macmillan education

#IgniteCuriosity

Macmillan
Budding Scientist
2025-26

Powered By **SPRINGER NATURE**

in Association with Indian Institute(S) of Technology

Project Reference Book

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Foreword

It was a pleasure for me to be approached by Macmillan Education India (MEI) in 2018 to explore the possibility of my involvement in their initiative "Macmillan Budding Scientist" (MBS). Right from the outset, it was clear to me that this was a somewhat unique beginning in the landscape of Indian school education system. At the time, I had already been professionally introduced to the school education system in India through (a) several invited and "popular" guest lectures for school students both at IIT Delhi and/or their respective schools, (b) an MHRD (now MoE) programme called IIT-Professor Assisted Learning (IIT-PAL) for class XI and XII school students that I was given the responsibility to initiate from IIT Delhi (along with a few of my colleagues), and (c) an honour of serving as an "Eminent in Education" member in the management committee of a Kendriya Vidyalaya (KV) in Delhi. Through the latter two, it was my sheer privilege to closely interact with KV teachers, who inspired me to appreciate the key foundational roles school teachers play in our lives and the unparalleled efforts they put in towards executing their responsibilities, beyond any prior experience of mine.

In 2018, MEI took the bold step of advancing the concepts of co- and extra- curricular initiatives of the Government of India that aim at enhancing the school education experiences of students by integrating beyond-the-classroom exploratory avenues for teachers and students. Inspired by Neil Armstrong, I would go to the extent of stating "*That first Macmillan Budding Scientist in 2019 was one step for Macmillan Education India, but a giant leap for corporate involvement in the Indian education sector*".

Having successfully completed three iterations since the first one in 2019, MBS initiative has fast established itself as a benchmark for recognizing co- and extra- curricular academic efforts of student-teacher teams from schools across the country. While encouraging beyond-the-classroom engagements of teachers with their students in schools, MBS initiative encourages students who wish to push their educational explorations beyond their books. Additionally, an abstract achievement of the MBS initiative is that it recognizes and celebrates those teachers who push their own limits in guiding students beyond classrooms. I feel privileged to have been asked to write this foreword for the first edition of this booklet showcasing projects of the MBS initiative. I hope that these projects will inspire students towards pushing the boundaries of their educational experiences beyond-their-classrooms but within-their-school-systems. More importantly, I hope this booklet will be seen as a first-of-its-kind effort in recognizing the often-unsung champions in our society – the teachers in schools who push their limits for every pupil entrusted to them.

Prof Aditya Mittal, B. Tech., Ph. D.
Kusuma School of Biological Sciences,
Indian Institute of Technology Delhi

Message from MD

Today STEM pervades every part of our lives and science's marvels can be seen and experienced everywhere we look in the world. STEM education links disciplines into a cohesive system and creates critical thinkers, increases science literacy, and prepares the next generation of innovators capable of transforming society through innovative solutions.

Being an integral part of India's education ecosystem, it is Macmillan's desire and duty to foster their interest, and ambition and give them a platform to showcase their creativity, which will spearhead tomorrow's technology.

At the Google Science Fair 2019, Tuan Dolmen from Turkey received the Scientific American Innovator Award for a digital agriculture module design that can capture tree vibrations. Further Aman KA and AU Nachiketh Kumar from India took home the National Geographic Explorer Award for a natural coagulant for rubber latex.

All of these children have done India proud, and we can't wait to see what they come up with in the future. You children should look up to young scientists like them as role models and strive to solve India's pressing problems, such as pollution, hunger and infant mortality.

I also encourage teachers to embrace STEM education because children are born with a natural curiosity for exploration and discovery.

We look forward to taking Macmillan Budding Scientist to schools across the country giving young learners an opportunity to showcase their ideas at a national level.

Rajesh Pasari
Managing Director
Macmillan Education India

About Macmillan Budding Scientist

 I remember the town hall hosted by the entire Springer Nature senior management team, on a cool November evening in 2016, in India. The Springer Nature group launched an innovative initiative to encourage and develop scientific talent in schools across India - Macmillan Budding Scientist, powered by Springer Nature. The thought behind it was to develop curiosity and scientific temper in young learners and promote research and innovation for sustainable development. The announcement came after an education conclave was organized by Springer Nature to discuss strategies and evolve solutions to challenges in science education in the years ahead. This initiative was to be integrated with the efforts of IIT Delhi towards school outreach and taken to thousands of schools in India, by Macmillan Education India. I would like to acknowledge the support of Ms. Subhra Priyadarshani, Chief Editor, Nature India who was instrumental in the conceptualization of the Budding Scientist initiative, enabled the partnership with IIT, and promised workshops on Science Communication to students.

At the launch event, a student of Amity International School Gurgaon Vaishali Tikko, was honoured by Springer Nature for the novel instrument she developed to help her fellow students facing learning difficulties. From 2016 to 2022 Macmillan Budding Scientist has grown in stature and today the engagement with IIT Delhi has extended to IIT Mumbai, Bhubaneshwar and Chennai. This will allow more students across the country to experience Science.

Macmillan Education is looking to expand this programme in the coming years and deepen its impact.

Vandana R Juneja
Director Marketing
Macmillan Education India

Vaishali Tikko, of Class XII was awarded as the budding scientist for her project titled- Novel instrument to detect learning disabilities in children by Macmillan Education. School Principal, Mrs Arti Chopra was also bestowed for fostering scientific talent.

From the Principal's Desk

Navrachana is committed to providing its students holistic education and provide a learning environment that will build, nurture and develop the trinity of faculties in every student- mental, physical and emotional.

At Navrachana, we believe that curiosity is the key to fostering the spirit of excellence. All our efforts in class thus, are geared to induce curiosity in students, to make them ask two magic questions: why, and why not? And it is with this questioning of the world around us that our students develop a scientific temperament. When they ask "Why?", they delve into the wonders of science and when they ask "Why not?", they embark on a quest to use science to better the world.

This scientific streak of curiosity that emerges in every student is eventually how ideas take root in classrooms. And with the guiding hands of our teachers, these ideas finally transform into solutions that take flight. We place a strong emphasis on holistic development, so our goal is to provide students with ample of opportunities to explore their interests and passions.

Ms. Suprabha Menon
Principal,
Navrachana Higher Secondary School,
Sama, Vadodara (Gujarat)

From the Principal's Desk

We live in an age where science and technology are transforming every aspect of our lives. From the way we communicate and travel to how we access information and solve global challenges, science is at the heart of it all. As an educational institution, we have the responsibility and privilege of preparing our students for a world that is driven by scientific advancements.

The students at the Broadway International School are given opportunities to explore, question and reason out even at the Pre-Primary level. Their curiosity is enhanced by taking them to various inter-school competitions. The idea is to develop a balance of scientific temper and linguistic abilities for them to be able to express their concerns and to find answers to all the unanswered questions. Organizing field trips to science museums, laboratories, or inviting professionals and scientists as guest speakers, exposure to real-world applications and interactions with experts have been quite inspiring for students. Our commitment to fostering scientific skills extends beyond the classroom creating an ecosystem where students not only learn theories but also actively engage in scientific exploration. By integrating all the above we strive to inspire a lifelong love for science and empower the next generation of innovators and problem solvers.

Ms. Rachana Desai,
Principal,
Broadway International School, Surat.

From the Principal's Desk

I extend my heartfelt gratitude to Macmillan Education team for their initiative which has left an indelible mark on the students of Gaikwad Global School, inspiring them to pursue excellence in academics and beyond. Activities like these by Macmillan Education are appreciable and are integral to nurturing future generations from across the country who are waiting for opportunities like these. Participation in events like the Macmillan Budding Scientist is not just an exercise in showcasing talent; it plays a vital role in achieving the dream of making 'Bharat - a Super Power' by inculcating a love of science, igniting curiosity and innovation amongst the youngsters of India.

We at Gaikwad Global School are determined towards developing scientific temper among our students by providing them multidimensional exposure through our teachers, resources and the events that we organize. Students are motivated to think beyond textbooks, explore new ideas, and develop practical solutions to real-world problems. We have always been at the forefront of promoting science and technology in our campus by organizing in-house annual science exhibition, field trips, industrial and campus visits, public rallies, awareness campaigns and so on.

The GGS Science Club (Affiliated to VIPNET, Ministry of Science & Technology, Govt. Of India) provides exposure to our students to undergo a wide spectrum of activities that paves the way to build a strong connect with scientific thinking and research.

We are one of the proud schools in our region who have been certified as "Eat right school" by FSSAI, Ministry of Health and Family welfare, Govt. Of India, by conducting eat right activities at our school due to which our students not only learnt to eat right and stay healthy but also acquired the skills of how to build a healthy society.

Gaikwad Global School, Chhatrapati Sambhajinagar takes immense pride in its young scientists and looks forward to their continued success in upcoming endeavours.

Dr. Sulekha Dhage,
Principal,
Gaikwad Global School,
Chhatrapati Sambhajinagar

From the Principal's Desk

As the Principal of this esteemed institution, I am proud to share how we are fostering scientific acumen among our students. Our vision is to nurture inquisitive minds capable of exploring the world through the lens of science. To achieve this, we have integrated a robust science curriculum that encourages critical thinking, experimentation, and problem-solving from an early stage.

We emphasize hands-on learning experiences, with students actively engaging in laboratory experiments, field trips, and science fairs. These opportunities not only allow them to apply theoretical knowledge but also spark curiosity and creativity. Additionally, we host regular workshops and invite experts in various scientific fields to inspire and broaden students' understanding of real-world applications.

Technology plays a key role in our approach, with interactive tools and digital resources that make learning more dynamic and accessible. We also promote interdisciplinary learning, where science is connected to other subjects like mathematics, art, and environmental studies, providing a holistic view of the world.

Our goal is to cultivate a generation of innovative thinkers who can apply scientific principles to address challenges and contribute meaningfully to society. By fostering a passion for discovery, we are preparing our students to become future leaders in science and technology.

Ajay Bahadur Singh,
Principal,
Mithi Gobindram Public School, Bhopal

From the Principal's Desk

I, Fareha Gaus Sayed, Principal of New Grace English School, firmly believe that nurturing scientific curiosity is pivotal to shaping the future of our students in an ever-evolving world.

In our school, fostering scientific acumen goes beyond the classroom. We strive to create a culture that celebrates curiosity, critical thinking, and creativity. Our teachers receive ongoing professional development to ensure they are equipped to inspire and guide students effectively. Through initiatives like science clubs, robotics teams, and environmental activities, we empower students to explore, innovate, and solve real-world problems.

The success of our students in competitions like the **Macmillan Budding Scientist** exemplifies this commitment. Their innovative project, the Flexible Highway Barrier, is a reflection of their ability to think critically and propose solutions to pressing societal issues. This achievement underscores our mission to prepare students for a future shaped by science and technology.

As educators, we remain committed to inspiring the next generation of thinkers and innovators, ensuring they are equipped to navigate and contribute to a rapidly changing world. Together, let us continue fostering a spirit of scientific excellence and curiosity in our students.

Fareha Gaus Sayed,
Principal,
New Grace English School, Pune

From the Principal's Desk

Mahatma Gandhi rightly said "The best way to find yourself is to lose yourself in the service of others." Firmly believing in ourcore values of Courage, Compassion, Equality and Integrity we at Sanskar Vidya Sagar aim to nurture our students so that they are well equipped to face the competitive society with value-based knowledge and skills that have contributed towards the growth and vision in building global citizens and a conscientious humanity.

Keeping in mind that to teach is to touch a life forever, we believe in holistic education that encompasses academics, co-curricular activities, sports and life-skills learning. As we venture ahead and spread our wings in this spectacular valley of value-based education and a robust curriculum that opens the door to global platforms for our peace loving and problem-solving students. Activities and events related to value education, environment, health education, games and sports, visual and performing arts, culture and heritage, personality development are effectively woven into the main fabric of school curriculum.

I take this opportunity to thank Macmillan Team for organising such a wonderful platform for students to experience dream making true.

Mrs. Shweta Deshpande,
Principal,
Sanskar Vidya Sagar, Nandanvan, Nagpur.

From the Principal's Desk

In today's fast-paced, technology-driven world, scientific literacy is a necessity. Schools play a pivotal role in cultivating scientific acumen, which encompasses curiosity, critical thinking, problem-solving and a deep understanding of scientific principles. At St. Joseph's High School we have left no stone unturned building this foundation from an early age which equips students to navigate and contribute to a rapidly evolving global landscape.

The motto of our school' Excellence in education and all round development 'has paved the way to equip students with the skills and mindset to tackle the challenges of the future. Hands-on activities, such as experiments, model-building, and fieldwork are conducted. Group projects not only build teamwork but also hone communication skills, essential for articulating scientific ideas effectively. Teachers incorporate case studies, debates, and problem-solving exercises into the curriculum to challenge students to think. Inviting guest speakers from scientific fields further ignite students' passion for science.

As educators, facilitators it is our collective responsibility to ensure that every student has the opportunity to unlock the wonders of science and contribute meaningfully to society. Thank you for such a platform and best wishes to every participant of the 'MacMillan Budding scientist 2024".

Mrs. Leena Verma,
Principal,
St Josephs's High School CBSE, Panvel

From the Principal's Desk

At The Jain International School, Nagpur, we believe in empowering young minds with the tools of scientific inquiry, critical thinking, and innovation. Our holistic approach integrates modern teaching methodologies, advanced infrastructure, and experiential learning, ensuring students develop a robust scientific temperament. We have well equipped laboratories for Physics, Chemistry, and Biology, where students actively engage in experiments that bridge theoretical knowledge with practical application. Our curriculum goes beyond textbooks, incorporating interdisciplinary learning and problem-solving activities.

Our Science Club serves as an enriching platform where students can explore their scientific interests beyond the classroom. This club allows students to engage in exciting experiments, discussions, and collaborative projects that ignite their curiosity and encourage critical thinking.

In line with the government's vision to promote innovation and entrepreneurship, we have established the Atal Tinkering Lab (ATL) at our school. The ATL provides students with a dynamic, hands-on environment where they can experiment with technology, electronics, and robotics. By designing prototypes, working on real-world issues, and tinkering with new ideas, students gain practical exposure to the STEM fields, learning how to turn theoretical knowledge into tangible innovations.

We nurture a culture of inquiry through project-based learning, where students identify societal problems and propose innovative solutions. Participation in national and international science fairs, olympiads, and competitions further sharpens their analytical skills and confidence. Our dedicated faculty members mentor students, guiding them to explore, question, and innovate.

At The Jain International School, Nagpur, our goal is to nurture scientifically literate individuals who are prepared to lead with curiosity, creativity, and a sense of purpose in a rapidly evolving world. By fostering scientific acumen, we aim to shape thinkers and innovators of tomorrow.

Ms. Anmol Badjatia,
Principal,
The Jain International School, Nagpur

From the Principal's Desk

With unwavering faith in the transformative powers of Science, Chettinad Vidyashram places profound emphasis on cultivating a spirit of inquiry and a scientific temper in its students. As we head towards a future powered by discovery and progress, the school keenly promotes scientific acumen in order to nurture critical thinking, innovation and a rational approach in youngsters.

The school has fully functional and state-of-the-art science laboratories where students gain hands-on knowledge and expertise. To enhance industry knowledge, students are engaged in immersive hands-on field explorations to hospitals, museums and research institutes at frequent intervals. Chettinad Vidyashram's biennial Science Expo is a haven for science enthusiasts, as this mega STEM festival showcases live projects, working models and innovative and strategically thought-of solutions for problems that plague the world. This science carnival witnesses innovative initiatives not just in science but in other realms like humanities, commerce etc. Considering that an analytical approach is intrinsic for any valid development, the school encourages all disciplines to showcase their progressive ventures on these two days of the Science Fest.

The school's curriculum has been conceived from a scientific perspective as there is a radical shift from rote learning to an approach propelled by science and rational thinking. Interdisciplinary projects and activities for students of all classes, seamlessly blend science with the other domains. To complement, textbook learning, students are exposed to experiments related to daily life, which is one of the easiest and most effective ways of fuelling critical reasoning. Science based games and challenges are an integral part of our classroom transactions.

The school encourages students to participate in science competitions and events where they get a chance not just to prove their scientific calibre but also to broaden their horizons. Chettinad Vidyashram encourages students to partake in Olympiads and other competitive exams that can help hone their intellectual rigour. By providing a multitude of opportunities for students to explore in their pursuit of scientific enlightenment, the school's alumni roster proudly boasts a distinguished line up of innovators, pioneering scientists, and enlightened global citizens.

Dr. S Amudha Lakshmi,
Principal,
Chettinad Vidyashram, Chennai

From the Principal's Desk

The future of education is on the brink of transformation. Children now prefer to experiment, and solve real-world problems rather than just learning from textbooks. At Gitanjali Devshala, we support this transformative approach by offering a classroom setting that encourages creative thinking and equips students with the tools they need to tackle problems in the real world.

Igniting Scientific Curiosity Through Hands-On Exploration

We spark curiosity through hands-on learning, encouraging students to ask questions and find answers through experimentation. Activities like building simple machines and designing eco-friendly solutions inspire excitement for science from an early age.

Teaching Tomorrow's Innovators Today

Our teaching methods include inquiry-based learning, STEM education, and real-world applications. Case studies, group discussions, and brainstorming sessions guide students to apply theoretical concepts in practical ways. Teachers foster creative thinking and exploration at every step.

Showcasing Innovation through Assemblies and Science Fairs for Extended Learning

Our Science in Action Assemblies and Science Fairs are platforms for students to showcase their creativity and extend their learning. We also have **Symposiums** where subject experts and parents from scientific fields share their insights to inspire students and broaden their perspectives. This way, we create a rich learning environment that connects students with real-world professionals.

Designing Solutions for Real-World Challenges

We place a strong emphasis on making education meaningful by connecting what is learned in the classroom to real-world situations. Through projects and field visits, students explore renewable energy, sustainability, and climate change. Design-thinking activities challenge them to develop practical solutions. These initiatives instil values like empathy and a sense of purpose. Our children understand that science is a powerful tool for innovation and a force for positive change.

At Gitanjali Devshala, we prepare students to lead with confidence, innovate, and make a lasting impact on the world.

Mrs Madhvi Chandra
Director and Principal,
Gitanjali Devshala, Secundrabad

From the Principal's Desk

I'am Usha Prem, Principal of Chinmaya Vidyalaya, Kolazhy, Thrissur, Kerala. I'am absolutely thrilled that my brilliant team of three have made it to the final round of Macmillan Budding Scientist programme. Their hard work, dedication, and curiosity have paid off.

We believe that instilling scientific temper in our children is essential for their cognitive, emotional, and social growth. By encouraging inquiry-based learning, critical thinking, and creativity, we aim to empower our students to become active participants in the scientific process, equipped to navigate the complexities of our rapidly changing world."

Here are some ways by which scientific acumen is being fostered in students of our Vidyalaya.

Curriculum Development

- Integrate STEM education: Incorporate science, technology, engineering, and mathematics (STEM) into the curriculum.
- Hands-on learning: Encourage practical experiments and activities that promote experiential learning.

Teacher Support

- Professional development: Provide teachers with training and resources to enhance their science teaching skills.

Student Engagement

- Science fairs and competitions: Organize science fairs, quizzes, and competitions to encourage student participation.
- Guest lectures: Invite scientists, engineers, and industry experts to share their experiences and inspire students.

- Science clubs: Establish science clubs or groups that focus on specific areas, such as robotics, astronomy, or environmental science.

Infrastructure and Resources

- Well-equipped laboratories: Ensure that science laboratories are well-equipped and safe for students.
- Technology integration: Incorporate technology, such as simulations, models, and educational software, to enhance science learning.
- Library resources: Provide access to science-related books, journals, and online resources.

Community Involvement

- Partnerships with industries: Collaborate with local industries, research institutions, and universities to provide students with real-world experiences.

Assessment and Evaluation

- Assessment strategies: Develop assessment strategies that evaluate students' scientific knowledge, skills, and attitudes.
- Feedback mechanisms: Establish feedback mechanisms to identify areas for improvement and provide support to students.

These initiatives empower our students to thrive in an increasingly complex technological world.

Ms. Usha Prem,
Principal,
Chinmaya Vidyalaya, Kolazhy, Thrissur, Kerala

From the Principal's Desk

"As the Principal of IES Public School, Chittilappilly, Thrissur, Kerala, I am beaming with pride! Our institution is dedicated to nurturing the talents of our students, providing them with numerous opportunities to shine. We foster scientific excellence by engaging our students in various activities that stimulate their curiosity and creativity. Our ATL Lab and Research Center serve as a hub for innovative experimentation, empowering our students to transform ideas into reality.

Our students have consistently demonstrated their exceptional abilities by participating in various inter-school competitions and events organized by renowned institutions. Their dedication and hard work have yielded impressive results, with numerous prizes and accolades won. Notably, they have published papers in research journals, conducted a successful Digi Fest, and participated in competitions conducted by esteemed organizations such as ISRO and NASA. Recently, we conducted a 2-day satellite-making workshop, showcasing our students' talent, perseverance, and teamwork.

I am thrilled to announce that our students have been shortlisted to participate in the prestigious Budding Scientists Program at IIT Madras, representing the South Zone! This exceptional opportunity is a testament to our students' intellectual curiosity, scientific acumen, and innovative spirit. We are incredibly proud of their achievement and look forward to their exciting journey at IIT Madras!"

I wish you all the best

Dr. Sujatha Harimohan,
Principal,
IES Public School,
Chittilappilly, Thrissur, Kerala

From the Principal's Desk

As we continue to navigate the complexities of the 21st century, it has become increasingly evident that science and technology will play a pivotal role in shaping the future of our nation. At Jay Group of Schools, we recognize the importance of fostering a culture of innovation and experimentation among our students.

The Atal Tinkering Lab: A Hub for Innovation

The Atal Tinkering Lab (ATL) has been a game-changer in our efforts to promote STEM education (Science, Technology, Engineering, and Math) among our students. This state-of-the-art facility provides a platform for our young minds to tinker, experiment, and innovate, using cutting-edge technology such as 3D printers, robotics, and microcontrollers.

Fostering a Culture of Innovation

Through the ATL, our students have been able to explore complex concepts in a hands-on and interactive manner. This has not only deepened their understanding of scientific principles but also instilled in them a sense of curiosity and creativity. By providing our students with the tools and resources they need to innovate, we are empowering them to become the problem-solvers and change-makers of tomorrow.

Science and Technology: Preparing Students for the Future

Science and technology are no longer just subjects in the classroom; they are the building blocks of our modern world. By integrating science and technology into our curriculum, we are preparing our students to navigate the complexities of an increasingly interconnected world.

At Jay Group of Schools, we are committed to provide our students with a world-class education that prepares them for success in the 21st century. The Atal Tinkering Lab and our emphasis on science and technology are just a few examples of how we are working to achieve this goal. By fostering a culture of innovation and experimentation, we are empowering our students to become the leaders and innovators of tomorrow.

M. Senthilkumar,

Principal,

Jay Matriculation School, Kitchipaklayam, Salem

From the Principal's Desk

KLE International school strongly creates a vibrant centre for learning which provides a congenial atmosphere for students to excel academically and develop into ethically strong and morally elevated individuals.

"Fostering Scientific Acumen in schoo" requires a multi-faceted approach. Here are some strategies to promote scientific literacy and critical thinking among students:

Curriculum Design

- Inquiry-based learning: Encourage students to explore scientific concepts through hands-on experiments and investigations.
- Interdisciplinary connections: Integrate science with other subjects, such as mathematics, language arts, and social studies.
- Real-world applications: Connect scientific concepts to everyday life and current events.

Teaching Methods

- Hands-on activities: Incorporate experiments, simulations, and models to illustrate complex scientific concepts.
- Discussion-based learning: Encourage students to engage in scientific debates, discussions, and problem-solving activities.
- Mentorship: Pair students with scientists, engineers, or mentors who can provide guidance and inspiration.

Assessment and Evaluation

- Performance tasks: Assess students' scientific knowledge and skills through hands-on activities and projects.
- Peer review: Encourage students to review and provide feedback on each other's work.

- Self-assessment: Help students develop metacognitive skills by reflecting on their own learning and progress.

Resources and Infrastructure

- Well-equipped laboratories: Provide students with access to modern scientific equipment and technology.

- Digital resources: Utilize online platforms, simulations, and educational software to enhance scientific learning.

- Guest lectures: Invite scientists and experts to share their knowledge and experiences with students.

Teacher Professional Development

- Workshops and training: Provide teachers with ongoing professional development opportunities to enhance their scientific knowledge and pedagogical skills.

- Collaboration: Encourage teachers to collaborate with colleagues and scientists to develop innovative lesson plans and activities.

- Mentorship: Pair teachers with experienced educators or scientists who can provide guidance and support.

Community Engagement

- **Science fairs:** Organize science fairs and exhibitions to showcase students' scientific projects and achievements.

- **Partnerships:** Collaborate with local industries, universities, and research institutions to provide students with opportunities for scientific exploration and discovery.

- **Parental involvement:** Engage parents and guardians in scientific activities and events to promote a culture of scientific literacy and enthusiasm.

By implementing these strategies, in our school we foster a culture of scientific acumen, preparing students for success in an increasingly complex and technologically driven world.

Ms. Dipti Ingley,
Principal,
Kles' International School,
Bangalore

From the Principal's Desk

There are only three ways to make a country wealthy – "to dig something up", "to grow something" or "to create something".

We are happy and thankful for selecting our School team for the Zonal round from the South Zone for the Macmillan Budding Scientist 2024-2025. Science encourage Curiosity. It invites students to question, explore and seek answers to the mysteries of the Universe. This curiosity, in turn, fosters critical thinking skills.

We give ample opportunities for our students to do practical experiments related to their topics of science subjects studied in the classrooms. We conduct theme based Science exhibitions which gives our students to explore and exhibit their scientific talents and skills. We selected the project on "Heavy Rain Detector" as we felt this would be useful for the Society.

To build the Students' Scientific temperament our teachers encourage them to ask more questions and feed their Natural Curiosity and this will also promote their interest in the subject. We conduct Science Quiz which triggers the students' interest and inquisitiveness. Quizzing is a mind sport that engage competitors to sharpen their knowledge beyond books.

Team based projects are given to help them to share their ideas and foster their critical thinking skills. Students watch science related videos in our digital classrooms. We have library where they read science related periodicals and journals. We encourage our students with scientific community by inviting professionals to share their experiences and insights. We take our students to Science Museums, Industries,Research Centres, Botanical gardens etc.

Scientific research is the backbone of innovation, driving breakthroughs that transform the world.

Dolly Vilgi Oommen
Principal,
St. Mary's Residential School,
Pathanspuram, Kollam

From the Principal's Desk

In today's fast-paced, ever-evolving world, the ability to think critically, solve problems, and innovate is essential for success. At, Summer Fields we believe that developing scientific acumen is not just about understanding theories but about cultivating a mindset that values inquiry, exploration, and continuous learning. In an era driven by technology and innovation, scientific literacy has become a cornerstone for success and progress.

Science is not confined to textbooks or laboratories; it is a way of thinking and approaching the world around us. Our mission is to encourage students to question, experiment, and seek solutions, whether in the classroom, at home, or in the community. By integrating hands-on learning experiences, promoting interdisciplinary collaborations, and fostering a growth mindset, we provide our students with the tools to not only understand science but to contribute to its future.

In our classrooms, science is not confined to textbooks alone. We encourage students to engage in collaborative learning, where teamwork and communication play an integral role in discovering new ideas and solutions. We also emphasize the importance of interdisciplinary learning, where science intersects with mathematics, technology, and the arts, fostering a well-rounded education.

As we continue to invest in modern resources, facilities, and teacher development, our goal is to ensure that every student has the opportunity to thrive in scientific pursuits. By fostering an environment that nurtures inquiry and innovation, we are preparing our students to become the thinkers, problem-solvers, and leaders of tomorrow.

Our Motto is a collaborative effort amongst students, teachers, and parents — to create a future where scientific acumen is not only celebrated but also embraced as the foundation for a brighter world.

Let us continue to inspire our students to see the world through the lens of science — where every question holds the potential for discovery, and every discovery leads to a brighter, more sustainable future.

Dr. Urmimala Sudhakar
Principal,
Summer Fields School
Gurugram, Haryana

From the Principal's Desk

At K. L. International School, we hold the pursuit of scientific knowledge as paramount. Our curriculum has been meticulously redesigned to align with contemporary advancements, seamlessly integrating experiential learning and practical applications. The Science Club (Innovators) and Eco Club (Friends of Earth) foster a spirit of inquiry and independent research, inspiring young minds to challenge conventions and explore uncharted territories.

In partnership with local experts, our students gain first-hand insights into real-world scientific applications. Our state-of-the-art laboratories, equipped with modern instruments, provide an abundant ground for hands-on experimentation and discovery. Complementing this, initiatives such as WM contests, science quizzes, and field excursions offer students enriching opportunities beyond the classroom, broadening their horizons and deepening their engagement with science.

We are proud to share that our participation in the CBSE Science Exhibition led to national recognition, with a project on extracting activated carbon from onion skins being shortlisted for the national level. Furthermore, I had the honor of receiving the National Award on Teachers' Day in 2023 from the esteemed President of India, Mrs. Droupadi Murmu, acknowledging our relentless efforts toward holistic student development.

To ensure we remain at the forefront of educational excellence, our teaching faculty engages in continuous professional development. Our teachers actively participated in the 10th National Annual Virtual Labs Nodal Centre Coordinator's Meet, reflecting our commitment to a dynamic and evolving learning environment. Additionally, we encourage participation in National and International Science Olympiads, nurturing a spirit of healthy competition while exposing students to global benchmarks of excellence.

With a firm belief in cultivating curiosity, collaborative problem-solving, and innovation, K. L. International School is dedicated to shaping scientifically literate and forward-thinking individuals, equipped to thrive in an increasingly complex and interconnected world.

Mr. Sudhanshu Shekhar
Principal,
K. L. International School, Meerut

From the Principal's Desk

At Spring Dales English School, Kathua, we are committed to fostering scientific curiosity and nurturing the potential of our students to innovate and excel in STEM fields. Our emphasis on hands-on learning and experiential education sets the foundation for young minds to explore real-world challenges and devise innovative solutions.

Key Initiatives

Visits to Premier Institutions/Industries:

This year, 118 students of 10th,11th,12th Students visited IIT Jammu, where they engaged with cutting-edge research, toured advanced laboratories, and interacted with distinguished experts. The students also visited Chenab Textile Mills, Mansar Lake, Municipality (Sewerage Water Assessment), Fish Farm this year. Spring Dales English School signed MOU in December 2024 with Government Degree College for Women(GDCW) Kathua & LPU to promote creativity and innovation in "STEM through workshops/projects and provide career counseling and mentorship to students of both institutions". These experiences inspire and expose students to the possibilities of STEM careers.

Atal Tinkering Lab (ATL):

Our state-of-the-art ATL encourages creativity and innovation. Students actively participate in building science projects fostering critical thinking and practical application of science concepts. Our school has been selected as one of the top Eco–Conscious Schools 2024-25 under the Generation Green Campaign under Atal Tinkering Lab.

Mentorship Sessions, Guest Lectures & Activities:

Regular Sessions such as Design Thinking and Problem Solving, Time and Resource Management, Patent and Copyrights, Generating Ideas, Robotics Workshop etc by experts equip students with essential skills to ideate and execute projects effectively. We have Eco & ATL Club which conducts various STEM activities and Science Exhibitions.

**Prof R. K. Gupta (Retd. HOD Physics,
Govt. Degree College Kathua)**

Director,
Spring Dales English School, Kathua

From the Principal's Desk

At St. Joseph's Convent School, we are deeply committed to providing our students with a well-rounded education that equips them to meet the challenges and opportunities of the future. To achieve this, we have adopted a comprehensive approach that integrates various strategies to ignite curiosity and promote a profound understanding of scientific principles.

We encourage our students to ask questions, conduct experiments, and engage in hands-on activities. A culture of inquiry is fostered in our school, by encouraging students to view every challenge as an opportunity to ask 'why' and 'how,' transforming curiosity into discovery. We also invite professionals from various scientific fields to share their knowledge and experiences, enriching our students' learning journeys.

Our science teachers play a pivotal role in fostering a scientific attitude among students. With their passion for the subject and dedication to nurturing young minds, they create an environment where learning is exciting and meaningful.

Students regularly engage in group projects, experiments, and presentations, fostering collaborative learning. Our curriculum integrates real-world problem-solving, helping students develop critical thinking and analytical skills that form the foundation of a scientific mindset.

Our school organized Epiphany Alley in the month of October, a celebration of creativity and innovation, where students showcased their scientific ideas and projects. Science carnivals and exhibitions are also held to highlight students' achievements and promote interdisciplinary learning by demonstrating connections between Science, Mathematics, Technology, and Engineering. Our extracurricular science programs provide additional opportunities for students to delve deeper into scientific topics and engage in experiential learning.

By incorporating these diverse methods, we strive to create a dynamic and engaging learning environment that nurtures a passion for science. Our ultimate goal is to empower students with the knowledge and skills they need to excel academically and contribute meaningfully to society.

Sr. Archana,
Principal,
St. Joseph's Convent School,
Jalandhar

From the Principal's Desk

At St. Joseph's Senior Secondary School, Chandigarh, we are deeply committed to nurturing a scientific temper among our students. Our approach to science education is not confined to theoretical learning; instead, we aim to instill curiosity, creativity, and a passion for exploration through hands-on experiences and collaborative projects.

The Annual Science Exhibition stands as a vibrant platform where students showcase innovative models and working prototypes that address real-world challenges. Events like the Science Mela further provide opportunities for students to present their ideas, fostering confidence and a spirit of inquiry.

In our pursuit of inclusive education, we extend our efforts to schools for the visually impaired by sharing student-made models and creating tactile teaching aids. These aids, designed under the expert guidance of our teachers, aim to make the world of science accessible to all learners, regardless of their abilities.

Our students also enthusiastically participate in various inter-school science competitions, broadening their horizons and inspiring them to innovate and think critically. Workshops on model-making and practical experiments are a regular part of their learning journey, encouraging them to delve deeper into the application of scientific concepts.

At St. Joseph's, we firmly believe that science is not just a subject but a way of life. By fostering scientific acumen, we aim to equip our students with the skills and vision to explore, innovate, and contribute meaningfully to society, preparing them to lead in a world driven by discovery and advancement.

Ms. Monica Chawla
Principal,
St. Joseph's Sr. Sec. School,
Chandigarh

From the Principal's Desk

Incredible Science! The phrase says it all. Science has always been fascinating and its wonders have incessantly inspired scientists around the world to seek more. Science at its best is an open-minded method of inquiry, not a belief system. At The Manthan School, we understand that education goes beyond textbooks and classrooms; it's about empowering our students with the tools to explore, experiment, and innovate.

As a testament to this, we are immensely proud to share that our talented students have showcased their exceptional scientific acumen in the MacMillan Budding Scientist Competition, organized in collaboration with IIT Delhi. The participating students' innovation and passion have secured them a spot among the top eight schools in the North Zone. We wish them good luck for the Zonal Round. This remarkable triumph highlights Manthan's commitment to nurturing young minds and fostering a culture of scientific inquiry.

The Macmillan Budding Scientist Competition serves as a perfect platform for the inquisitive minds to explore and appreciate the wonders of science, instilling intrigue among the students, fueling their imagination, and inclining them towards scientific reasoning. We wholeheartedly congratulate the winners and are committed to enthusiastically support their passion and endeavors to unleash their creativity and ingenuity.

We, at The Manthan School, empower 21st century students with a scientific mindset that involves cultivating an environment that encourages critical thinking, creativity, and a sheer exuberance for discovery. Our approach integrates hands-on experiments, collaborative projects, and real-world problem-solving scenarios that challenge students to think beyond traditional boundaries. We aim to ignite the spark of curiosity through an array of initiatives, including dynamic science clubs, interactive seminars with experts, and participation in inter-school and national level science events.

Dear students, you are a harbinger of change to society at large, and my heartfelt wishes will always be there for you. Your unwavering commitment and zeal will usher you to the zenith of success and glory. Let's strive for excellence together.

Poonam Kumar Mendiratta
Principal
The Manthan School,
Greater Noida (West)

From the Principal's Desk

"Fostering scientific acumen in students is an essential part of education, and we at Carmel School, Sadew, Upper Shillong strive to achieve this in various ways. One effective approach is engaging students in project work, both individually and in groups. These projects allow them to explore scientific concepts, solve real-world problems, and work collaboratively to find creative solutions.

Organizing science exhibitions is another way we encourage students to showcase their talents. These events give them a platform to present their innovative ideas, experiments, and discoveries, building confidence and enthusiasm for science. Additionally, we are also introducing activities such as coding and robotics, which will make learning interactive and fun while preparing students for future technological advancements.

To ensure sustained growth, we also focus on training teachers, enabling them to guide and inspire students effectively. Teachers are encouraged and helped to create inquiry-based learning environments where curiosity and exploration are valued.

By combining these efforts, Carmel aims to create a culture where students develop critical thinking, problem-solving skills, and a love for science. Through hands-on activities and innovative approaches, we strive to nurture the next generation of scientists, engineers, and thinkers, equipping them with the tools they need to succeed in a rapidly evolving world.

Sr. Hazel A. C. also known as
(Rita Rithiang Rymbai),
Principal,
Carmel School, Sadew

From the Principal's Desk

Rooted in the belief that education is not merely about imparting knowledge but fostering a culture of curiosity, creativity, and critical thinking, GD Goenka Signature School stands at the forefront of educational innovation, redefining traditional paradigms and pioneering new approaches to learning. Empowering students by promoting academic excellence in a safe and nurturing environment. Supporting socio–emotional well–being and creating responsible citizens and leaders who are 'Tomorrow's Ready'.

Innovations in pedagogy implemented by school:

Our balanced approach towards providing exposure to a multitude of skill development, hands on training and academics is what helps us ensure 360' development and overall wellbeing of our learners. Mentioned below is a glimpse of our footprints in nurturing our learners in all the realms. We strive to:

- Transform our classrooms into learning spaces that facilitate the quest to know more, to introspect, to imagine, to create, to explore and experience.
- We try to reinvent and rebuild our curriculum and pedagogical practices to rekindle to joy in learning.
- Along with excellence in academics we focus at the 'learning beyond classrooms' that equips our students for success in the real world with a positive approach, growth mindset, decision making, and communication and leadership abilities.
- We focus on 'learning beyond classrooms'.
- We allow our students to explore and experience what they learn. We practice 'Child centered learning' by keeping in mind the individual differences.
- We instruct less and motivate to 'do' more.
- We have adopted flexible curriculum that is inclusive and suits the learning styles of each learner.

- Strategies like 'Happy assessments' only allow us to focus more on learning than on evaluation. Innovative Pedagogical practices such as:
  - Guided research
  - Flipped classrooms
  - Project based learning
  - Life skills embedded curriculum.
  - Subject-integrated learning and
  - Art-integrated learning help us provide the best learning experience to each learner suited to their individual styles and needs.

At the heart of GD Goenka Signature's innovative ethos lies a profound commitment to experiential learning. We believe in the transformative power of learning by doing, where students are not passive recipients of information but active participants in their own educational journey. In keeping with our commitment to innovation, GD Goenka Signature embraces **flipped learning** as a transformative educational approach. By flipping the traditional classroom model, we optimize face-to-face instructional time for **interactive, collaborative activities, discussions, and hands-on exploration. Through pre-recorded lectures, multimedia resources, and online discussions,** students engage with content at their own pace, enabling personalized learning experiences that cater to individual interests, abilities, and learning preferences.

In conclusion, GD Goenka Signature stands as a beacon of educational innovation, inspiring a generation of lifelong learners, innovators, and changemakers. We remain steadfast in our commitment to pushing the boundaries of education, embracing new possibilities, and empowering students to realize their full potential in an ever-changing world.

Dr. Alpana Baveja,

Principal,

GD Goenka Signature School, Gurugram

From the Principal's Desk

We extend our heartfelt gratitude to Macmillan for organizing the Macmillan Budding Scientist, which has been an inspiring and innovative platform for our students. This programme has ignited young minds with creativity and enthusiasm, pushing them to explore the exciting world of robotics. The opportunity to participate has fostered a spirit of collaboration, learning, and technological advancement among the students.

The dedicated efforts of the Macmillan organizing team have truly made this event a memorable experience for our students, providing them with the chance to showcase their talents and innovation. It is through such platforms that students are encouraged to think critically, solve complex problems, and develop essential skills for the future.

We sincerely appreciate the valuable platform provided to our students and the inspiration it has generated. Your support in nurturing young talent and advancing education in robotics is commendable. We look forward to more such enriching experiences in the future.

Thank you once again for everything.

Mrs. Farhat Hasan
Principal-Director
International School ICSE, Patna

From the Principal's Desk

Kerala Public School, Mango, Jamshedpur, is committed to nurturing scientific acumen among students through various innovative initiatives. The school emphasizes experiential learning and critical thinking to inspire young minds toward science and technology and encourage students to analyze problems, evaluate data, and form evidence-based conclusions.

Hobby classes play a pivotal role in this mission, offering students opportunities to engage in hands-on activities like Incorporate lab experiments and practical sessions where students explore scientific concepts in action.

The school use real-life examples to demonstrate principles (e. g., Newton's laws using motion and force experiments). These classes provide a platform for students to explore scientific concepts beyond textbooks, encouraging curiosity and creativity.

Science exhibitions are another cornerstone of the school's efforts. These exhibitions showcase student projects and models, fostering a deeper understanding of scientific principles while enhancing their presentation and research skills and Encourage students to present their projects, write reports, or create models. Platforms like science fairs, exhibitions, or STEM clubs can provide visibility. Themes such as renewable energy, space exploration, and sustainable development are explored, aligning with contemporary global challenges.

Participation in interschool science competitions and Olympiads is actively encouraged, helping students compete at regional and national levels. These Science competition encourage teamwork through group experiments, discussions, and presentations. These events hone problem-solving abilities and expose students to real-world scientific challenges, fostering a sense of achievement and confidence.

The school also celebrates the contributions of great scientists and their inventions through dedicated events. Activities such as quizzes, debates, and role-plays during events like Science Day or the birthdays of luminaries like C. V. Raman and Albert Einstein inspire students to appreciate the history and impact of scientific discoveries. Webinars for teachers and students conducted time to time.

These initiatives collectively in still a scientific temperament among students, preparing them to be future innovators and leaders. Kerala Public School, Mango, stands as a beacon of progressive education, striving to make science accessible, engaging, and meaningful for its students.

Mrs. Rupa Ghosh,
Principal,
Kerala Public School Mango

From the Principal's Desk

Dear Parents, Teachers, Students, and Members of the Macmillan Budding Scientist Community,

As we continue our journey toward educational excellence, it is crucial that we remain forward-thinking and adaptable to the rapid changes occurring in the world around us. In this regard, I am excited to announce an ambitious initiative that will enhance our curriculum, expand the horizons of our students, and prepare them for the opportunities and challenges of the future.

Incorporating Artificial Intelligence (AI) and Robotics into our educational framework will provide our students with cutting-edge knowledge and skills essential for thriving in the 21st century. These technologies are no longer futuristic concepts but are integral to fields ranging from healthcare and engineering to finance and entertainment. Our mission is to not only familiarize our students with these innovations but to immerse them in hands-on, real-world applications that will stimulate their curiosity, critical thinking, and problem-solving abilities.

To facilitate this, we are developing dedicated spaces within the school for students to engage in robotics workshops, coding clubs, and AI-driven learning projects. These hands-on experiences will ignite their passion for science and technology, demonstrating that these fields are not only relevant but also incredibly rewarding.

Furthermore, as AI and Robotics become increasingly intertwined with various industries, it is essential that students learn not only the technical aspects of these fields but also their ethical and societal implications. We will be emphasizing the responsible use of technology and ensuring that students develop a deep understanding of how to use these tools to create positive impact in society.

Our commitment to fostering interest in science goes beyond just introducing new technologies. Throughout the academic year, we will host science fairs, guest lectures from industry experts, and hands-on experiences that demonstrate the power of innovation. We believe that when students see the real-world impact of what they are learning, their curiosity and excitement about science will flourish.

In addition, we will provide opportunities for students to explore the ever-expanding career paths in AI and Robotics. By partnering with local tech companies, universities, and STEM organizations, we will expose our students to a variety of career options and provide them with mentorship from professionals in the field.

The future is bright for our students, and by equipping them with the tools to succeed in emerging technologies, we are ensuring that they will be leaders in innovation, creativity, and problem-solving. The integration of AI and Robotics into our school curriculum is just the beginning of an exciting chapter in our journey, one that will continue to evolve as technology progresses.

I look forward to seeing how our students engage with these new opportunities and grow into the thinkers, creators, and leaders of tomorrow.

Sincerely,

Mr. John Stephen,

Principal,

La Martiniere for Boys, Kolkata

From the Principal's Desk

At St. Michael's School for Girls, we are committed to cultivating a deep appreciation for science as an essential tool for understanding and addressing the complexities of the modern world. A robust foundation in scientific thought empowers students to think critically, solve problems creatively, and contribute meaningfully to societal progress. Our approach to science education is holistic and dynamic, emphasizing active engagement and inquiry. By combining theoretical instruction with hands-on experimentation, students explore the principles that govern our natural and technological landscapes. This interdisciplinary methodology — spanning biology, chemistry, physics, and environmental science — ensures students understand the interconnected nature of scientific fields and their impact on the world around them. Experiential learning is central to our curriculum. Through project-based activities, collaborative research, and practical problem-solving exercises, students develop essential skills such as analytical thinking, teamwork, and self-directed inquiry. Field excursions to environmental sites and science centers further enhance their learning experience, allowing them to apply classroom knowledge in real-world contexts.

At St. Michael's, we strive to empower young women to excel as leaders, innovators, and changemakers in STEM fields. By fostering intellectual curiosity, resilience, and a passion for discovery, we prepare our students to navigate the challenges of the 21st century with confidence and creativity. Together, we are shaping a generation ready to make a lasting impact on the world.

Mrs. Sangeetha Chakravarti,
Principal,
St. Michael's School for Girls, Siliguri

From the Principal's Desk

"Creativity is the key to success in future, and primary education is where teachers can bring creativity in children at that level."

At our Academy, we are dedicated to nurture a passion for science and technology among our students that stimulates creativity, curiosity and innovation. One of the main events in the Academy is the Annual Science Exhibition and Seminar, where students showcase their scientific skills and experiments. This event hones their research and presentation skills and instills in them a sense of scientific inquiry from an early age. The event also helps in bringing out the raw talents of the students and to transform their creativity and thinking (innovative ideas) into reality. The teachers of the Academy take keen interest in translating all the processes.

We, at the Academy, aim to instill a love for learning and inquiry, preparing our students to navigate the complexities of an ever-evolving scientific landscape. It is with great pride and appreciation that I acknowledge the exceptional efforts of Macmillan Education on organizing the Macmillan Budding Scientist Program at our school. This invitation has provided our students with a unique platform to engage with science beyond textbooks, encouraging innovation, critical thinking, and problem-solving.

In a world increasingly driven by technological advancements and scientific discovery, such programs are instrumental in equipping young learners with the skills and mindset necessary to excel in the future. By fostering curiosity and a passion for inquiry, Macmillan Education has contributed significantly to the holistic development of our students.

We extend our heartfelt gratitude to Macmillan Education for their unwavering commitment to empowering young minds. This collaboration has made a lasting impact, and we look forward to continuing this partnership to nurture the next generation.

Joshua Salam,
Principal,
Brighter Academy, Imphal

From the Principal's Desk

Developing scientific acumen among students is pivotal for nurturing curiosity, critical thinking and innovation. Our school plays a significant role in creating an environment that promotes scientific inquiry and fosters a deep understanding of the world.

Interactive Science Curriculum

An engaging science curriculum is the foundation of fostering scientific acumen. Our school provides an inquiry-based approach that encourages students to ask questions, explore concepts and conduct experiments. Hands-on activities, such as building models, performing laboratory experiments and participating in fieldwork, allow students to apply theoretical knowledge practically. Students participated in activities like know your scientists, shadow puppetry, skit, documentary writing, journal reading on new inventions and life of scientists and diya making related to water holding capacity of soil (types of soil).

Dedicated Science Labs

Equipping schools with well-designed science laboratories ensures that students can explore various scientific phenomena firsthand. Experiments help students to visualise abstract concepts and develop practical skills in observation, data analysis, and problem-solving. In the chemistry laboratory students tested the hardness of water. In the computer laboratory, Students made posters on canva and powerpoint presentations on Cyber Safety and Role of Artificial Intelligence in Cyber Security-Boon or Bane. Students also made two projects on the Internet of Things(Home Automation System) and Artificial Intelligence(Attendance Tracker).

Integration of Technology

Incorporating technology into science education can elevate the learning experience. Virtual laboratories, simulations and educational apps provide students with interactive ways to explore complex concepts. Schools can also leverage tools like AI, robotics and coding platforms to align with modern scientific advancements. Digital presentations are used in smartboards, practical sessions are conducted on Applied Mathematics, Financial Market Management etc.

AI tools like Padlet, Olabs, Canva, Geogebra etc. are being used by our teachers.

Encouraging Research and Innovation

Creating opportunities for students to undertake small research projects fosters independent thinking. Science fairs, innovation contests and exhibitions provide a platform for students to showcase their ideas and inventions, motivating them to think critically and creatively. Our students participated in CBSE Science Exhibition-Waste management. Their model demonstrated waste management and by converting waste into useful products.

Co-Curricular Activities

Clubs such as science clubs, robotics teams and astronomy groups allow students to delve deeper into their scientific interests outside the classroom. Participation in workshops, national competitions, and hackathons enhances their skills and confidence. Our Science and Nature Educational Activity students visited Acharya Jagadish Chandra Bose Indian Botanical Garden to analyse the variety of plant species, including their features, classifications, adaptations.

Collaborations and Guest Lectures

Partnering with research organizations, universities and industries gives students exposure to real-world scientific applications. Guest lectures by scientists, engineers and researchers inspire students and provide insights into various scientific careers. Our students joined Space Odyssey Camp which provided a spectacular and unforgettable journey through the Solar System that included an introduction to the all-important Electromagnetic Spectrum. It was hosted by international STEAM Outreach Specialist Mr. Sam Gibbs who is deeply committed to encouraging the next generation of young scientists, engineers and professionals in their career pathways.

Promoting Environmental Awareness

Schools can encourage environmental science through activities like eco-projects, tree plantation drives, and recycling campaigns. Such initiatives teach students to apply scientific principles to solve real-world problems, particularly in sustainability. Our students visited Acharya Jagadish Chandra Bose Indian Botanical Garden where they were exposed to a wide variety of plant species, helping them understand the different parts of the plant and how they contribute to a variety of sources of food.

Fostering a Culture of Curiosity

Teachers play a crucial role in fostering scientific acumen by encouraging students to ask questions, think critically and remain curious. A supportive environment where mistakes are viewed as learning opportunities helps students explore without fear. Students participated in soap making activity on bagless day by using stearic acid, sodium hydroxide, coconut oil, perfume and colours.

By adopting these strategies, schools can cultivate a generation of scientifically literate individuals who are well-prepared to innovate, solve problems and contribute meaningfully to society. The goal is to inspire a lifelong passion for discovery and learning in every student.

Mrs. Koeli Dey,
Principal,
Sushila Birla Girls' School, Kolkata

From the Principal's Desk

We are all aware that scientific curiosity and reasoning are extremely important in education, and that is something we strive for at Vandya International School. In a world where changes are constant, it is crucial for our students to learn how to think analytically, critically, and innovatively in order to overcome future obstacles.

The philosophy we adopt considers our students' inquisitive nature and assists them in critical thinking. The use of computers in hands-on lab experiences coupled with the use of cutting-edge technology allows students to understand science in a more engaging and stimulating manner.

We are conveniently incorporating AI software, robotics and 3D design into our class curriculum in order to encourage students to be more of forward thinkers. Furthermore, it encourages creativity and collaboration amongst students through science clubs, workshops and nationwide and worldwide scientific fairs.

Our aim is to encourage every student to become a critical thinker and a problem solver, which is why our teachers are extremely focused on every student's development. Through STEM tasks, environmental initiatives, and research, we inspire students to utilize their inventiveness and accountability in solving societal issues through the application of science.

We, at Vandya International School, are dedicated to ensuring that the students of today become the scientists and inventors of tomorrow.

Ajanita Hazarika
Principal
Vandya International School, Guwahati

From the Principal's Desk

It gives us immense pleasure to announce that our student-led team has been selected for the zonal round of the Macmillan Budding Scientist 2024-2025 with their innovative project on the Garbage Robot. Competing against over 1,200 teams from the Middle East zone and securing a spot among the top 10 finalists is a remarkable achievement, especially for a school just established in 2023.

This accomplishment serves as a tremendous source of encouragement for our students, showcasing their hard work, ingenuity, and determination. We owe this success to the guidance and support of the Ministry of Education in the UAE, which fosters an environment that encourages innovation, creativity, and entrepreneurship across all grade levels. Our curriculum emphasizes critical thinking and problem-solving from an early age, ensuring students develop a scientific temperament that prepares them for real-world challenges.

In our innovative learning environment, we promote scientific literacy through engaging initiatives like curiosity corners and STEAM Labs. Students from Kindergarten onwards explore the practical applications of science, enhancing their lateral thinking skills and inspiring them to pursue their passions.

We extend our heartfelt gratitude to Macmillan for their Budding Scientist program, which provides invaluable platforms for young minds to showcase their talents. A special thank you to our dedicated science teachers and supportive parents, whose encouragement propels our students to reach new heights. Let us celebrate this achievement together and continue to inspire our young scientists to explore, innovate, and excel!

Ms. Joyeeta Bhattacharya,
Principal,
Woodlem Park School Hamidiya, Ajman

From the Principal's Desk

At Springdales School, students begin developing essential scientific skills from the earliest years in Kindergarten. Our science curriculum emphasizes both the knowledge of core scientific concepts and the practical application of scientific inquiry. Students engage in hands-on experiments and real-world learning experiences that make science meaningful and relevant to their lives.

Throughout the school, science lessons are enriched by cross-curricular connections, including STEM (Science, Technology, Engineering, and Mathematics) initiatives and sustainability projects. These interdisciplinary approaches help students see the impact of science beyond the classroom and inspire a deeper understanding of the world around them. Critical thinking and problem-solving are integral to our science education at every stage. By encouraging students to ask questions, analyse information, and propose solutions, we foster the development of essential 21st-century skills that prepare them for future challenges. Our goal is to nurture curious, confident learners who see science as a vital tool for understanding and improving the world.

In every phase of their education, Springdales students are empowered to become independent thinkers and innovative problem-solvers, ensuring that science is not only a subject they study but also a lens through which they interpret their world.

Mr David,
Principal,
Springdales Dubai School

From the Principal's Desk

In today's fast-evolving world, fostering innovation is vital for children's success. To nurture scientific thinking, curiosity, and a passion for innovation, schools must provide opportunities for exploration and experimentation. At Indian School Sohar in Oman, we strive to inspire students to explore new ideas and push boundaries.

We offer a variety of hands-on activities where students build models, conduct science experiments, and design products. Our science labs cater to primary, middle, and senior students, ensuring resources are available for every age group.

Beyond traditional science education, we recognize the importance of creativity in driving innovation. Our teachers encourage students to think outside the box, find unique solutions, and express themselves through art, music, and writing. This creative freedom helps children develop an innovative mindset.

Collaboration is crucial in innovation. Competitions like those organized by Macmillan allow our students to work in teams, share ideas, and tackle challenges together. Teamwork fosters cooperation and teaches students how to solve complex problems as a group.

Our dedicated team helps students identify real-world problems and come up with practical solutions. By posing open-ended questions and providing opportunities for experimentation, our teachers cultivate a problem-solving mindset. We celebrate achievements, big or small, to build confidence and inspire further innovation.

In line with our commitment to cutting-edge education, we've recently added an AI and Robotics lab to enhance our science and technology curriculum. Our STEAM lab for students in classes III-V is already operational, providing dynamic hands-on learning in science, technology, engineering, arts, and mathematics.

At Indian School Sohar, we are proud to equip students to become tomorrow's innovators.

Ms. Sanchita Verma,
Principal,
Indian School Sohar, Sohar, Oman

From the Principal's Desk

It is a proud moment for Aspire Indian International School as our students won the prestigious Macmillan Budding Scientist Award among 600+ teams from GCC securing 5th rank globally last time and continuing mightily this time as well. AIIS is one of the shortlisted teams of the Middle East Zone for 2024-25. This achievement reflects our unwavering motto of 'Igniting Young Minds' and integrating sustainability and development goals into the curriculum.

Our students showcased exceptional passion for research, creativity, consistent improvement and meticulous documentation embodying the spirit of innovation, resilience and teamwork. The unwavering support of progressive parents and the guidance of dedicated teachers who form the backbone of such successes made this possible.

We are determined to take the goals of a sustainable future head-on by fostering critical thinking, environmental responsibility and global awareness. By encouraging students to innovate and address real-world challenges, we aim to empower them to be changemakers who contribute meaningfully to a sustainable and equitable future for all.

Dr. Geetika Ahuja

Principal,

Aspire Indian International School, Kuwait

From the Principal's Desk

Abu Dhabi Indian School places a strong emphasis on fostering inquiry-based learning and real-life applications to nurture scientific acumen among its students. The school believes in inspiring curiosity and encouraging students to ask questions, investigate, and explore concepts beyond textbooks. By integrating inquiry-based approaches into the curriculum, students are empowered to develop critical thinking, problem-solving, and analytical skills.

Well-equipped science laboratories serve as hubs where students can explore concepts practically, deepening their understanding of theories through experimentation.

To further encourage innovation, schools organize science fairs, workshops, and field trips. These events inspire students to think creatively and connect classroom learning with real-world applications. During the Block period Students perform Hands-On experiments and activities which allow them to reinforce theoretical knowledge and make Science more engaging.

Incorporating STEM (Science, Technology, Engineering, and Mathematics) education in the curriculum helps students develop skills like problem-solving, logical reasoning, and analytical thinking, which are critical for scientific pursuits and to take part for external competitions like Formula Ethara-Yas in School Abudhabi UAE, Al Tasamuh conducted by Global Indian International School Abu Dhabi, AI and Robotics competitions, IIC Science Expo, UAE Innovation Exhibition etc.

Collaborative projects and research-oriented assignments provide opportunities for teamwork and in-depth exploration of topics, fostering a scientific mindset. Participation in science competitions and exhibitions helps students build confidence and refine their skills while receiving recognition for their efforts.

Additionally, schools can leverage technology, such as simulations, virtual labs, and AI-based tools, to make science more interactive and engaging. By integrating sustainable practices and current global issues our schools instil a sense of responsibility and a drive to find solutions to pressing challenges. Through these efforts, our schools cultivate a generation of critical thinkers and innovators who are well-prepared to contribute to a scientifically advanced future.

Mr. Neeraj Bhargava
Principal
Abudhabi Indian School

Macmillan Budding Scientist, powered by Springer Nature 2025-26

Finalists:

1. **School Name:** Navrachana Higher Secondary School, Sama Vadodara

   Winner: Grand Finale and **Runner Up:** West Zone

   Students: Aanshi Sheth, Sreehari Sreejesh, and Dhyana Brahmbhatt

   Project Supervisor: Ms. Sudha Naddi

   Project Name: Jal Hi Jeevan

A Design Thinking Approach

Mineral deficiencies are a prevalent issue around the world affecting millions worldwide and deteriorating their health. The poor are the most affected. Having no economic stability, getting mineralised water will not be their priority. But what they are unaware of is that several problems that they face such as joint pains, backaches, fatigue, etc. are all symptoms of taking demineralised water. It is difficult for them to have a high-mineral diet because of their condition but this can be compensated by providing mineralised water.

Step 1: Empathise:

- These problems have been confirmed by an online survey conducted by our team to know the condition of the masses. 40% of people have a mineral deficiency, 69. 9 % have a RO TDS that is not up to the mark and yet, only. 31. 6% are willing to switch to a cheaper, remineralising RO.

- This problem has also been affirmed by people living in slums who have several mineral deficiencies. The survey also confirmed the lack of awareness regarding the importance of consuming mineralised water and how it affects our health.

Step 2: Define: Inadequate supply of mineralised water

Step 3 - Ideate:

- We pooled many solutions including Himalayan salt and Alkaline Water Pitchers, but these did not turn out to be ideal due to either effectiveness or cost.

- Solving mineral deficiencies can be solved using a combination of Activated charcoal and kelp.

- These are natural products that will add minerals such as calcium, B12, fluoride, potassium, magnesium sodium and trace minerals such as iron, manganese and zinc.
- These two are sustainable, eco-friendly, effective and cheap and can remineralize our RO water. These are easily available and produced naturally in villages. They are clean and can increase the TDS (total dissolved salts) in water proving to be extremely helpful for fulfilling our mineral needs.

Step 4 - Prototype:

- We created a prototype and incorporated these as cartridges and dispensers in our existing RO system which could help in remineralizing the RO water with activated charcoal and kelp.
- Activated charcoal has a porous structure which causes ion exchange and adsorption of toxins and gases. Kelp acts as a semi-permeable membrane which causes minerals to get released.

Step 5 - Test

We are in the process of testing. The Arduino coded dispenser is still in the process of making. We will combine the components once our prototype is complete.

Sustainability - Taking steps for a healthier water future:

- **#3** - Good health and well-being: tackling the prominent issue of mineral deficiencies by remineralizing water.
- **#6** - Clean water and sanitation: Providing mineralized water even to the underprivileged in the country.
- **#12** - Responsible consumption and production: Spreading awareness about the mineral content needed in water and making people conscious about their water consumption patterns.
- **#7** - Affordable and clean energy: Making the product eco-friendly and cost-effective to make it available to all populations in our country.

2. **School Name:** Summer Fields School, Gurugram
    Runner Up: Grand Finale and **Runner Up**: North Zone
    Students: Namish Dawar, Yuvraj Sharma and Ayushman Pattanaik
    Project Supervisor: Ms. Poonam Anand
    Project Name: Synthetic Pollinizer

Scan the code to watch the video of the project

The Synthetic Polleniser, is an innovative project aimed at addressing the decline in natural pollinators, such as bees, by using artificial means to ensure crop pollination. This is achieved through the use of fiber glass robotic petals that mimic real flowers. These robotic flowers are equipped with pollen dispenser which distributes pollen and lemon grass oil as fragrance to attract and support bees.

Significance

1. **Support for Declining Bee Populations**: The project addresses the global decline in bee populations due to factors like pesticides, habitat loss, and climate change. By providing a reliable source of pollen and nectar, it helps sustain bee populations and ensures continued pollination of crops.
2. **Enhanced Food Security**: By improving pollination efficiency, the Synthetic Polleniser can lead to higher crop yields, contributing to global food security.
3. **Sustainability**: The project offers a sustainable alternative to natural pollinators, which are increasingly threatened by environmental challenges.

Uniqueness

1. **Innovative Design**: The use of fiber glass robotic flowers that mimic real flowers is a novel approach to artificial pollination. These robotic flowers are equipped with pollen dispenser and lemon grass oil, attracting bees as if they were real plants. The lid of the pollen dispenser as per requirement if any bad weather condition prevails.

Concept

1. The project combines principles of robotics, biomimicry, and ecology to create a sustainable solution for pollination challenges.
2. The robotic flowers are designed to closely resemble real flowers, with fiber glass as petals. This design tricks bees into thinking they are real flowers, encouraging them to land and pollinate.
3. The Synthetic Polleniser can be placed alongside real crops, creating a specialized environment that supports bees and helps maintain their population.

Experimental Design

Mechanical Setup: This consists of an artificial flower made up of fiber glass with pollen and a smell humidifier in the middle. Fragrance to be put on the artificial flower to attract bees. The humidifier releases the fragrance in the form of vapor from which bees are attracted. They sit on the flower and pollen sticks on their body hairs. They will fly away with pollens and sit on other flowers.

Synthetic pollenizers offer a sustainable alternative to natural pollinators, which are often affected by factors like habitat loss and climate change. This helps ensure consistent pollination even in challenging environmental conditions.

Overall, the results of synthetic pollinisers have demonstrated their potential to revolutionize agriculture by providing a reliable and sustainable solution to pollination challenges. In conclusion, Synthetic pollenizer is a concept to aid artificial pollination to encourage bees to forage. In our project we are building an artificial pollen dispensing robot. It is an artificial flower which dispenses pollen grains at pollinators which help the flower to pollinate. These steps help ensure that synthetic pollenizers are effective and can be integrated into agricultural practices to improve crop yields and support declining bee populations.

Artificial Pollen Dispenser
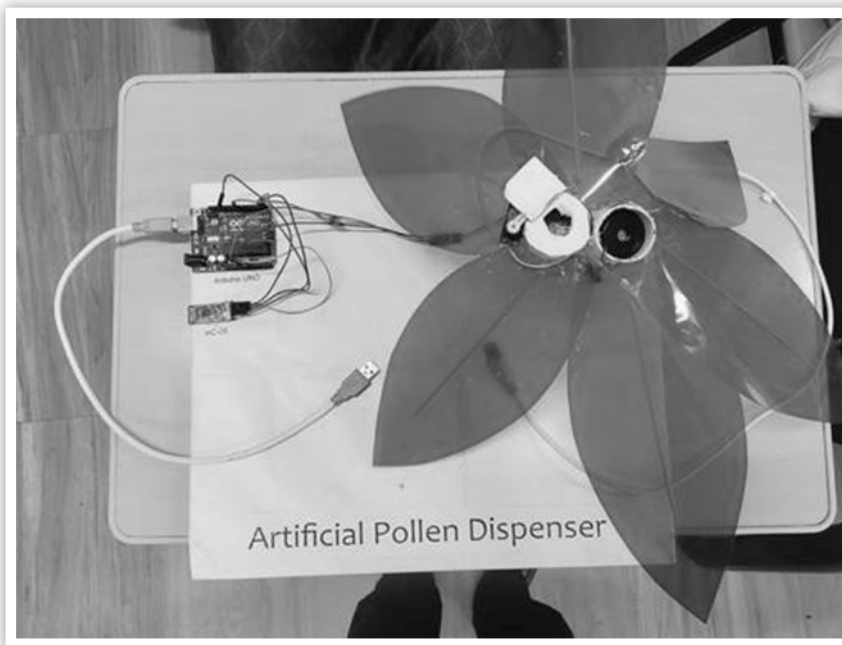
3. **School Name:** The Jain International School, Nagpur

   Winner: West Zone

   Students: Mast Akshit Jagam, Miss Yayati Gurharikar, and Mast Akshat Mahule

   Project Supervisor: Ms. Ritu Sharma

   Project Name: Sautomatic Fire Control System for Electric Vehicles

Scan the code to watch the video of the project

Rationale: Electric vehicles (EVs) are becoming more popular due to their environmental benefits. However, they come with certain risks, one of which is the potential for battery fires. These fires can be dangerous and difficult to control due to the high energy density of the batteries. So to solve this problem, we have made an automatic system that detects and extinguishes fires in electric vehicles for the safety of the driver and the vehicle.

A few sentences explaining the need of work: In our neighbourhood, we have observed two incidents where electric vehicles (two wheeler) caught fire while parked outside the house. We often see similar reports in the news about the incidents of electric vehicles catching fire. On an average one electric vehicle catches fire in a month. It leads to loss of money and resources, causes environmental pollution and it is dangerous for the driver also. We went to the electric vehicles showrooms and service centres to find out the reasons for the electric vehicles catching fire. The main cause was the batteries. Due to overheating of batteries, due to faulty batteries these fires were caused. So we thought of making a model which can prevent these incidents caused due to the problems related to the batteries.

Scientific Principle(s)/ Concepts: A Project, based upon collection of real – time data and the processing of the data gathered by the use of a microcontroller and giving commands to the motors and other parts of the circuit as per the data received.

Materials Used: Micro Controller, IC Regulator, Driver IC, Capacitors, LCD, Flame Sensor, Smoke sensor, Temperature sensor, Motor (12V), Servo motor, Fire extinguishing liquid, Blue tooth module, GSM module, Wood, Wires.

Procedure/ Description:

In our model, we are supplying 12 volts to the circuit as we are using a motor which needs 12 volts to function. But the microcontroller Arduino V2 (ATMEGA328) which may be considered to be the nucleus of the whole system, works on 5V, so we have used a regulator IC that converts 12V into 5V so that the circuit works properly. The Arduino after receiving the signals from the smoke sensor, flame sensor and temperature sensor displays the information on the LCD display (speedometer console of the vehicle) and if it goes beyond the threshold, an alert (beep sound) is produced and the microcontroller gives command to the motors accordingly.

We cannot control a 12V motor through Arduino, so to operate the motor through the Arduino, we are using a motor driver which amplifies the 5V coming from the Arduino into 12V and also amplifies current from 20Milliamperes to 2 Amperes. The motor driver also controls the direction of the motor.

We established a closed loop feedback system with microcontroller which senses the smoke using the Smoke sensor, flame using Flame detector sensor, Temperature using the temperature sensor and sends the signals to the Servo motor to change the direction of the nozzle of the pipe.

When smoke, temperature is detected above the threshold or a flame is detected the microcontroller directs the motor driver to rotate the shaft of the motor clockwise. The shaft and the screw moves downwards to press the piston of the extinguisher and the foam (fire extinguishing foam) is sprayed. Then it rotates anticlockwise, the shaft and the screw go up and releases the piston of the fire extinguisher.

The foam is not continuously purged, it is done for two seconds, then it stops, so that the excessive usage of extinguishing liquid can be saved. After two seconds if the smoke, temperature or fire is detected, the purging is done again.

If the **Smoke sensor** detects the value above 50 ppm, a beep sound is produced and the microcontroller gives command to the motor to rotate clockwise to press the piston of the fire extinguisher to spray the fire extinguishing liquid in the battery box in all the directions to stop the fire due to which smoke is produced.

If the smoke sensor detects the value below 50 ppm, then no operation will be performed.

The **Flame sensor** used is infrared sensor, if the wavelength detected by the flame sensor is more than 600nm. The sensor sends the message to the microcontroller and the microcontroller finds out on which side of the battery box the flame is produced and accordingly directs the motor to do the purging in a particular direction by directing the servomotor to move the nozzle of the pipe in the direction, the flame has been detected and the fire is extinguished.

The **Temperature sensor (NTC)** senses the temperature. If the temperature sensor senses the temperature above 55 degree celsius, a beep sound is produced to alert the driver and the extinguishing liquid is sprayed in all the directions in the battery box.

A **GSM module** has been attached in the circuit. The GSM module will send the live data of different parameters (Flame detected or not, values of temperature, smoke and voltage) on IOT server (ThingSpeak) after every 30 seconds. You can also get the data on your devices through an app called ThingShow.

If the driver is away from the vehicle and he notices smoke or fire in the vehicle he can activate the automatic fire extinguishing system from his mobile using an app **BLUE TOOTH ELECTRONICS.**
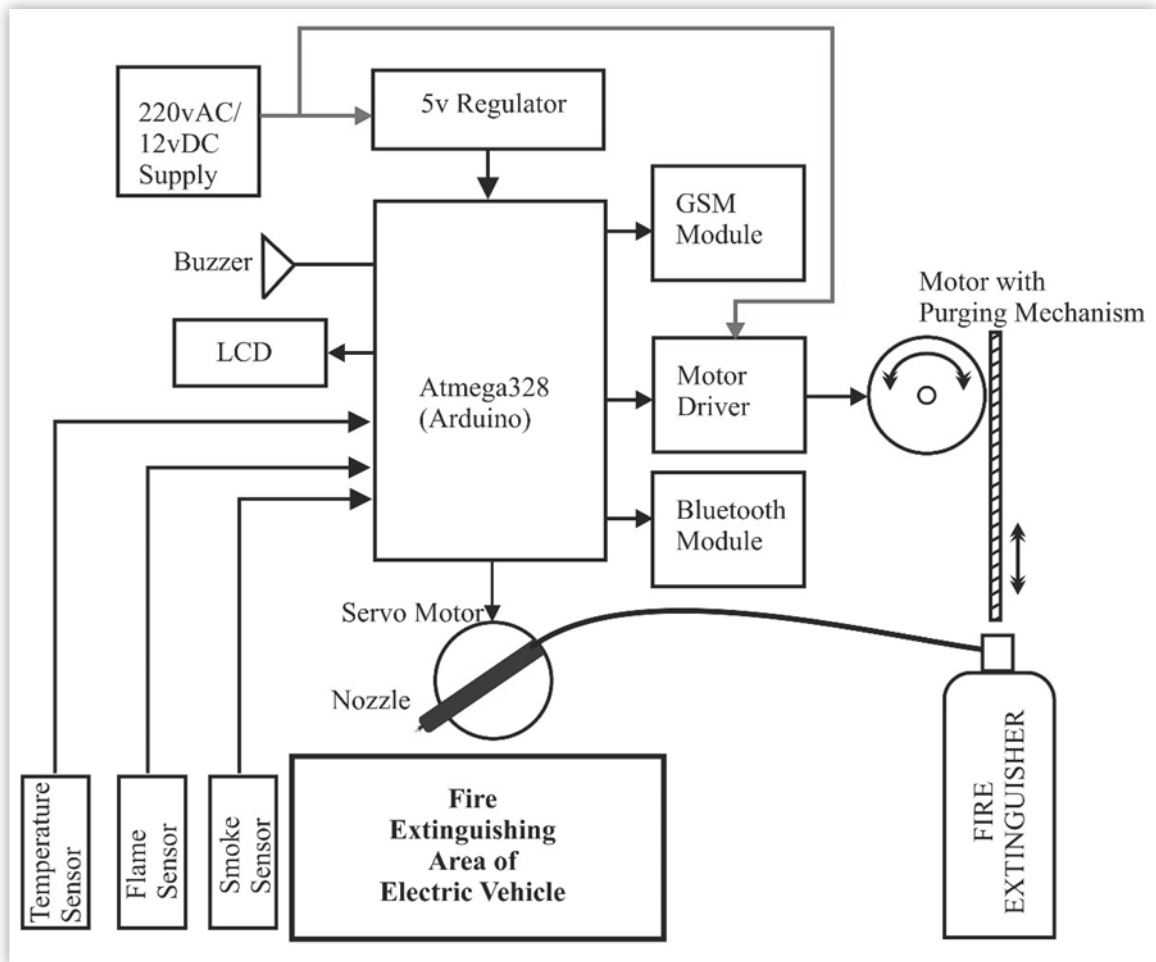
Hypothesis: Once the model is mobilized for the masses, the immediate benefit would be that the vehicle and the driver could be saved.

Data Analysis: The data will be shown on your mobile devices through an app called Blue Tooth Electronics and on the speedometer console of the vehicle. The GSM module will send the live data on IOT server (ThingSpeak) after every 30 seconds. You can also get the data on your devices through an app called Thing Show.

Results: By using this model, we can significantly improve safety of the driver and the vehicle by providing an immediate response to fire hazards. As electric vehicles continue to evolve, integrating such safety features will be crucial in ensuring that they remain a safe and sustainable mode of transportation.

By using this model, we can achieve several **Sustainable Goals**.

1. **Good health and well being:** Since the EV vehicles won't catch fire, we can ensure the safety of passengers and the vehicle.
2. **Affordable and clean energy:** As an electric vehicle runs on battery, it does not cause pollution.
    3. **Decent work and economic growth:** The cost of manufacturing new EV two wheelers could be reduced as this system prevents their burning.
    4. **Industry, innovation and infrastructure:** This system is innovative and beneficial for the industry since it prevents fires in electric vehicles and does not require manual intervention.
    5. **Sustainable cities and communities:** This model will save the passengers and the vehicles, so the cities and communities will be sustainable in long run.
    6. **Climate action:** Using this system we can prevent burning and reduce pollution of the air and thus help in reducing carbon footprints.

4. **School Name:** St. Jospeh's Convent School, Jalandhar
   Winner: North Zone
   Students: Avreen Kaur, Jaanvi Jain, and Aaradhya Dewan
   Project Supervisor: Ms. Gurpreet Kaur
   Project Name: Agrigenius

Scan the code to watch the video of the project

Sustainable farming is not just about preserving resources, but about innovating for a better tomorrow. It is a revolutionary solution that integrates advanced technology with eco-friendly practices addressing the critical challenges faced by farmers. Developed on the basis of extensive surveys with farmers and agricultural experts, Agrigenius aims to combat pressing issues while fostering sustainable practices.

Key Problems:

Water Scarcity: The world is facing an alarming water crisis, with the prediction that future conflicts may arise over this precious resource. Rivers are drying up, fertile lands are turning into deserts. The agricultural sector, heavily reliant on water for crop irrigation, is particularly vulnerable to this crisis.

Energy Inefficiency in Agriculture: In India, farmers face severe challenges with electricity, a crucial resource for running irrigation pumps. Despite the fact that electricity is subsidized by the government, it is often unreliable. Farmers experience frequent power outages, particularly during critical periods when irrigation is most needed.

Wildlife Damage to Crops: Crop damage caused by wild animals is another significant challenge, particularly in areas near wildlife reserves. Reports show that up to 71% of households near reserves experience crop losses due to animal intrusions. This issue is not restricted to just a few regions; it affects farmers worldwide, leading to severe economic setbacks.

Solution:
360-Degree Rotating Solar Panels

To combat energy inefficiency, Agrigenius introduces 360-degree rotating solar panels that optimize energy capture throughout the day. These solar panels can power irrigation systems, providing farmers with reliable energy, even in remote areas. With government subsidies supporting the integration of solar panels, this solution is both practical and financially accessible.

Soil Moisture Detection System

Addressing water scarcity, Agrigenius incorporates a soil moisture detection system that conserves water by ensuring precise irrigation. This system monitors soil moisture levels in real time, preventing over-irrigation or water wastage. It allows farmers to use water efficiently, ensuring that every drop counts and that crops receive just the right amount of water.

Animal-Detecting Buzzer System

The threat of wildlife damaging crops is addressed through an animal-detecting buzzer system. This system uses advanced sensors to detect the presence of animals near the fields and activates a loud buzzing sound to scare them away. The sharp noise is designed to trigger the animals' natural fear response, preventing crop damage without harming the wildlife. This solution fosters coexistence between humans and animals, protecting both the farmers' livelihoods and wildlife.

The Main Highlight:

Agrigenius also features a mobile app that allows farmers to monitor and control their systems remotely. Through the app, farmers can track moisture levels, receive real-time alerts, and manage irrigation efficiently from the comfort of their homes. This smart, integrated approach empowers farmers to safeguard water resources, optimize energy use, and protect their crops from wildlife damage.

Agrigenius is not just helping farmers today but also securing a better future for tomorrow. We are committed to ensuring that every drop of water is preserved, every farmer is empowered, and the land is respected for generations to come.

5. **School Name:** Gitanjali Devshala, Hyderabad
   Runner Up: South Zone
   Students: Ishan Mandala, Pranay Pushkar, and Srihitha Reddy
   Project Supervisor: Ms. Mahima Khare
   Project Name: Microbial Visibility Marker (MVM)

Scan the code to watch the video of the project

Science is not just about innovation—it's about making a difference. "Microbial Visibility Marker: A pledge to secure every bite," is a scientific initiative driven by the belief that health and well-being begin with what we consume. Ensuring its safety is a commitment to oneself and the future of communities. An idea inspired by a vision, driven by a question that resonates "What if there was a way to know that before the first bite?"

Concern Statement

Each of us can distinctly recall the times when we have come in contact with food that seemed fresh only to later realize it's spoiled- be it a bar of chocolate or a cup of yoghurt. Microbial contamination and poisoning in packaged food often goes undetected, highlighting the critical need for proactive detection 'before the first bite'. This global dilemma, affecting millions of lives each year, calls for innovative solutions to rephrase food safety standards.

Fundamental Principle

The Microbial Visibility Marker (MVM) operates on the core principle of bioluminescence, where the enzyme luciferase catalyses the oxidation of the substrate luciferin, in the presence of oxygen and adenosine triphosphate (ATP) molecules, producing light. This reaction, regulated by the luciferin binding protein, stabilizes luciferin until a microbial trigger initiates the process. In nature, these components are organized within specialized compartments called scintillons, where they are stored in an inactive form preventing unwanted reactions under normal conditions.

Mechanism

This principle is the mechanism we aim to incorporate into our MVM system, where the luciferin-luciferase interaction in the MVMs on food packaging, is triggered by microbial activity. Upon detecting spoilage, the markers emit a visible glow, providing a clear and immediate indication of the presence of pathogens, serving as a powerful tool, preventing consumption of contaminated food.

In line with our current capabilities, we designed our prototype to mimic:

Luciferin	–	Quinine
Luciferase	–	Yeast
LBP	–	Sucrose
Microbial trigger	–	Tonic water (demonstrated effectively using UV light)

Making of MVM: From Blueprint to Prototype

- *Synthesize luciferin, luciferase and luciferin-binding protein genetically to ensure a consistent, scalable and eco-friendly source of components.
- *Optimize these components to enhance reactivity to specific microbial triggers and alterations in environmental parameters.
- *Program the engineered luciferase system into MVMs, our glow sensors.
- *Integrate MVMs into food packaging, developed to glow in response to microbial activity, enabling detection despite the package barrier.
- *Validate accuracy and reliability under practical conditions, revolutionizing food safety standards.

Innovation in action

Imagine a world where your food talks to you, warning you that it's no longer safe. That's the world our MVMs make a reality! It's not just MVMs but the core technology itself that holds promise for transformative change across diverse fields.

Takeaway

Our journey with this endeavour is our commitment to give back to society in a meaningful way, driving progress while empowering generations to come.

6. **School Name:** Chettinad Vidyashram, Chennai
    Winner: South Zone
    Students: Harsha Madhav B, Jaswanth B K and Krithika S.
    Project Supervisor: Ms. Rubina Jebamalai
    Project Name: Automatic Angle Corrector for Drill Machine

Scan the code to watch the video of the project

Introduction:

In precision machining and construction, accurate drilling angles are crucial for achieving high quality results. However manual angle adjustments are often time-consuming and prone to human errors leading to compromised structural integrity and increased material wastage. To address these challenges the automatic angle corrector for drill machines offers a solution that enhances efficiency and accuracy in drilling operations.

Problems caused by improper drilling:

- Damage to the work piece.
- Uneven holes.
- Injuries to the operator.
- Structural failures.
- Electrical and fire hazards.
- Tool breakage.

Aim:

To prevent the problem mentioned above revolutionize drilling practices across small scale industries by providing a Cost effective and user-friendly tool that enhances precision and reliability.

Materials:

This project is carried out by.

Arduino micro controller:

An Arduino micro controller is a small affordable and versatile device used to control the electronic components. It is programmed using the Arduino integrated development environment which supports a simple C++ based language.

MG995 Servo motor:

This is high speed servo motor it has excellent holding power, fast control response and accurate positioning. This motor can rotate 180°.

Power bank:

A power bank is a portable, rechargeable battery pack designed to provide power to electronic devices. It serves as a convenient power source for powering Arduino boards, sensors, motors or other mobile electronics especially in situations where an external power supply is unavailable.

Mini hand drill:

It is a compact manual tool used for drilling small holes in various materials like wood, plastic and metal. They are lightweight and easy to use.

Working:

The Arduino board sends the job to each part. The rotatory encode constantly monitors the drill and checks for any displacement of the drill from its original position. When the rotary encoder senses a displacement, it sends a signal to the servo motor and makes the servo motor rotate the drill back to its starting position. It turns it in the opposite direction until the drill reaches its original position. when this is achieved it stops rotating.

Conclusions:

- This project functions as an adapter for a hand drill and includes a precision measurement system.
- It is particularly useful in areas where transporting a drill press is difficult as its low-profile design makes it highly portable.
- It is significantly much cheaper than a drill press.
- It is safe for the users.

7. **School Name:** International School ICSE, Patna

   Runner Up: East Zone

   Students: Samanyu Sinha, Arya Anusha Singh and Abhiraj Pathak

   Project Supervisor: Mr. MD Saif Alam

   Project Name: Game **Lux:** Customizable Arduino-Based Mobile Phone

Scan the code to watch the video of the project

Game Lux demonstrates how basic hardware and innovative software integration can replicate essential features of modern smartphones. With its modular design and focus on usability, it serves as a practical example of STEM learning, fostering creativity and problem-solving skills among students and hobbyists.

Key Features of Game Lux

1. **Phone Interface:** A menu-based navigation system offering options like games, image viewing, and basic settings, giving a classic phone experience with touchscreen capabilities.

2. **Gaming:** Includes interactive games like "Guess the Number," showcasing touch responsiveness and dynamic gameplay. Plans include expanding to more classic games like Snake and Tic Tac Toe.

3. **Image Display:**
   Supports the display of image formats like JPEG, BMP, and PNG stored on an SD card.

Hardware Components

1. Arduino Mega 2560: The brain of the system, featuring robust I/O capabilities and efficient multitasking.

2. 3. 5-inch TFT Color Screen: A vivid, touch-enabled interface delivering intuitive interactions.

3. Power Supply: A portable, 9V battery or USB-powered system ensuring reliability and ease of use.

Overcoming Challenges

From managing limited memory and touchscreen calibration to optimizing processing speeds, our journey taught us valuable lessons about hardware-software integration and system efficiency.

Future Potential

We envision Game Lux evolving into a more advanced system with:

- GSM module integration for calls and SMS.
- Wi-Fi connectivity for basic internet usage.
- Expanded storage for games and media.
- Enhanced UI design for a more modern aesthetic.

Conclusion

Game Lux is more than a prototype; it is an educational and inspirational tool that highlights the possibilities of DIY innovation. With accessible resources and a creative mindset, this project pushes the boundaries of what basic hardware can achieve.

As we conclude, we leave you with this thought:

"Innovation isn't about the tools you have; it's about the creativity you bring to them.

8. **School Name: Carmel School, Sadew, Shillong**

   Winner: East Zone

   Students: Eiwandaka B. Lynser, Bashaikupar Marbaniang and Dateishisha Kharbuki

   Project Supervisor: Ms. Nevalean Langstieh

   Project Name: Harvesting fresh water using a fog catcher

Scan the code to watch the video of the project

In areas without adequate rainfall, people have had to get creative and find other ways to get the water they need. In some places, such as those prone to fog, the air itself can be a source of fresh water. The air around us contains moisture in the form of water vapour. Clouds form when the air temperature gets cool enough that the water in the air starts to condense, which means that the water vapour turns into tiny water droplets. All these tiny water droplets make a cloud visible to us. Fog is a low-hanging cloud that touches the ground. Fog can make it difficult to see very far. Fog can be found in many different parts of the world, including coastal areas, mountains, and deserts. Coastal regions frequently get fog because the warm air of the land meets the cooler air from the ocean right around or just above ground level. When these air layers collide, the water vapour condenses, and fog is created. Thus, fog can be a valuable source of water for people living in these regions. While the collected water may need additional treatment steps to make it clean enough to drink, it can be used immediately for most other purposes. But how can you get water out of the fog? With a fog catcher! A fog catcher is a device made of a mesh material that collects

water droplets from the foggy air. Mesh screens are set up perpendicular to the path of the wind. As the wind carries the fog through the mesh, the water droplets get caught and accumulate on its surface. Once the droplets combine and become big enough, gravity pulls them down the mesh and into containers set up for water collection. Fog catchers are becoming more popular in areas where water scarcity is a problem, and they can provide a sustainable source of clean water.

Through condensation, atmospheric water vapour from the air condenses on cold surfaces into droplets of liquid water known as dew. The phenomenon is most observable on thin, flat, exposed objects including plant leaves and blades of grass. As the exposed surface cools by radiating its heat to the sky, atmospheric moisture condenses at a rate greater than that of which it can evaporate, resulting in the formation of water droplets. The fog collector is made up of three major parts: the frame, the mesh netting, and the trough or basin. The frame supports the mesh netting and can be made from a wide array of materials from stainless steel poles to bamboo. The mesh netting is where the condensation of water droplets appear. It consists of filaments knitted together with small openings, coated with a chemical to increase condensation.

9. **School Name:** Abudhabi Indian School, Muroor, Abudhabi

    Runner Up: Middle East Zone

    Students: Rishikesh Jayagopal, Mohamed Kasim and Dilshan Ayyanam Veetil

    Project Supervisor: Mrs. Sobha Alin

    Project Name: Digital **Guardians:** The New Era of RFID Door Lock Technology

Scan the code to watch the video of the project

DIGITAL GUARDIANS: THE NEW ERA OF RFID TECHNOLOGY

This is our Tech Enhanced: RFID door lock system. This project uses:

1. **Arduino Uno Microcontroller** 2. **RFID Reader (RC522)** 3. **RFID Tag**
4. **Servo Motor** 5. **Jumper Wires**

Power supply (more than 9V) {Will also come included if we are making this a real product}

This is a solution to a lot of home thefts happening around the world. Research shows that a home theft occurs every 30 seconds worldwide. That is also a reason why we made this product. Just imagine how many people lose their valuable possessions. Our product works like the room locks in hotels but this model is more cost-efficient as we want to make the whole world have this kind of technology and make the whole world safe with maximum high security. Also, our product can close its door by itself after 7 seconds whereas hotel rooms have to close and open the door every time. This is automated and minimizes unnecessary door openings. If we are making this into a business and planning to sell the product, we would sell it for 30-50 AED in the UAE and 300-500 INR in India which reflects our understanding of the market because electronic devices are very expensive in some places. Plus, there are a lot of people in the world who need a good and cheap security system because a lot of people have their house doors exposed and open. So, we are trying to make it accessible to everyone. This is also a very compact product and is customizable and this sets us apart and is better than the room locks in hotels. You can add motion sensors, fingerprint sensors, buzzers, LEDs and a lot more. Our main goal is to make home security more accessible to everyone. We can also customize our product for the proper functioning of the door by making the delay of the lock longer to close the door if you have any luggage to carry etc. These require very few tweaks and we are making mobile apps for these small things but it is not necessary and is completely optional as you can make changes in the code by yourself. We have used the Arduino IDE app and extensions are installed such as the SPI extension, which is the Serial Peripheral Interface extension and MFRC522 Extension, which is a key factor required for the connection between the RFID reader and the RFID tag. Each RFID tag has a unique code which makes our door lock systems unbreakable. We can also add colour-coded RFID tags and RFID readers and can place them in various entrances, and this makes it easier for identification. We also have an energy savings calculator as additional information so that we can analyze how much energy you spend along with some tips for energy saving. This is why our product is A GAME CHANGER FOR HOME SECURITY.

10. **School Name:** Indian School Sohar

    Winner: Middle East Zone

    Students: Dhriti Basu, Mekha Manojkumar and Paviksha Hari Prasath

    Project Supervisor: Sudarshan Gupta

    Project Name: RailSafe Barrier

Scan the code to watch the video of the project

AI is neither good nor evil. It is a tool. It is a technology. It is for us to use.

The number of deaths due to people falling down on railway tracks or trains clashing with people on railway tracks in 2022 is a whopping 21 thousand in India alone. To overcome this problem, we have got an idea. This idea includes a few barriers that are placed at the end of the platform. The barriers operate like boom barriers but are controlled by colour sensors instead. The colour sensors will be placed at the side of a metal frame which will be parallel to the height of the colour patch attached to the side of the train.

The side of the train will have a patch of a specific colour, for example, a shade of red. The colour sensor will detect the shade of red colour, and the barriers or the doors will open, which will otherwise be closed when the train is not there, thus preventing people from falling on the railway tracks or from walking over the railway tracks.

The added advantage of this project is that the colour sensor will be coded to identify only a particular shade of red which will be attached to a particular train. This will make sure the passengers do not force barricades open. This system does not apply for goods trains or cargo trains as this only ensures passenger safety.

We have also used the ultrasonic sensor which works by the principle of ultrasonic sound waves at the second barricade to showcase the difference between the two.

Using colour sensors is more efficient than ultrasonic sensors as it is easier for passengers to force the barricades open by keeping objects or their hand in front of the ultrasonic sensor, which doesn't happen in the case of the colour sensor.

In this model we have used boom barriers just to demonstrate our idea in a simple way. But in reality, it is not feasible or practical to construct the barriers across the entire platform. Instead, we can build compact glass sliding doors which will be placed adjacent to the train doors. These will operate on the basis of the colour sensors too.

Furthermore, we have implemented an object detection security system to identify objects on the tracks. This ensures that trains do not collide with obstacles and helps prevent derailments.

We would like to emphasize that our project is currently a prototype. In a practical implementation, high-tech and more powerful sensors would be used to ensure optimal performance and reliability.

11. School Name: Jay Matriculation School, Salem
   Students: Shreenithi E., Niha Muskaan N. and Kavinesh S.
   Project Supervisor: Akila S.
   Project Name: Railway Track Monitoring and Alert System

Scan the code to watch the video of the project

Abstract:

Railway accidents during rainy seasons are a significant concern, resulting in substantial economic losses and casualties. Our project, Railway Tracks Monitoring System (RTMS), aims to address this issue by detecting faults and damages earlier, ensuring the safety of passengers and goods.

Inspiration:

The increasing number of railway accidents inspired us to create a system that enhances safety and efficiency. A recent incident in Bihar, where a railway worker lost their life during shunting operations, further motivated us to develop RTMS.

Purpose:

The primary purpose of RTMS is to ensure the safety and integrity of railway tracks by identifying faults and damages earlier.

Live Monitoring System:

RTMS provides live data about track conditions, leveraging technology to enhance safety and efficiency, reduce human efforts, and provide a safe travel experience for millions of people.

Working:

The system uses:

1. IR Sensors: To detect cracks and bends on railway tracks.
2. Camera Surveillance: For real-time video feed.
3. Motion Detection: To identify potential threats.
4. Alert System: To send alerts to railway authorities and train drivers.
5. Ultrasonic Sound: To detect and deter wild animals from the tracks.

Advantages:

1. Low Cost: An effective and low-cost model.
2. Real-time Monitoring: Automatic track monitoring data sent to the control room.
3. Reduced Animal Mortality: Minimizes animal mortality due to train accidents.
4. Improved Railway Safety: Enhances overall railway safety with real-time monitoring and alerts.

Future Scope:

In the future, we plan to install RTMS in real-time transportation systems, making travel safer and more convenient.

12. **School Name:** Delhi Public School, Nacharam, Hyderabad

    Students: Koppula Akshath Reddy, Alonipally Devik Krishna Goud, and Rithvik Sai

    Project Supervisor: Harika

    Project Name: AI Yoga Trainer

Scan the code to watch the video of the project

Overview:

The AI Yoga Trainer is a virtual assistant designed to guide users through yoga exercises using artificial intelligence (AI). Hosted on a platform or website, it provides yoga routines, real-time feedback. The aim is to offer an immersive, adaptive yoga experience without the need for a traditional instructor.

The Problem:

Yoga practitioners, whether beginners or experienced, face several common challenges:

1. Lack of Personalized Guidance: Traditional yoga classes often don't cater to individual needs, especially for beginners, increasing the risk of injury and hindering progress.

2. Limited Accessibility: In-person yoga sessions can be challenging due to location, time constraints, or physical limitations, making it hard for many to practice regularly.

3. Inconsistent Feedback: Without real-time corrections, users may perform poses incorrectly, leading to poor posture, reduced effectiveness, and higher injury risks.

The Solution:

The AI Yoga Trainer leverages AI, machine learning, and computer vision to address these challenges and offer a personalized yoga experience:

Real-Time Posture Feedback: Using computer vision, the AI monitors posture and provides immediate corrections to improve alignment and prevent injuries.

Progress Tracking: The AI tracks key metrics like flexibility and strength, providing valuable insights and adjusting routines to optimize progress.

Key Features:

1. **Real-Time Feedback:**
   - Computer Vision: The AI uses advanced technology to monitor posture and provide immediate corrections.
   - Alignment Corrections: Instant visual cues and instructions guide users to adjust their posture, helping prevent injury.

2. **Future Enhancements:**
   - Customizable Session Length and Intensity: Users can adjust session duration and intensity based on their preferences.

- ○ Voice and Visual Assistance: Voice prompts and visual demonstrations guide users through each pose.
- ○ Progress Tracking: The AI tracks flexibility, strength, and balance, with integration of fitness trackers to monitor real-time data such as heart rate.
- ○ Breathing and Meditation Guidance: AI suggests breathing exercises and meditation to complement yoga and enhance mental well-being.
- ○ Accessibility Features: The system offers modified poses for injuries and mobility challenges, with multi-language support.
- ○ Goal Setting: Users can set fitness or wellness goals, and the AI adjusts routines to meet them.
- ○ AI-Driven Yoga Community: An interactive platform for users to share progress and experiences.

Who Will Benefit:

1. Beginners: Those new to yoga can benefit from guided routines that focus on proper form.
2. Busy Individuals: The AI Yoga Trainer allows users to practice yoga anytime, anywhere, offering flexibility and convenience.

System Architecture:

1. User Interface (UI): Simple, intuitive design with a dashboard, workout plans, progress tracker, and settings.
2. AI Engine:
   - ○ Machine Learning Models: AI algorithms improve based on user feedback and yoga data.
   - ○ Computer Vision: Real-time posture tracking using cameras or wearables.
3. Backend: Cloud storage for user data, preferences, and progress, with frequent updates.

Future Enhancements:

Wearable Integration: Real-time adjustments using heart rate monitors.

Augmented Reality (AR): Poses demonstrated by AR avatars.

Social Features: Share progress within the yoga community.

AI-Driven Meditation: Personalized sessions based on emotional state.

13. School Name: Chinmaya Vidyalaya, Thrissur

Students: Nivedita V Dhanayan, Bhadra Anoop and Devaamsh Arun Mampazhy

Project Supervisor: Babitha S.

Project Name: Tarani

Scan the code to watch the video of the project

Overview

Time-calculator Assistant for Road-crossing - Arduino-prototype & New-technology Implementation-ideas.

For a pedestrian or even for a vehicle, crossing a road in India can be a challenge many a time. The challenge only gets bigger when the point of crossing is after a curve in the road and the pedestrian gets to see the incoming vehicle only after it negotiates the curve and is about to reach the crossing point. In short, in many cases, it can be a matter of life and death.

The Chinmaya Vidyalaya at Thrissur is at such a location that pedestrians who travel to and from the school encounter such a crossing point. Incoming vehicles come from behind a curve, that too with a slight downward slope, and so despite the zebra crossing, one is often worried about their safety. Perhaps, with time, a foot over bridge or some other solution may be implemented, however for now, we don't have it. Moreover, we know from observation that such crossing points after a curve are common in India and constructing foot over bridges in all those places may not be practical and not senior citizen friendly. As students, together with our mentor teacher, we started thinking what is it that we can do or suggest as a solution.

Various ideas were considered - for example to develop a system for the vehicles to be warned of the presence of pedestrians waiting to cross the road or even a system that can force the vehicle to slow down, however this could perhaps mean implementing systems on all vehicles or methods than could cause inconvenience to vehicles even when there is no one waiting to cross. Displaying live videos of vehicles can be costly and does not give a sense of speed or time, the latter is true with installing mirrors as well. Eventually we zeroed in on a system or device that can give an estimated time that the vehicle will take to reach the crossing point, thereby helping the pedestrian or vehicle wanting to cross the road to make a judgement.

We did a prototype using Arduino and successfully demonstrated it. The beauty of the solution is that it is useful not just for road crossings after a curve, but for similar rail crossings or even for any general (i. e. without a curve) crossing point. Likewise, the output can be communicated in many different ways - like on a display board or as voice or both. If cost is not a factor, a live video combined with the estimated time is also possible.

If appropriate sensors can be found or developed, handheld devices or even incorporating the solution into future smartphones are possible. There may be even more avenues that we have not thought about yet, but the reader can now add on to this.

Technology cannot be a substitute for common sense or caution or road discipline. However, the right mix of technology to the aid of humans can be lifesaving.

14. School Name: Kles' International School, Belagavi

Students: Md. Khizar Peerzade, Affan Harlapur and Chinmay Methgudmath

Project Supervisor: Ruthveena Malannavar

Project Name: Smart Bridge

Objective:

The objective of smart bridges is to improve safety, extend lifespan and optimize maintenance.

Principle:

The principle of a smart bridge project is to use advanced monitoring systems and adaptive designs.

- Pulse Width Modulation (PWM): The PWM principle is a technique that controls servo motors by varying the width of electrical pulses sent to the motor. PWM creates a series of pulses of varying width that are repeated at a consistent rate. The width of each pulse determines the speed of the servo motor. A potentiometer is a variable resistor that measures the position of a servo motor's shaft and sends feedback to the control circuit.

- TDR, which stands for "Time Domain Reflectometry," is a principle used in soil moisture sensors where a high-frequency electromagnetic pulse is sent through the soil, and the time it takes for the pulse to travel and reflect back is measured, allowing for the calculation of soil moisture content based on the fact that the speed of the pulse is directly related to the soil's dielectric constant, which is largely influenced by its water content; essentially, wetter soil slows down the pulse, resulting in a longer travel time.

Material Required:

- Arduino Uno: The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller (MCU) and developed by Arduino. cc and initially started in 2010.

- Arduino cable: The Arduino Cable is a type of USB cable designed specifically for the Arduino Uno.

- 2x servo Motor: A servo motor is a motor that can precisely control the linear or rotational motion of a mechanical system.

- Soil Moisture sensor: A soil moisture sensor measures the amount of water in the soil. It can be used to monitor soil moisture levels and schedule irrigation events.

- Small breadboard: A breadboard is a plastic board with holes that's used to build and test electronic circuits without soldering.

- Jumper wires: A jumper wire is an electrical wire with connector pins at each end that connects two points without soldering.

- Foam sheet

Construction Steps:

- Connect the jumper wire to servo motors.

- Connect the water detector sensors to jumper wires.

- Then connect it to Arduino Uno.

- Attach the jumper wires to Arduino Uno with GND pin.

- Connect the servo motors, GND and 5 V wires with breadboard.

- Connect the another wire to Arduino Uno in pin no. 4

- Connect all the jumper wires to the breadboard in a line.

- Connect one water detector sensor wire to the breadboard and another wire to the Arduino Uno pin no. 5.

- Take a foam sheet and make table base and bridge.

- Connect all the materials to the base.
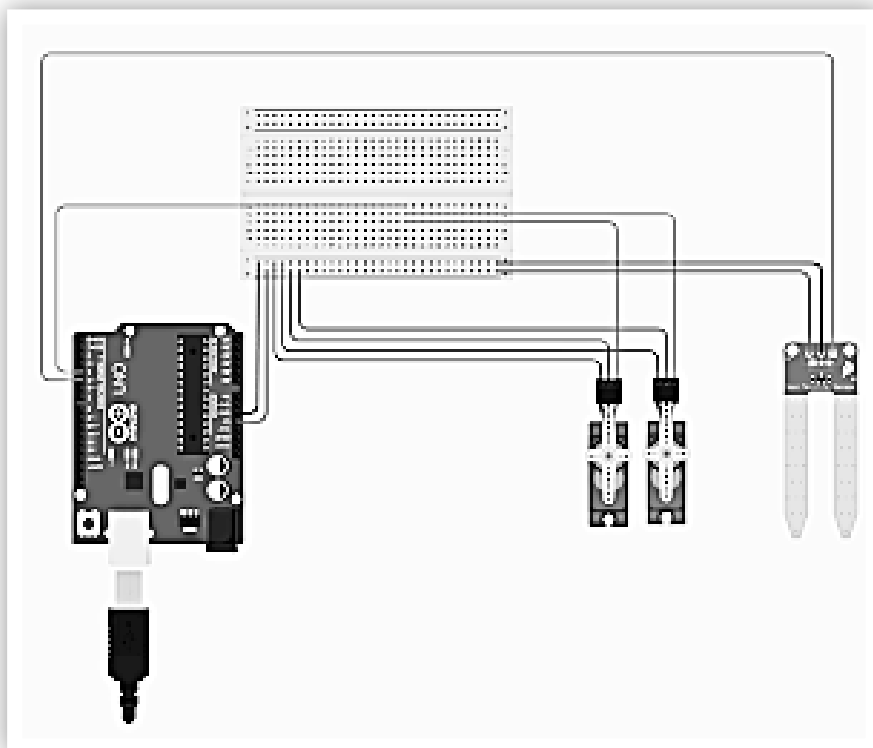
Coding In Arduino IDE:

```
include <Servo. h> #
define soilpin A1 #
int soil = 0;
Service service1;
Servo servo2;
int on = 90;
int off = 0;
void setup()
{
pinMode(soilpin, INPUT);
servo1. attach(9);
servo2. attach(10);
servo1. write(off);
servo2. write(off);
}
void loop()
{
soil = analogRead(soilpin);
if(soil < 700)
delay(500);
servo1. write(on);
servo2. write(on);
} else
delay(500);
servo1. write(off);
servo2. write(off);
}
```

Application:

- Flood prevention: This prevents bridge foundations from breaking and keeps traffic moving during floods.

- Safety: The automatic height adjustment system keeps the bridge at a safe height, which prevents accidents and damage.

- Resilience: the system makes bridge more resilient to flooding and climate change.

15. School Name: IES Public School, Thrissur

Students: Farah Febin, Aswathy B. S. and Sreya Baburaj

Project Supervisor: Rathi A. N.

Project Name: Sign Language Recognizer

Scan the code to watch the video of the project

The Sign Language Recognizer is an innovative project designed to bridge the communication gap between the deaf and hearing communities. Utilizing advanced computer vision and narrow AI technologies, this tool recognizes sign language gestures and translates them into English text in real time. It employs a Raspberry Pi 4 (RPi4) as the processing unit, paired with a 7-inch touch display for a user-friendly interface. The software for this project is entirely developed in Python, leveraging its versatility and wide range of libraries.

The primary objective of the project is to enhance accessibility and inclusion for deaf individuals in education, workplaces, public services, and social environments. This technology addresses critical communication challenges by interpreting the shape, movement, and orientation of hand gestures, associating them with their corresponding English translations. The system is trainable and adaptable, accommodating various sign languages and individual signing styles for improved accuracy and usability.

Key applications of the recognizer include its use in educational institutions, where it assists teachers and students in interacting with deaf individuals and serves as a learning tool for sign language students. Public services, such as hospitals and government offices, can implement the technology to ensure equitable access to essential services. In workplaces, the recognizer fosters inclusivity by enabling effortless interaction between deaf employees and their colleagues. Socially, the tool enhances participation in conversations and events, making them more inclusive for deaf individuals.

16. School Name: St. Mary's Residential School, Pathanspuram, Kollam

Students: Aryanath R M, Sreehari A S and Asif S

Project Supervisor: Sunitha K Samuel

Project Name: Heavy Rain Detector

Scan the code to watch the video of the project

Introduction

Climate change refers to the long-term warming of the planet due to an increase in average global temperature, primarily caused by human activities that release green house gases into the atmosphere.

Climate literacy is important to help people understand and become aware of climate change, its causes, effects, and potential solutions. It is also essential that we have the ability to effectively communicate climate change information to others and advocate for climate action. This helps communities to prepare for and respond to climate related disasters and changes.

As a result of varied climatic conditions, Kerala has experienced more intense and erratic rainfall events, which lead to landslides and floods. In 2018, Kerala experienced its worst flood in decades, with over 410 deaths and thousands displaced. A series of landslides has occurred in different villages of Wayanad in 2024.

Weather Forecasting

Weather forecasts help people prepare for dangerous conditions like storms, floods, and heat waves. In case of such situations, people can stay indoors to avoid unnecessary risks. Rainfall measurements are also equally important in a small state like Kerala for many reasons including – agriculture, flood controlurban planning, transportation, water resource management, forecasting, and so on.

Objective

The aim of the project is to construct a heavy rain detector using rain gauge.

Rainfall measurement by IMD

The Indian Meteorological Department uses data from over 3700 rain gauges to prepare rainfall statistics in India. The IMD's rainfall categories are:

Condition	mm/day
No rain	0. 0
Trace rain	0. 01 – 0. 04
Very light rain	0. 1 – 2. 4
Light rain	2. 5 – 7. 5
Moderate rain	7. 6 – 35. 5
Rather heavy rain	35. 6 – 64. 4
Heavy rain	64. 5 – 124. 4
Very heavy rain	124. 5 – 244. 4
Extremely heavy rain	Greater than 244. 5

The IMD provides rainfall statistics in tabular, map, and geographical formats for the country, states, districts, and other administrative zones. The statistics are available for various temporal scales, including weekly, monthly, seasonal and annual.

Main Components of Rain Detector

1. Rain Gauge
2. Light Emitting Diode (LED)
3. Buzzer Alarm
4. 9-volt batteries
5. Switch
6. Connecting wires

17. School Name: St. Josephs's High School CBSE, Panvel

Students: Mst. Mohd Arman Khajatullaman Shaikh and Ms. Carol Jessica A.

Project Supervisor: Mrs. Sabira Shaziya Shaikh

Project Name: IOT Based Landslide Early Warning System

Scan the code to watch the video of the project

Problem statement:

Landslides, one of the most devastating natural disasters in hilly areas, cause significant destruction to property, infrastructure, and human life. Triggered by factors such as heavy rainfall, earthquakes, soil erosion, and human activities like construction and mining, landslides have become increasingly frequent in India. Over the past decade, landslides have claimed many lives annually. For example, in August 2021, Maharashtra experienced multiple landslides due to heavy rains, resulting in at least 60 deaths. Similarly, the catastrophic 2013 Uttarakhand disaster claimed 6000 thousands of lives. More recently, in July 2024, a devastating landslide in Kerala's Wayanad district killed more than 300 people. From Figure 1, it is observed that a total of 3,782 landslides occurred between 2015 and 2022, according to information provided in the Lok Sabha by Dr. Jitendra Singh, Minister of State (Independent Charge) for Earth Sciences. These events highlight the urgent need for effective preparedness and safety measures in landslide-prone regions.

The objective of a landslide early warning system is to mitigate these risks through:

Figure 1 – United Nation Sustainable Development Goals.

Our objective is inspired by several United Nations Sustainable Development Goals (SDGs), including Climate Action, Clean water and Sanitation, and Decent work and Economic growth.

- Real-time data monitoring and collection: Installing moisture sensors on mountains to track soil moisture levels.
- Information sharing: Communicating warnings to authorities like SDMA,IMD, PWD, emergency services, and the public.
- Emergency measures: Ensuring shelters are equipped with essential supplies like medical kits, food, clothing, and lights.

During heavy rainfall, water seeps into the soil and underlying layers, weakening their structure and increasing the likelihood of landslides. To detect this early, moisture sensors can provide real-time data to a monitoring station.

Components & Working:

The main components used in this project are the ESP32, moisture sensors, the Blynk IoT platform, the Arduino IDE, LEDs, and jumper wires. Two moisture sensors are connected to the ESP32 device on pins 34 and 35. The ESP32 comes with built-in Bluetooth and Wi-Fi capabilities. Once the moisture levels detected by the sensors are processed by the ESP32, the data is transferred to the Blynk platform, where the real-time moisture levels are displayed.

If the moisture level exceeds a threshold value, an alarm is activated. For this demonstration, LEDs are used to simulate the alarm system, connected to the ESP32 on pins 4 and 5. This technology enables authorities to respond proactively, potentially preventing loss of life. In situations where sudden landslides leave no time for evacuation, emergency bunkers equipped with medical kits, food, and other essentials can act as life-saving shelters.

Conclusion:

landslide early warning systems play a critical role in reducing disaster risks. By providing timely alerts and enabling efficient resource allocation, these systems can protect communities, save lives, and improve disaster response strategies in vulnerable regions.

Future scope:

- To utilize BHUVAN (Indian Geo platform of ISRO) data for forecasting for rain forecasting to implement necessary precautionary measures.
- Additionally, to design a rainwater harvesting model that effectively captures and utilizes rainwater.

18. School Name: Broadway International School, Surat

   Students: Dirsty Agarwal, Kiara Bhogar and Achhat Sarsahay

   Project Supervisor: Shreya Bhagat

   Project Name: Water Treatment Plant and Drainage
   Cleaning System

Scan the code to
watch the video
of the project

Scope

Our project can be used to keep our rivers clean to decrease the burden on local bodies and to solve the problem of clogged drainage.

Problem Statement

As we know that today's major issue is pollution, which is degrading our mother nature. Because of urbanization and industrialization, our water bodies and environment are getting polluted. The pollution of our rivers is caused by industrial factories and the indiscriminate disposal of solid waste. Pollution should never be the price of prosperity. Water clogging is also common because of household waste, so to stop those clogging and to stop river pollution we have made automatic drainage cleaner. It will help us to collect recyclable plastic and will not harm animals. Hypothesis

We have tried to find the reason behind the water pollution. We come to the conclusion that factories and drainage water is degrading the rivers to some extent. So, we tried to find a solution to decrease that. For that we come to the conclusion that every factory needs to clean the water before releasing it into the river. On other hand the water that is being released from drainage should be free from plastic waste. It will help us to keep the rivers clean.

Objective

The objective of this project is to keep the rivers clean and to reduce the water pollution. As for the comfort of today's generation, we can not compromise with the future of upcoming

generation. It's high time we take strict action to save mother nature. As we have already degraded mother nature to the extreme level.

Methodology

Our system consists of two main systems, one is the Water Purifying Unit and the second is Automatic Drainage Cleaner. Our first system majorly focuses on factory wastes which is the main reason for water pollution. So to reduce that we have attached a water purifying system to remove solid waste from the waste water of the factory. Our second system mostly focused on clogged drainage. Water clogging is also common because of household waste, so to stop those clogging and to stop river pollution we have made automatic drainage cleaner.

Procedure

Water Purifying system:Water is collected from the factories and passed through five steps to remove solid particles. First it will pass from stones then from gravels after that from charcoal then from sand and at the end it will pass from cotton. For advancement, we can also fit a carbon filter, chlorination tank and UV treatment to remove soluble impurities. After passing from the purifying system, either you can release or reuse it in the factory. The water purifying system ensures that the water is free from harmful chemicals, bacteria, sediments, heavy metals, and other contaminants.

19. School Name: Gaikwad Global School, Chhatrapati Sambhajnagar (Aurangabad)

Students: Sairaj Bharat Shinde, Arya Umesh Pardhe and Sarthak Mahesh Thale

Project Supervisor: Syed Misbah W.

Project Name: Sugar Rocket

Scan the code to watch the video of the project

Problem Statement:

Fire crackers like rockets are the center of attraction for children during Diwali.

The gunpowder used in these rockets is made up of potassium nitrate, sulphur and charcoal which on combustion produces harmful gases like carbon protoxide, carbon monoxide, Hydric sulphide, Nitrous oxide, etc.

These gases are highly toxic in nature which cause air pollution and can also cause Keratitis, Conjunctivitis, Corneal ulceration & Loss of vision.

Apart from this if the rocket takes a proper trajectory then it goes to the sky or else it may hit anyone causing severe physical injuries and burns or may cause fires in surroundings.

Proposed Solution: To solve this problem we have designed and developed a project "Sugar rocket". The aim behind making this project model is to reduce the environmental and health hazards caused by gunpowder by replacing the rocket fuel with a material from our kitchen i. e. sugar, as it won't produce toxic gases after combustion.

To reduce chances of physical injuries, we have designed a distant ignition system and a simple launcher that gives a proper trajectory to the rocket.

Methodology:

Our sugar rocket is made up of all pre-used materials like old PVC pipes, cardboard, sawdust and so on.

The rocket is powered with potassium nitrate and sugar in proportions of 65%: 35%.

The ignition system is based on a simple circuit connected to a power source of

3. 7V, controlled by a switch (wired and wireless both). When it is turned on it ignites the matchstick and further the rocket fuel.

The launcher comprises of a steel rod fixed to the ground. The rocket is inserted into the launching rod with the support of PVC ring attached to the body of rocket. When launched the rocket takes a proper direction preventing injuries and the person launching remains at a safe distance too.

Results: The sugar rocket launched safely and successfully with a proper trajectory.

Images:

Conclusions:

The sugar rocket made by KNO_3 and sugar mixture has potential environmental advantages in terms of being less toxic and more biodegradable compared to other chemicals, but it should still be used with care.

The potential for environmental harm exists if large quantities are released into ecosystems.

The combustion process still contributes CO_2. Therefore, it is most beneficial in carefully controlled and small-scale applications.

Future Scope:

With improvisation and guided research, the rocket can be made useful for various missions including military operations and unmanned space launches.

Limitations:

The Carbon dioxide gas produced as a product of combustion needs to be limited.

The used rocket body contains non-biodegradable materials which need to be collected and discarded properly.

Nitrogen compounds in KNO_3 can lead to eutrophication if mix with water bodies.

20. **School Name:** New Grace English School, Pune

Students: Ayesha Ahteshamuddin Shaikh, Rida Ajas Sayyed and Yusra Toufique Sayyed

Project Supervisor: Nasreen Mubin Khan

Project Name: Innovative Flexible Highway Barrier

Scan the code to watch the video of the project

In today's fast-paced world, road safety is a pressing concern as high-speed collisions on highways often lead to devastating consequences, including loss of lives and extensive property damage. The students of Grade VIII at New Grace English Convent, Pune, have risen to this challenge with their innovative project, the Flexible Highway Barrier—a groundbreaking solution designed to enhance safety and minimize the risks associated with high-speed accidents.

The Problem with Traditional Barriers

Conventional highway barriers, though widely used, have inherent limitations:

- Ineffectiveness at High Speeds: Traditional barriers often fail to stop or slow down vehicles effectively during high-speed collisions.
- Increased Vehicle Damage: Their rigid structure exacerbates the impact, leading to severe damage.
- Higher Risk of Secondary Accidents: These barriers may cause vehicles to ricochet unpredictably, increasing the risk of further mishaps.

Our Innovative Solution

The Flexible Highway Barrier addresses these challenges by incorporating advanced engineering concepts that prioritize safety, effectiveness, and innovation.

1. **Impact Absorption and Speed Reduction:**
   - Dual-Spring Mechanism: A specialized dual-spring system absorbs and dissipates the energy from collisions, significantly reducing the impact force experienced by both the vehicle and the barrier.
   - Flexible Plate: The barrier features a fallible plate designed to adjust during impact, ensuring gradual deceleration and minimizing vehicle damage.

2. **Controlled Vehicle Redirection:**
   - Safe Redirection: Unlike traditional barriers, our system redirects vehicles back onto the road safely, preventing them from veering into oncoming traffic or causing secondary accidents.

Benefits of the Flexible Highway Barrier

- Enhanced Safety: The design drastically reduces the risk of severe injuries and fatalities by controlling and absorbing the impact of high-speed collisions.

- Minimized Property Damage: By cushioning the impact and reducing rebound effects, the system protects vehicles and infrastructure, saving costs on repairs and replacements.

- Reliable Performance: The barrier performs effectively under high-speed conditions, making it a dependable safety measure for highways.

Conclusion

This innovative barrier system represents a significant advancement in highway safety. By integrating flexibility, energy absorption, and controlled vehicle redirection, it addresses the limitations of traditional barriers while offering a practical, cost-effective, and life-saving solution. The dedication and ingenuity of our students—Ayesha Ahteshamuddin Shaikh, Yusra Toufique Sayyed, and Rida Ajaj Shaikh—are evident in this project, which stands as a testament to their commitment to creating a safer world.

21. School Name: Sanskar Vidya Sagar school, Nagpur

Students: Shrimahi Zhilpe, Chaitanya Pasari and Devansh dudhalkar

Project Supervisor: Anjali Bhargava

Project Name: Acne Alert

Scan the code to watch the video of the project

Statement of Problem:

Everyday in the morning all the Adolescents don't dare to see mirror as they are scared to get new pimple/Acne on face and affect their persona. Is there any way to detect early pimples?

Solution:

Acne Alert is the solution for this problem.

Explanation: We have developed an Acne Alert program. In this one has to see in the camera of Laptop, immediately acne/s are identified and shown in Yellow box with dimensions.

If the marked value is below a certain level and acne is about to spurt so that one can take necessary action.

Method:

Pimple detection using OpenCV and Convolutional Neural Networks (CNN) involves a combination of image preprocessing and deep learning to identify pimples on facial skin. This includes resizing images to a uniform size, converting them to grayscale. Histogram equalization can enhance contrast, and thresholding or edge detection helps segment skin regions, focusing on areas where pimples are likely to appear.

Future Research:

We have started working on usage of Acne Alert to detect breast Cancer at very early stages.

Conclusion:

 The use of Acne Alert will prove as a boon for Adolescence and will help for early treatment and safeguard body image.

22. **School Name:** Mithi Gobindram Public School, Bhopal
    Students: Vivan Menghani, Abhinav Verma & Suyash Kriplani
    Project Supervisor: Syed Maqbool Ahmed
    Project Name: Mixer Grinder Without Electricity

Scan the code to watch the video of the project

This model is based on Electro-magnetic Induction in which the coil containing blade rotates by means of magnetic field and it also rotates the jar attached to it by innovation technique. We can make it useful for the conservation of electric current as it works on magnetic field.

This model contains copper coil, strong magnets and metal blade along with batteries.

This project is based on Lenz Law. Lenz's Law states that the direction of an induced electromotive force (EMF) is always such that it opposes the change in the magnetic flux that induces it. In other words, the induced current will flow in a direction that creates a magnetic field opposing the change in the original magnetic field.

This law was formulated by Heinrich Lenz in 1834 and is a fundamental principle in electromagnetism. It helps explain many phenomena, including electromagnetic induction, transformers, and generators.

Application in a Manual Mixer Grinder

To apply this concept to a mixer grinder without electricity, we have designed a mechanism where the user manually provides the rotational energy to generate the necessary power to operate the grinding mechanism. Here's how it works:

1. **Manual Rotation of a Magnet or Coil System**

Instead of an electric motor, the user manually rotates a crank or a wheel attached to a rotor with a magnet or coil system.

As the crank is turned, it causes a magnet to move in relation to a coil or vice versa. This motion induces a current in the coil (according to Faraday's Law of Induction), which generates a magnetic field.

2. **Induced Magnetic Field and Mechanical Movement**

According to Lenz's Law, the induced magnetic field will act to oppose the motion that caused it. This means that the resistance you feel while rotating the crank is actually a manifestation of the energy being used to induce the current that drives the mixer's mechanical action.

The mechanical movement of this system (created by the user's effort) can be transferred through gears or belts to rotate the blades of the mixer grinder.

3.   Resistive Forces and Energy Conservation

As the user applies force to rotate the crank, the induced current works against the motion. This resistance is necessary for the mixer grinder to function because the energy supplied by the user is being converted into mechanical work and electrical energy, which powers the grinding blades.

The system relies on converting manual energy into both electrical energy (to create a magnetic field) and mechanical energy (to drive the grinding mechanism), while Lenz's Law ensures energy conservation throughout the process.

Advantages of a Manual Mixer Grinder Based on Lenz's Law

No Dependence on Electricity: This model can operate in areas without electricity, making it suitable for remote locations or as an emergency backup.

Eco-friendly: Since it doesn't rely on an external power source, it reduces electricity consumption and is environmentally friendly.

Exercise and Efficiency: Manual operation provides an added benefit of exercise while still being effective in grinding, mixing, or chopping tasks.

Conclusion

A mixer grinder based on Lenz's Law works by converting manual mechanical energy into electrical and then back into mechanical energy, with electromagnetic principles governing the resistance and energy transfer. It operates without electricity, providing an innovative solution for grinding and mixing in an environmentally friendly and energy-efficient manner. The system is a great application of fundamental physics principles like Lenz's Law to create a useful, sustainable, and energy-independent kitchen appliance.

23. School Name: St. Joseph's Sr. Sec. School, Chandigarh

   Students: Tijil Kanna, Saurabh Saroha and Abhijot Singh

   Project Supervisor: Ms. Monica Chawla

   Project Name: Krrishi Saarthi

Scan the code to watch the video of the project

I.   Purpose behind the development:

Traditional farming methods often require significant manual labour and time, especially for tasks like monitoring soil conditions, watering crops etc. To address these challenges, this project proposes the development of rover designed to help farmers in performing essential agricultural activities. The rover is equipped with advanced sensors and robotic features to monitor temperature and humidity, help in seed sowing, and perform precise irrigation. By automating these tasks, the rover reduces the need for manual labour, improves crop management, and promotes sustainable farming practices. The aim is to help the old and handicapped farmers.

II.   Scientific principle Involved:

The automatic seed sowing mechanism relies on principles of mechanics and automation. A motorized dispenser drops seeds.

Radio Frequency (RF) and Infrared (IR) technologies are used for remote control. RC uses RF communication, where a transmitter sends signals to the receiver on the rover to control its movement and actions.

Sensors like DHT11 are commonly used to measure environmental factors such as temperature and humidity. These sensors work by detecting changes in resistance, capacitance, or voltage due to environmental conditions.

The sprinkler system operates based on fluid dynamics and hydraulic principles. Water is pumped through pipes and released through a nozzle under pressure, dispersing over a large area. The solar panels are mounted on the rover's surface, allowing it to harness sunlight to recharge its battery throughout the day.

For measuring the soil moisture a soil moisture sensor is being used. In this, an electromagnetic pulse is sent through the probe inserted into the soil.

III.   Materials used for Construction:

|	
I. Arduino UNO	VI. Solar Panel
II. Arduino Nano	VII. DHT11 Sensor
III. Motor Driver Shield (L293D)	VIII. Li-ion Battery
IV. IR Receiver	IX. BO Motor
V. Soil Moisture Sensor	X. LCD Display

IV. Construction and Working of Exhibit:

It is a versatile and autonomous agricultural rover designed to streamline essential farming tasks. The rover can do automated seed sowing, real-time environmental monitoring, and efficient irrigation. By integrating remote control functionality with an IR sensor and receiver, the rover provides both manual and automated operation modes, enhancing flexibility and ease of use for farmers. The temperature and humidity sensors ensure that environmental data is constantly monitored, while the sprinkler system delivers water directly to crops as needed. It also consists of a Soil Moisture Sensor which measures the present moisture level of the soil. If the soil is dry the buzzer starts beeping, once the soil becomes moist the buzzer stops beeping. This combination of features reduces the farmer's workload and improves crop management. It also ensures sustainability as the batteries are charged using solar panel.

V. Applications:

1. Automated Seed Sowing.
2. Remote-Controlled Farming Operations.
3. Environmental Monitoring (Temperature, Humidity and Soil Moisture).
4. Efficient Water Usage through sprinkler based irrigation.
5. Solar-Powered Sustainable Farming.
6. Labour Reduction in Farming Tasks.

VI. Illustrations:
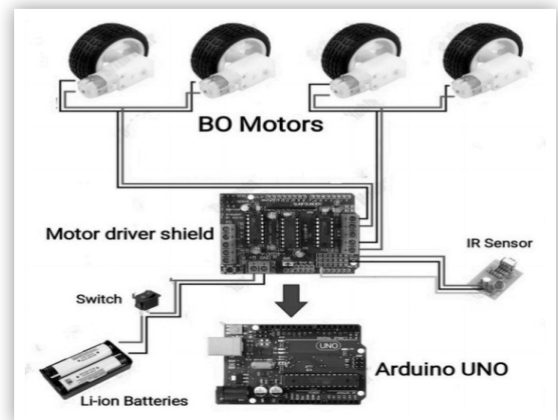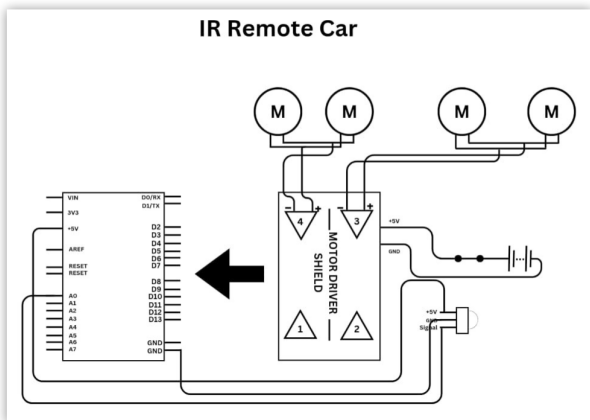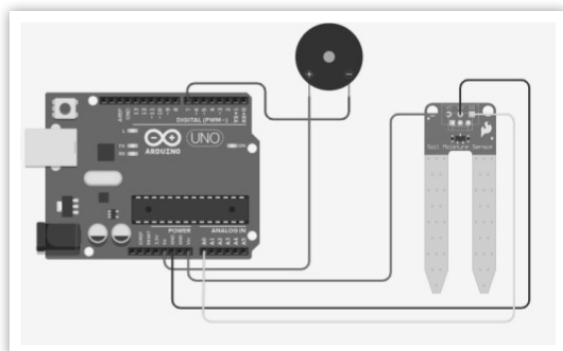
Soil Moisture Level Measuring

DHT11 Sensor
Breadboard
Arduino Nano
LCD with I2C
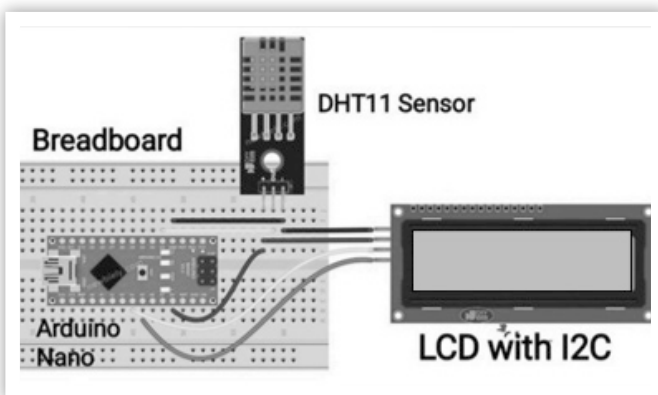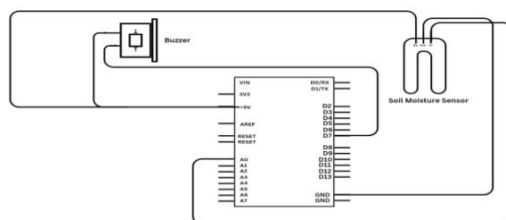
Temperature & Humidity Display
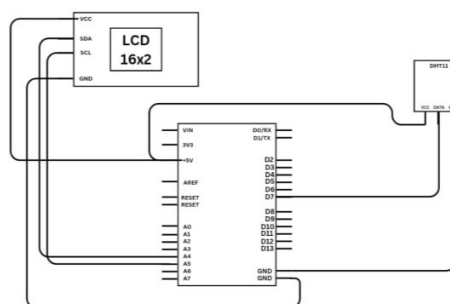
24. School Name: GD Goenka Signature School, Gurugram

   Students: Advita Pandey, Arhnav Kommu and Anik Singh

   Project Supervisor: Dr. Alpana Baveja

   Project Name: Gestro

Scan the code to watch the video of the project

The Bluetooth-Controlled Car project demonstrates the integration of hardware and software to create an innovative solution for wireless vehicle control. This project incorporates a microcontroller-based car equipped with a Bluetooth module and an Android application named Gestro, developed using the MIT App Inventor platform through blockbased coding.

Overview

The car is powered by an Arduino microcontroller and uses an HC-05 Bluetooth module for wireless communication. It is equipped with DC motors controlled by an L298N motor driver, allowing precise navigation. The Gestro app acts as the control interface, enabling users can drive the car wirelessly with a smartphone.

Gestro Application

Gestro is designed using the MIT App Inventor, a user-friendly platform that facilitates block-based coding for app development. The app features an intuitive and visually appealing interface that offers two primary control modes:

1. Gesture Control: Users can tilt their smartphone to control the car's direction (forward, backward, left, right).

2. Button Control: A set of virtual buttons allows manual control of the car for finetuned movements.

The app connects seamlessly to the car via Bluetooth, ensuring real-time response. The integration of gesture-based controls enhances the user experience, making it both engaging and interactive.

Technical Specifications

- Microcontroller: Arduino Uno
- Bluetooth Module: HC-05
- Motor Driver: L298N
- Motors: DC motors for forward/reverse and left/right movement.
- Power Source: Rechargeable battery pack.

Features and Benefits

1. Wireless Operation: Eliminates the need for physical connections.
2. Gesture-Controlled Navigation: Provides a modern, hands-free control experience.
3. Real-Time Control: Ensures smooth and precise movement without lag.
4. Educational Value: Introduces students to concepts of wireless communication, microcontrollers, and app development.

Applications

This project can be used in educational demonstrations, robotics competitions, and as a foundation for advanced robotic applications. The combination of hardware and software exemplifies how modern technology can simplify tasks and inspire innovative solutions. With Gestro, users not only control a car but also explore the exciting possibilities of app controlled robotics.

25. School Name: The Manthan School, Greater Noida West

    Students: Swasti Singh, Pragalbh Singh and Virat Singh

    Project Supervisor: Poonam Kumar Mendiratta

    Project Name: Solar Powered Sand Batteries

Scan the code to watch the video of the project

Introduction:

Solar powered sand batteries represent an innovative approach to renewable energy storage. These systems leverage solar energy to heat sand, which acts as a thermal energy storage medium. The concept addresses the intermittent nature of solar power by providing a method to store excess energy produced during peak sunlight hours for use when solar power generation is low.

Mechanism:

Energy Collection: Solar panels or concentrated solar power (CSP) systems capture sunlight, converting it into thermal energy.

Energy Storage: The thermal energy is transferred to sand, which has high heat capacity and stability. Sand can be heated to temperatures exceeding 800°C.

Energy Release: When energy demand peaks or sunlight is unavailable, the stored thermal energy is extracted from the sand and converted back into electricity, often using thermoelectric generators or heat exchangers.

① Low-cost, intermittent electricity powers electric heaters.

② Electric heaters store thermal energy in bricks at temperatures up to 2,100°F.

③ Air is heated by passing through the bricks.

④ Air can be used to generate steam through a boiler package.

⑤ Air and/or steam is delivered to any industrial process.
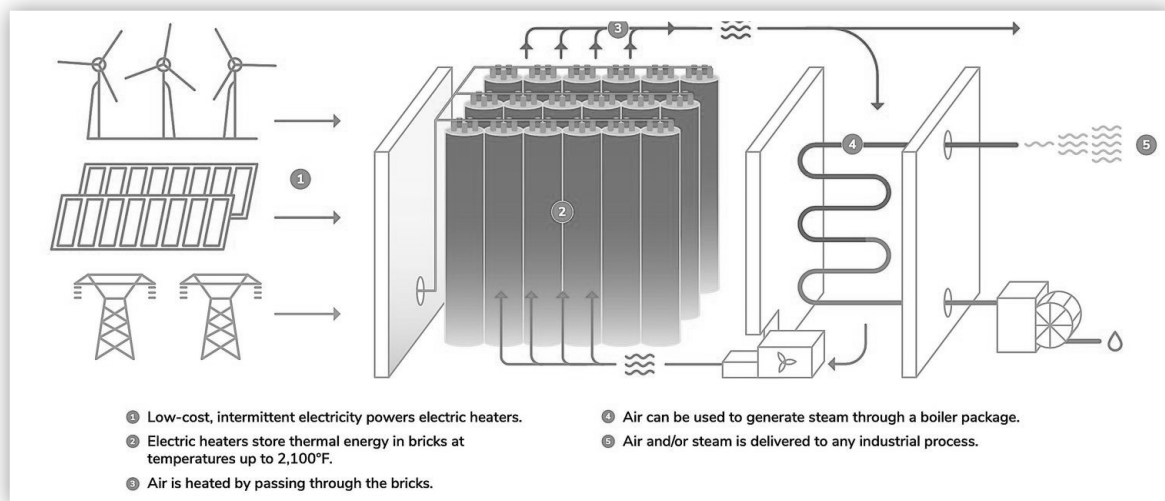
***Figure** – 'Mechanism of Solar powered sand batteries'.*

Advantages:

Efficiency: Sand has excellent thermal conductivity and heat retention properties, making it an efficient medium for thermal storage.

Cost-Effectiveness: Sand is abundant and inexpensive, reducing the overall cost of the storage system.

Longevity: Sand does not degrade over time, providing a durable and long-lasting storage solution.

Environmental Impact: Utilizing solar energy and sand minimizes the environmental footprint, as it avoids the need for rare or hazardous materials.

Challenges:

Scalability: Implementing sand batteries on a large scale requires significant infrastructure and investment.

Heat Loss: Ensuring minimal heat loss during storage and retrieval of thermal energy is crucial for maintaining efficiency.

Conversion Efficiency: Converting stored thermal energy back into electricity with high efficiency remains a technical challenge.

Applications:

Grid Stabilization: Sand batteries can be used to stabilize power grids by providing a reliable energy source during peak demand times.

Remote Areas: They offer a feasible solution for energy storage in remote or off-grid locations where traditional batteries might not be viable.

Industrial Use: Industries with high thermal energy demands can benefit from sand battery systems to reduce reliance on fossil fuels.
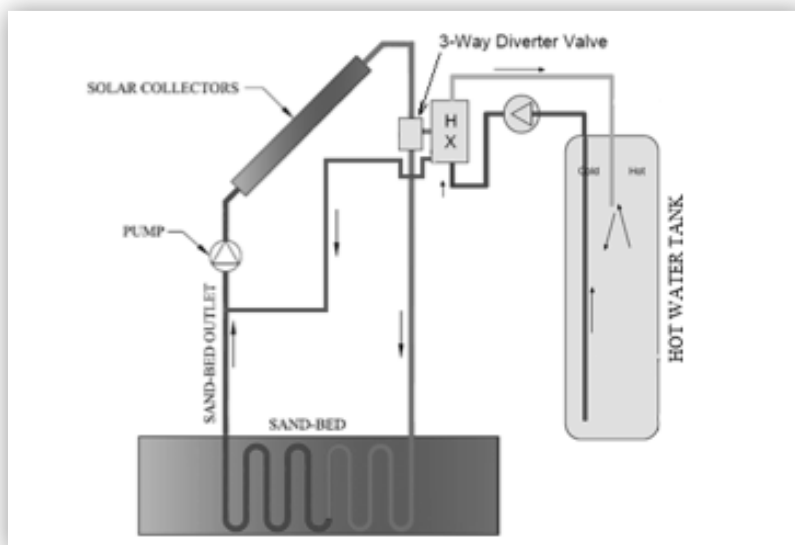
Figure – 'Heating sand bed using hot water'.

Future Prospects:

Research and development in materials science and energy conversion technologies are expected to enhance the efficiency and feasibility of solar powered sand batteries. Innovations in thermal insulation and energy conversion processes will likely drive broader adoption and implementation of this technology, contributing to the global transition toward sustainable energy solutions.

26. **School Name:** K. L. International School, Meerut

Students: Raghav Agarwal, Keshav Agarwal and Aryan Chaurasia

Project Supervisor: Mr. Sudhanshu Shekhar

Project Name: Arduino Self Driving Car with Automatic Street Light and Toll Plaza

Scan the code to watch the video of the project

Problem Statement:

A lot of energy and electricity consumption.

The increasing number of accidents day by day.

Proposed Solution:

Street light will be on when car pass by.

Using ultrasonic sensor so that car automatically stops when there is another car or any object.

Working of toll plaza without human intervention.

Methodology

Results:

Of car:

1. Ultrasonic sensor: stops the car when it senses the object.
2. Infrared sensor: keeps the car on track.

Of Street Light And Toll Plaza:

1. Infrared sensor: street lights on when car pass by.
2. Servo motor: pulls up and down the toll booth.
3. Future propects

We will add features to our car using different sensors like the bump sensors or the light sensors.

Purchase an Arduino-compatible color sensor and use it to detect traffic lights or traffic signs on our model roadway.

We will also add GPS for location and upcoming GPS toll system.

27. **School Name:** Spring Dales English School Changran, Kathua

    Students: Sachi Sharma, Sadhya Sambyal and Jagruti Sharma

    Project Supervisor: Ms. Neelam Gupta

    Project Name: Aquafina- The Clearance of Water

Scan the code to watch the video of the project

"Aquafina" is a system that we created to clean the water from groundwater sewage, than the water could be used in. fields, homes, communities and many more.

The Problem

We observed that agriculture is the backbone of our economy and groundwater is the main source of irrigation even after that the ground water sewage reduces the quality of the water used for irrigation, thus reducing the yield of the crop cultivated and also increases infertility of soil. We realized that we can solve this big issue by creating such a system that could be easily used by farmers.

Hypothesis

We tried to find several ways to solve this problem and none of them were capable enough to solve this issue but only one of them was suitable and that was by using a whole system consisting of membranes, sensors, and other applications such as RO system. We find this suitable as this has an easy mechanism but it is effective too.

Methodology

Primary Filtration consist of two-tank system with sponge membrane. Raw sewage is initially filtered through a two-tank system separated by a sponge membrane. This physical filtration process removes large solid particles and organic matter. Secondary Filtration system consist of RO membrane filtration. The partially treated water is then subjected to a more advanced filtration process using a prototype TFC (Thin Film Composite) membrane. This membrane removes dissolved salts, heavy metals, and other contaminants, producing high-quality water suitable for irrigation.

We have also used soil moisture sensing and irrigation control. A moisture sensor continuously monitors the soil moisture levels in the field. Based on the sensor data, the system determines the irrigation needs of the crops. The system triggers the water pump to deliver the required amount of treated water to the field through a drip irrigation system. Drip irrigation ensures efficient water delivery directly to the plant roots, minimizing water loss through evaporation and runoff. We can use the water in two ways and one of the ways is that this clean water can be use in the communities for various purposes like gardening, washing vehicles, utensils and clothes. It can be also used for drinking after boiling. For this, we have attached our model with a tank that is connected with the community's water supply system and to ensure the ph of water we have attached a PH value sensor

to this tank. So that we can know the pH value of water that it is alkaline, basic, acidic or neutral. So this water can be used for various day to day activities and we can also ensure the pH value of water from pH value sensor and we can use the water according to its PH value. We have also used a TDS meter near the RO system. TDS meter is a small hand-held device used to indicate the Total Dissolved Solids in a solution, usually water.

Conclusion

After testing different soil types and needs of different crops we can conclude these things:

- The system is nearly perfect for the growing problem of groundwater sewage, that gets used in irrigation, but to make sure the use of such system,can be only done by giving awareness about how this problem can solve this easily.

- This project can be a game changer in states like Punjab, Haryana, only for cleaning water also.

- This project ends the use of fertilizers to a great extent which in turn helps reduce soil pollution.

Future perspectives

- We can use a better mechanism of RO system when being used in agricultural fields.

- The coding of the moisture sensor can be changed according to the need of the crop, for such crops as paddy as it requires more water.
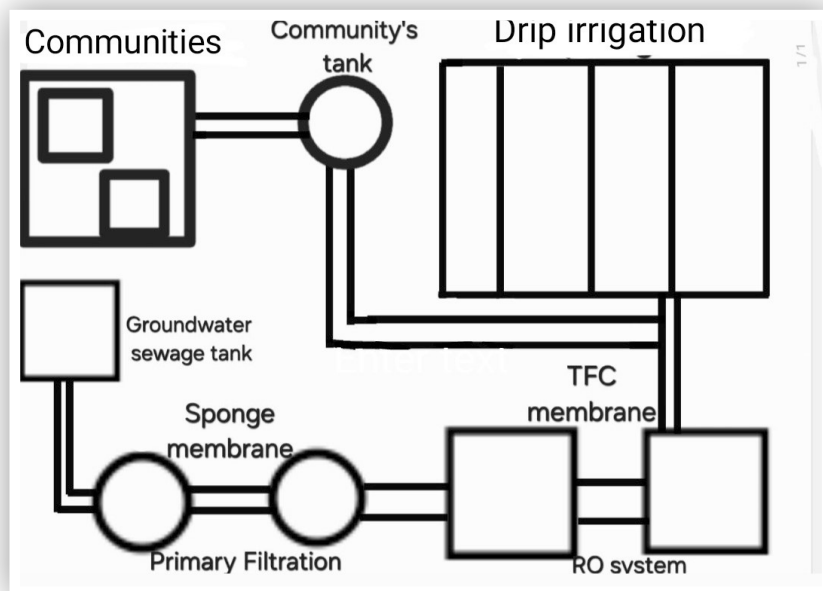
Working mechanism of Aquafina.

28. **School Name:** Kerala Public School Mango, Jamshedpur

    Students: Rahat kalam, MD Arfat Salim Ansari and Mohammad Hasan Raza

    Project Supervisor: Mr. Ankit Sharma

    Project Name: Automatic fire extinguisher

Scan the code to watch the video of the project

Introduction:

An automatic fire extinguisher is a system that can automatically detect and put out a fire without human intervention. It is designed to react quickly to fire, reducing the damage and loss caused.

Aim and objectives:

The primary goal is to minimize property damage, equipment loss, and potential harm to human life to be able to operate without human intervention, ensuring protection even in areas where people might not be present at all times. The main purpose of an automatic fire extinguisher is to detect the early signs of a fire and alert the building occupants without human intervention. It reinforces the coverage provided by manual fire detection, providing protection for our premises even during periods of low occupancy.

Principle:

The principle of an automatic fire extinguisher is to use a heat sensitive liquid(eg: water) that expands. When the liquid reaches a certain temperature it causes the glass bulb to burst and release the extinguishing agent.

Construction: Step 1: First we connect 10 k resistor to the ammeter pin of BD140 transistor, 1k resistor to base pin of transistor. Now we fix the positive end of IR receiver LED with 10 k and 1k resistor and we take red LED and connect the negative end of red LED to collective wire of transistor. Then we connect 220 ohm resistor with positive end of red LED and negative end of IR receiver LED.

Step 2: In next step we connect the negative end of the pump to positive end of the pump with negative end of IR receiver LED. Then the battery and switch are connected and the negative end and positive end of battery is connected to the ammeter pin of transistor and negative pin of IR LED. we get the complete circuit and we fix the entire circuit in the plastic container.

Benefits:

- Immediate response – Automatic fire extinguishers can respond in 10 seconds or less, stopping fires before they spread and cause damage.

- 24/7 protection – Automatic fire extinguisher can provide protection around the lock even when no one is present.

- Minimal human intervention – Automatic fire extinguishers are designed to put out fires without requiring human intervention.

- Safety in unmanned areas – Automatic fire extinguishers can protect areas that are unmanned or have limited human presence.

- Reduced property damage and lower insurance premiums.

- Cost effective – Automatic fire extinguisher can be prepared without Aurdino device.

Conclusion:

The automatic fire extinguisher project successfully demonstrates the potential of innovative technology to significantly improve fire safety by rapidly detecting and extinguishing fire without human intervention, providing a protective approach to minimizing property damage and safe guarding lives, the system's effectiveness in early fire detection, combined with its automated response mechanism, presents a valuable tool for residential, paving the way for enhanced fire safety measures across in various environments.

29. **School Name:** Sushila Birla Girls' School, Kolkata
    Students: Anushka Sinha, Vaibhavi Agarwal and Druhina Dey
    Project Supervisor: Chandrima Ghosh
    Project Name: Attendance Tracker

Scan the code to watch the video of the project

This innovative solution combines the power of computer vision and data handling to streamline attendance management in a reliable and automated manner.

The project leverages OpenCV, a popular computer vision library, to detect and recognize faces in real-time. Using a webcam or a similar video feed, the system identifies individuals and marks their attendance. This eliminates the need for traditional manual methods, which are often time-consuming and prone to errors.

Here's how it works:

Face Detection and Recognition: The system uses pre-trained models to detect faces and match them with pre-stored data. Each individual has a unique identifier, ensuring accurate recognition.

Attendance Marking: Once a face is recognized, the system logs the individual's name, date, and time into a CSV file. The CSV format is simple yet effective for storing and managing attendance records.

Data Accessibility: The CSV file allows for easy access and manipulation of data, making it suitable for generating reports or integrating with other systems.

One of the standout features of this project is its scalability. It can be deployed in various settings, such as schools, offices, or events, to manage large groups efficiently. Moreover, the use of OpenCV ensures that the system remains fast and responsive, while the CSV format keeps data handling lightweight and straightforward.

This system also addresses key challenges like ensuring accuracy, saving time, and reducing human intervention. For instance, by automating the process, we minimize the chances of errors caused by manual entry. Furthermore, integrating OpenCV with machine learning models can enhance the accuracy of face recognition, even in challenging conditions like varying lighting or angles.

In conclusion, our Attendance Tracker is a step toward smarter and more efficient attendance management. It demonstrates how modern technology, like computer vision and data processing, can revolutionize everyday tasks. We hope this project inspires further innovation and adoption of such tools in real-world scenarios.

30. **School Name:** St. Michael's School for Girls, Siliguri
Students: Khushi Ali and Palak Agarwal
Project Supervisor: Sewangi Singh
Project Name: From Exhaust to **Innovation:** Turning Vehicle Emissions Into Sustainable Products

Scan the code to watch the video of the project

Aim:

This project seeks to mitigate urban air pollution by capturing harmful vehicle emissions and converting them into sustainable, innovative products. It aligns with the United Nations Sustainable Development Goals (SDGs): SDG 11 (Sustainable Cities and Communities), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action). By addressing air pollution and promoting a circular economy, the project aims to significantly enhance urban environments and quality of life.

Concept and Implementation:

Urban air pollution, primarily caused by vehicle emissions, poses severe environmental and health challenges. Exhaust gases contain particulate matter, nitrogen oxides, and carbon monoxide, all of which degrade air quality. This project proposes an innovative solution involving roadside installations equipped with carbon absorbers, HEPA filters, and carbon semi-filters. These systems capture emissions from passing vehicles without requiring any modifications to the vehicles.

Captured emissions, predominantly soot, are processed and repurposed into eco-friendly products:

- Tiles: Durable, practical, and aesthetically pleasing tiles offer a sustainable alternative to conventional materials.
- Ink: High-quality, eco-friendly ink made from soot serves as a replacement for petroleum-based inks.
- Exfoliators: Personal care products made from soot provide a sustainable alternative to chemical-based options.
- Biochar: A soil-enriching product that sequesters carbon and enhances agricultural productivity.

Key Features:

- IR Sensors: These sensors detect vehicle movement and activate the emission capture system, signaling its operation with a green light. This ensures energy-efficient functionality by activating only when necessary.
- Soot Monitoring Sensors: These sensors track the filters' capacity and prevent over-accumulation.

Advantages:

1. Environmental Impact: Reduces urban air pollution, enhancing air quality and public health by actively capturing harmful emissions.
2. Sustainable Products: Converts emissions into eco-friendly alternatives, reducing resource consumption and waste generation.
3. Scalability: The system can be deployed in cities globally, enabling widespread mitigation of air pollution.
4. Energy Efficiency: The reliance on solar power minimizes the carbon footprint and energy costs, making it an environmentally responsible solution.
5. Cost-Effectiveness: Low maintenance costs and solar energy integration ensure affordability for municipalities and governments.

Sources and Inspiration:

- Data from the World Health Organization and pollution control boards highlights the urgent need to address urban air pollution.
- Research on carbon capture technologies provided the basis for repurposing emissions into valuable products.
- Advances in renewable energy and sustainable product development informed the system's scalability and practicality.

This project demonstrates how innovation and sustainability can converge to tackle urban air pollution while contributing to a greener future.

31. **School Name:** Vandya International School, Guwahati

    Students: Pragyan Rk Deka, Nishant Das and Ishan Afridi Parash

    Project Supervisor: Mr. Rajdeep Nandy

    Project Name: Smart home solution

Scan the code to watch the video of the project

As the name suggests, our project is based on smart home solution with a minimal human intervention.

The project integrates several innovative features, including an automatic gate opening system, an anti-theft alarm, a water tank alert, a fire detection system, and an automatic ringing bell—each utilizing specific technologies to address common household challenges.

The automatic gate opening system employs a pressure switch to facilitate effortless entry. As a vehicle approaches, the pressure switch detects its weight and automatically opens the gate, allowing for smooth passage. This system not only enhances convenience but also restricts access to authorized vehicles, bolstering security for the property.

In terms of security, the anti-theft alarm system utilizes laser technology to safeguard the home against intruders. A laser beam is set up across potential entry points, and any interruption of this beam activates a loud alarm. This precise monitoring of doors and windows ensures that any unauthorized access is immediately detected, significantly enhancing the overall security of the residence.

Additionally, the model features an automatic water tank alarm powered by a relay mechanism. This system continuously monitors the water level in the tank and triggers an alarm when the water reaches a predetermined level. By alerting homeowners to potential overflow, it conserves water and protects the property from the risk of water damage, reflecting the students' commitment to sustainability.

The fire detection system incorporates a zener diode, providing an essential layer of protection against fire hazards. The zener diode detects voltage changes caused by smoke or heat, triggering an alarm and alerting occupants to evacuate. This proactive approach enables timely action in the event of a fire, safeguarding lives and property.

Lastly, the home is equipped with an automatic ringing bell system that activates when someone steps on the stairs. Utilizing a pressure switch, this system detects weight and rings the bell, notifying residents of visitors. This thoughtful feature enhances convenience and ensures that no one goes unnoticed, contributing to a welcoming home environment.

32. School Name: The Brighter Academy, Imphal

Students: Narumbam Lanchenbi Chanu, Sarangthem Deepa Devi and Longjam Yaiphabi Devi

Project Supervisor: Mr. Soibam Sukumar Singh

Project Name: Solar Power Irrigation System

Scan the code to watch the video of the project

Introduction

Solar Power Irrigation is a revolutionary approach to agricultural water management, harnessing the abundant energy of the Sun to power irrigation system. As the world struggle with the challenges of water scarcity, climate change and sustainable sources of energy and food production etc, introducing Solar Power Irrigation system as one of the solutions towards harnessing of sustainable energy will relief the vast challenges of farmers to some extent.

Solar Power Irrigation System can find applications in town water supply, livestock watering and irrigation. The Solar Power Irrigation System is an application of a solar-powered water pumping system used in paddy fields, and gardens for watering plants, vegetables, etc. This in turn, helps the farmers as well as the nation to some extent towards the exploration of eco-friendly and future sustainable form of irrigation.

Description

Solar Power Irrigation System has four main parts:

Solar panel: Covert solar energy into electrical energy.

Water pump: Draws water from a source (like well or river). It has a motor running on electricity generated by the solar panel.

Pump controller: Manages the energy distribution from the solar panel.

Irrigation system: Distributes the water to the crops via pipes.
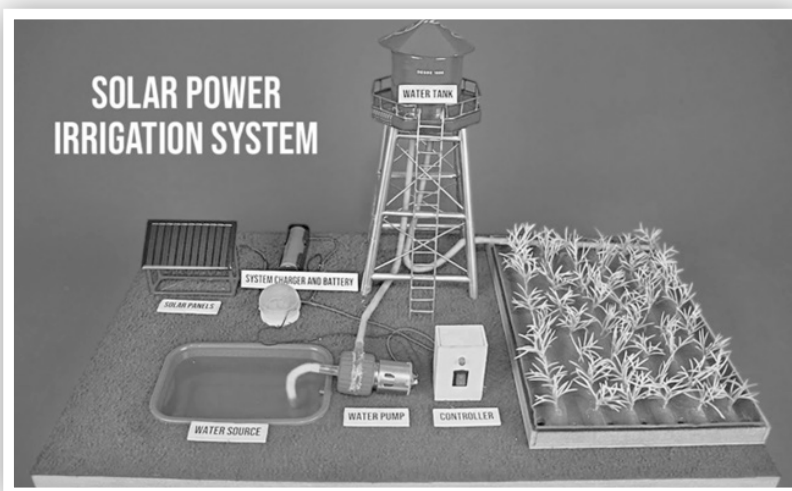
Working

Solar energy is trapped and converted to electrical energy by using solar panels and this electrical energy is used to charge and stored inside a charger and battery system using electric wires.

This electrical energy is used to power the water pump to pump up water from water sources like rivers, lakes, wells, etc to the overhead water tanker through pipe lines.

At the same time, the water pump also transported and supplied this water from the overhead water tanker throughout the agricultural field through the irrigation system using network of pipelines.

The excess or used water is again allowed to follow to the water source through pipelines.
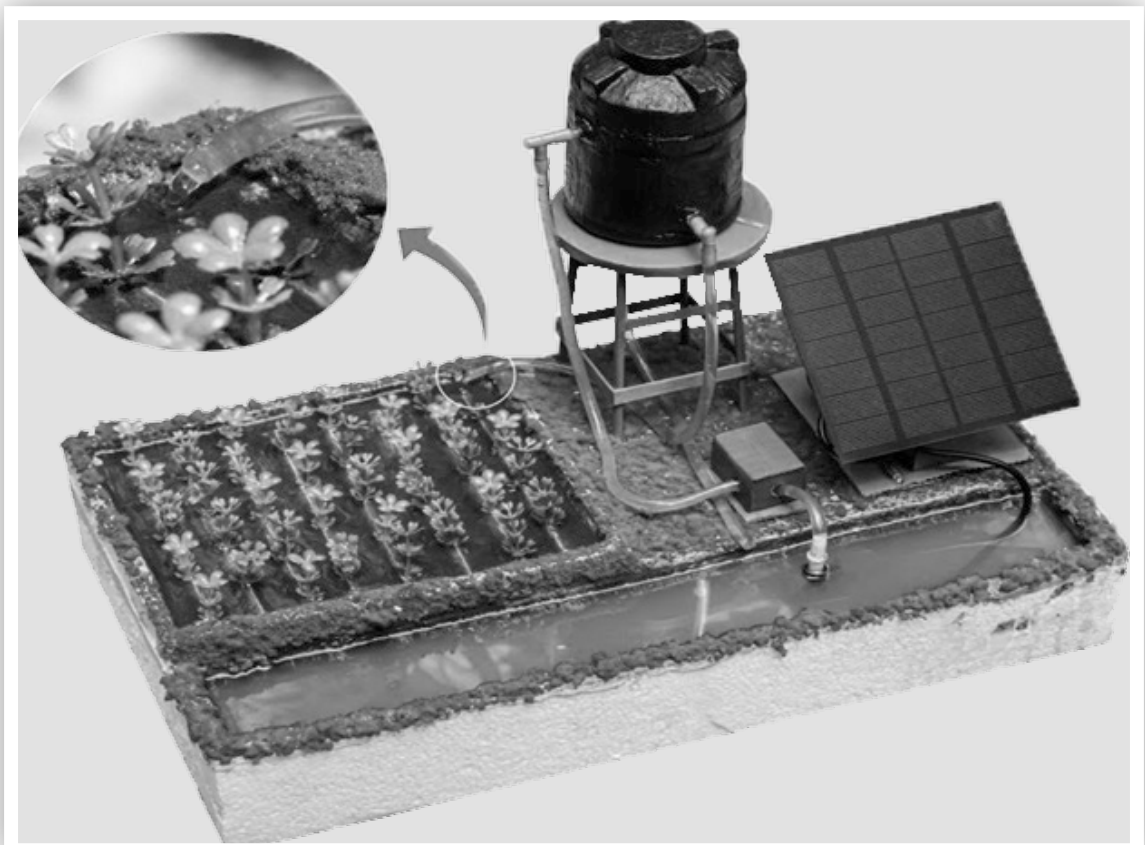
A Mini Model of Solar Irrigation System.

Advantages of Solar Power Irrigation System

It makes irrigation possible in remote areas.

It is environment friendly.

No electricity bills to be paid.

It is durable, requiring minimal maintenance.

It is a positive approach towards the exploration of sustainable forms of energy.

Current Scenario of Solar Power Irrigation Systems in India.

Nearly 60% of Indians are farmers. But due to the lack of availability of electricity in remote areas, irrigation becomes very difficult and becomes one of the major issues in the livelihood of the people of rural areas even if the land is fertile and depends on rainfall only. Solar Power Irrigation System can save not only electricity but also save Indian farmers (during drought and scanty rainfall) who are otherwise prone to suicide.

Solar water pumping systems can make irrigation possible even in remote areas. The pumps are available for various types of irrigation, including paddy fields, horticulture farms, gardens, etc.

Solar Power Irrigation System – Future Scope

With advancements in technology, the systems can be made more user-friendly. We can even control the motor pump from a remote location using mobile phone. We can get water level indication of the reservoir and overhead storage tank on our mobile phone. These technologies are already available in the market, though presently they are not so popular.

Conclusion

Solar Power Irrigation System offers a cost effective and reliable system of irrigation for agricultural water management locally as well as globally. By harnessing (capturing and utilizing) the energy of the sun, it helps the farmers to approach an eco-friendly and sustainable source of energy, towards the development of agriculture.

33. School Name: Springdales dubai School, Dubai

Students: Eashan Sharma, Pavjas Singh and Niteen Subrayan

Project Supervisor: Aliya Amjad Waghu

Project Name: Archa Vitae

Scan the code to watch the video of the project

We, Eashan Sharma, Pavjas Singh, and Niteen Subrayan, from Springdales School, Dubai, are proud to present our project, Archa Vitae, which addresses a critical environmental issue. Instead of depleting forests to meet the growing demand for agricultural land, we propose utilizing unused lands like Greenland to practice sustainable farming using our innovative solution, the Archa Vitae.

The Archa Vitae is an advanced machine engineered to overcome Greenland's harsh climatic challenges. It is equipped with cutting-edge technologies such as humidifiers, specialized lighting, heating, and ventilation systems, all of which work together to create an ideal environment for plant growth. This ensures that crops can thrive in areas previously considered unsuitable for agriculture. The system promotes sustainability by incorporating natural fertilizers and organic pesticides, making it an eco-friendly alternative to traditional farming methods.

Constructed with durability and efficiency in mind, the Archa Vitae has an aluminum outer layer for structural strength and a cork inner layer for effective insulation against Greenland's extreme weather. The machine's mobility is ensured by wheels for easy relocation, while anchors provide stability during operation. Additionally, the Hydro Hub, a key component of the Archa Vitae, purifies polluted water and supplies it to the LeafLink system.

The LeafLink system enhances crop growth by using natural elements like moss and lava rocks, which improve soil quality and optimize plant yield. Beyond cultivation, LeafLink manages pollination processes and doubles as a renewable energy hub. Powered by wind turbines and solar energy, it ensures energy self-sufficiency for the entire setup and functions as a reliable battery station.

For investors, the Archa Vitae offers an innovative and efficient farming solution. Priced at AED 1. 7 million ($462,833. 16), it comes with advanced features, including remote management capabilities via CCTV and a dedicated sub-base for streamlined operation. Its compact dimensions of 10m x 10m make it both space-efficient and versatile, enabling deployment in diverse terrains while maximizing agricultural productivity.

The Archa Vitae is more than just a farming machine—it is a visionary leap toward sustainable agriculture. By transforming underutilized lands like Greenland into thriving agricultural hubs, it provides a practical, eco-friendly, and forward-thinking solution to one of the world's most pressing challenges.

34. School Name: Woodlem Park School Hamidiya, Ajman

Students: Ninan Negi, Renith Kizhakkeveetil and Rasil Ummer Kunnath

Project Supervisor: Ms. Saswati Biswas

Project Name: Garbage Robot

Scan the code to watch the video of the project

Introduction

The Quarky Robot is an innovative garbage-cleaning robot designed to promote cleanliness and sustainability. It works in conjunction with a laptop for operational control, aligning with the Sustainable Development Goals (SDGs) by addressing environmental and societal challenges related to waste management.

Objectives

- To automate garbage collection in public and private spaces.
- To utilize robotic technology for efficient waste management.
- To support the achievement of SDGs, particularly SDG 11 (Sustainable Cities and Communities) and SDG 12 (Responsible Consumption and Production).

Sustainable Development Goals (SDGs) Addressed

- SDG 11: Sustainable Cities and Communities.
  Ensures cleanliness in urban and rural areas, reducing pollution and enhancing livability.
- SDG 12: Responsible Consumption and Production.
  Promotes efficient waste segregation and disposal practices.
- SDG 13: Climate Action.
  Reduces waste accumulation, contributing to lower greenhouse gas emissions from landfills.

Components and Materials Used

- Quarky Board: Core microcontroller for robot functions.
- Sensors: Ultrasonic sensors for obstacle detection, infrared sensors for waste identification.
- Motors: DC motors for movement and garbage collection.
- Laptop: Acts as the control interface.
- Power Supply: Rechargeable battery pack.
- Chassis: Lightweight, durable frame for robot assembly.

Working Mechanism

System Architecture

- The Quarky board serves as the brain of the robot, interfacing with sensors and motors.

- The laptop is connected to the robot via Bluetooth, Wi-Fi, or USB for real-time monitoring and control.

Operational Workflow

1. Initialization: The robot is powered on and connected to the laptop.
2. Navigation: Ultrasonic sensors detect obstacles, enabling smooth movement.
3. Garbage Detection: Infrared sensors identify waste materials.
4. Collection: The robotic arm or collector picks up the garbage and stores it in an onboard bin.
5. Disposal: Once the bin is full, the robot moves to a designated disposal area.

Features and Advantages

- Autonomous Operation: Minimal human intervention required.
- Real-Time Data Analysis: The laptop processes data to optimize garbage collection routes.
- Environmentally Friendly: Promotes cleanliness and waste segregation.
- Scalability: Can be adapted for various environments, such as parks, offices, and industrial areas.

Challenges and Solutions

- Challenge: Limited battery life.

  Solution: Use of energy-efficient motors and sensors.
- Challenge: Garbage detection accuracy.

  Solution: Advanced image processing algorithms integrated into the laptop software.

Results and Impact

- Enhanced cleanliness in test areas.
- Increased awareness of proper waste disposal.
- Contribution to achieving SDGs by reducing waste-related environmental issues.

Future Scope

- Integration of AI for smarter waste detection and segregation.
- Deployment in larger areas with multiple robots working in coordination.
- Solar-powered models for greater sustainability.

Conclusion

The Quarky Garbage Cleaning Robot demonstrates the potential of robotic technology in solving environmental challenges. By aligning its objectives with the SDGs, the project not only showcases technological innovation but also contributes to building a cleaner and more sustainable future.

35. School Name: Aspire Indian International School, Kuwait

   Students: Alvina Terrin, Anav Ramakrishnan and Antonio Yacob Jophy

   Project Supervisor: Mrs. Rufee Shakeel Parkar

   Project Name: Perpetual Motion Energy Generation Project

Scan the code to watch the video of the project

Perpetual motion refers to the theoretical concept of a machine or system that can operate indefinitely without external energy input. In reality, however, energy is always lost due to factors like friction and air resistance, which prevent true perpetual motion. Our model showcases this concept while also highlighting the challenges that scientists encounter in trying to achieve it.

In our project, we've used recycled materials, such as plastic bottles, wrappers, old bicycle wheels, waste wood, and iron rods, to create a system that converts mechanical energy into electrical energy. A motor is attached to the wheel, which is connected to a multimeter to measure the current generated. This is a sustainable approach to produce electricity—the faster the wheel spins, the more energy is generated.

However, our model eventually slows down. This is due to friction in the wheel's bearings, air resistance, and electrical resistance in the wires, which all lead to energy loss in the form of heat. While it may seem like the system is generating energy continuously, true perpetual motion isn't possible according to the laws of thermodynamics. Energy dissipation inevitably slows the wheel's rotation, meaning that additional energy would always be needed to keep the system in motion.

Despite these limitations, our experiment demonstrates how mechanical energy can be converted into electrical energy, offering a glimpse into the principles of energy transformation.

For future iterations, we plan to explore ways to keep the wheel spinning continuously by connecting it to a consistent energy source to produce a steady flow of electricity.

Macmillan Budding Scientist, powered by Springer Nature 2023-24

Finalists:

1. **School Name:** Manav Rachna International School Sec-46, Gurugram
   Winner - North Zone and **Winner** Grand Finale
   Students: Reyansh Vig, Advith Prakash, & Aditya Malpani
   Project Supervisor: Mr. Prabhat Kumar
   Project Name: Net Zero Home

Scan the code to watch the video of the project

A "Net Zero Home" is a residential building designed to produce as much energy as it consumes annually, achieving net-zero energy consumption. It aims to reduce the carbon footprint and environmental impact by minimizing energy use and utilizing renewables.

Established standards, energy modelling, renewable integration, monitoring, and real- world examples ensure reliability and performance.

Net-Zero Homes: Building a Sustainable Future

Amidst rising temperatures and dwindling resources, net-zero homes emerge as beacons of hope for a sustainable future. These innovative dwellings aren't just eco-friendly, they offer a multitude of benefits for homeowners and the planet.

Solving Critical Issues:

- **Reducing Carbon Footprint:** By generating renewable energy and minimizing reliance on fossil fuels, net-zero homes play a vital role in mitigating climate change.
- **Energy Cost Savings:** Their highly efficient design significantly reduces energy consumption, translating to lower energy bills for homeowners.
- **Energy Independence:** Self-generating their own energy through renewable sources like solar panels, net-zero homes offer resilience against power outages and grid disruptions.
- **Improved Indoor Air Quality:** Advanced ventilation systems and non-toxic materials create healthier living environments, free from harmful pollutants.
- **Resource Efficiency:** Sustainable materials and practices minimize environmental impact, addressing concerns about resource depletion.

Addressing SDGs:

Net-zero homes directly or indirectly contribute to several Sustainable Development Goals (SDGs) set by the United Nations:

- **SDG 7: Affordable and Clean Energy:** Promoting energy efficiency, renewables, and cost savings.
- **SDG 11: Sustainable Cities and Communities:** Reducing emissions, enhancing resilience, and fostering sustainable development.
- **SDG 12: Responsible Consumption and Production:** Prioritizing resource efficiency, integrating renewables, managing waste effectively, and encouraging sustainable practices.
- **SDG 13: Climate Action:** Reducing carbon emissions, promoting energy efficiency, and integrating renewable energy.
- **SDG 15: Life on Land:** Conserving land, promoting sustainable land use, conserving water, enhancing carbon sequestration, and preserving native species.

Urgency and Context:

Climate change demands immediate action. Net-zero homes offer a tangible solution, transitioning individuals and communities towards low-carbon living. Growing environmental awareness and advancements in renewable energy technologies make this the perfect time to embrace this innovation.

Key Features:

- **Smart technology:** Automatic outdoor lights, battery level indicators, security systems, and even weather stations create a connected and efficient home.
- **Renewable energy:** Dual-axis solar trackers maximize energy generation from the sun.
- **Geothermal heat pumps:** Provide efficient and sustainable heating and cooling.
- **Home automation:** Smart systems optimize energy use and offer convenience.

Government Support:

Many governments, including India, offer subsidies to encourage homeowners to install solar panels and adopt renewable energy solutions. Exploring these financial incentives can make transitioning to a net-zero home more accessible.

Conclusion:

Net-zero homes aren't just a dream; they represent a practical and attainable approach to sustainable living. By embracing this innovative concept, we can build a future where individuals and communities thrive in harmony with the environment. Let's make sustainability a reality, one net-zero home at a time.

2. **School Name:** La Martiniere for Boys, Kolkata
   Winner - East Zone and **Runners Up** Grand Finale
   Students: Krishav Agarwal, Aarav Kapoor & Kritin Dhelia
   Project Supervisor: Ms. Bishakha Banerjee
   Project Name: Gesture Controlled Exoskeleton

Scan the code to
watch the video
of the project

Scope of the Project

Our project aims to build reliable, cheap exoskeletons which can mimic one's movement and can be used in a variety of fields.

The Problem Statement

We observed that the exoskeletons today were very bulky, heavy and also required a human pilot to be seated in them. We realized if a lighter, more precise gesture-controlled exoskeleton were to be made that it would be applicable in multiple parts of society, from firefighting to the army.

Hypothesis

We researched in many ways how to apply our code to a robotic model of a hand. We coded, researched, rebuilt, tried and failed but finally found out that when we code two programs- in C++ (Arduino) and python, as well as implement it through an Arduino to the Servomotors, build the hand out of 3D printed parts and use a pulling mechanism for the fingers, the model perfectly mimics the movement of a human hand.

The Objective

The objective of our project is to build the King of Robots- one whose limitations are endless. Complimenting the 3D printed model with two programs, we created an efficient yet powerful machine. It has a use for quite literally anyone- be it an army chief with insufficient soldiers or a baker with no staff. The gesture-controlled hand will quite literally mimic one's arm's movement- with enough resources, parts like the body and torso can also be made.

Methodology

We used 3D printed parts to make the structure of the hand and assembled it using super glue and 3D printed nuts and bolts. Furthermore, we used fishing wire to connect the fingers to the servomotors, allowing for a pulling motion. We coded two separate programs- one in C++ (For the Arduino) and one in Python. The computer webcam reads the movements of the actual hand, translates it and allows for the machine hand to mimic the movement. The motors rotate, and due to being attached to the fingers via fishing wire, can move to mimic the movement. This is a revolutionary idea-just imagine the infinite number of possibilities. It is truly one of the inventions that can change the world.

Conclusion

After testing continuously, we concluded three things:

- The hand, although good, is not nearly perfect. Better materials, wiring and superior code to be discovered can further enhance the project.
- This hand, can use a particular form of voice recognition AI to benefit the elderly and disabled.
- The hand's technology can be used in other projects, just like Edison's lightbulb has changed into the modern tube light, our prototype can pave the road for further projects and ideas.

Limitations

A limitation of our hand is that it always needs a computer to stay near-as it is connected to the Arduino.

Another issue with the project is the speed and reliability of 3D printing. PLA is a great material for a prototype like ours, but better materials and increased building speeds would be a surefire way to further enhance our project.

3. **School Name:** Minhajul Huda English School Edappal

    Winner - South Zone

    Students: Mohammad Fouad M. P, Haniya Faisal, & Alisha Sadik. K

    Project Supervisor: Mr. Santosh Kumar

    Project Name: Multipurpose Robotic Vehicle

Scan the code to watch the video of the project

TECH-SAVVY STUDENT TRANSPORT SYSTEM

ABSTRACT

This project introduces a cutting-edge solution for bolstering student safety during school bus transportation through the integration of **Infrared (IR) and Ultrasonic sensors**. Our innovative system aims to mitigate potential risks associated with school bus transit.The Infrared sensors are strategically placed to monitor the interior of the bus, detecting the presence of students as they embark or disembark. Complementing this, Ultrasonic sensors are employed to create a protective perimeter around the bus, detecting obstacles and alerting the driver when the child puts his hands or head outside.

INTRODUCTION

The purpose of a tech-savvy school bus for student safety is to address and mitigate the risks associated with transportation, considering the unfortunate incidents that have occurred in school buses. Tragic incidents, such as students being left behind unattended, underscore the critical need for advanced safety measures.By incorporating technology, such as Infrared and Ultrasonic sensors, into school buses, the aim is to create a proactive safety system. Infrared sensors monitor the interior to ensure no child is inadvertently left behind, while Ultrasonic sensors, alerts the driver when the child puts his hands outside.

OBJECTIVE

The primary objective of the tech-savvy school bus project is to enhance student safety during transportation. This is achieved through the integration of technologies, such as IR and Ultrasonic sensors, with the following key goals:

Real-time Monitoring and Automated Alerts

Implementing Infrared sensors to monitor the interior of the bus ensures that students are not accidentally left behind. The system is also designed to trigger automated alerts in case of emergencies or irregularities.

Obstacle Detection and Alarming System

This feature helps in detecting and alarming driver when child puts his hands or heads outside the windows.

METHODOLOGY

Infra red Sensor Placement

Install **Infrared sensors** strategically inside the school bus to cover key areas where students board and disembark. Ensure sensors are positioned to provide comprehensive coverage of the interior, minimizing blind spots.

Ultrasonic Sensor Placement

Install Ultrasonic sensors on the exterior of the bus, focusing on areas where students are likely to put their hands or heads outside, such as windows or emergency exits, exterior of the bus etc focusing on areas where students are likely to put their hands outside and notifies the driver immediately.

RESULTS

The results of the tech-savvy school bus project are expected to yield several positive outcomes, that include - **Enhanced Student Safety, Real-time Monitoring Systems and Accurate Attendance Tracking.**

CONCLUSION

Reduction in Safety Incidents

By leveraging Infrared and Ultrasonic sensors, the project aims to significantly reduce safety incidents such as students being left unattended on the bus or accidents during transit.

Parental Confidence

Parents gain increased confidence in the safety of school bus transportation, knowing that advanced technology is actively employed to monitor and ensure the well-being of their children during their daily commute to and from school.

Community Trust in Educational Institutions

In summary, the tech-savvy student transport system school bus project is not only about enhancing student safety but also setting a precedent for the positive influence of technology on societal values and the integration of innovation into everyday practices.

4. **School Name:** Carmel Convent Sr. Sec. School, Bhopal

    Winner - West Zone

    Students: Aadya Tiwari & Afiya Zuberi

    Project Supervisor: Ms. Madhumita Mazumdar

    Project Name: Homemade portable polythene shrinking machine

Scan the code to watch the video of the project

We often come across these slogans like. Plastic is drastic , Say No to polythene, but have we really made this world polythene free ?

The answer is no and it is astonishing to know that the problem of plastic pollution actually starts from our homes when we find no ways of disposing of these polythene bags, we either throw them in the dustbin or give it to the scrap dealers for recycling.

Understanding this major problem statement we have come up with an innovative yet **Homemade Portable Polythene Shrinking Machine** which is a unique attempt from our side to shrink polythenes but not melt or burn it.

These small spherical balls can be handed once to the scrap dealers after easily recycling it can be used in building roads in place of stones being heavy and dense if by chance they get disposed in water they will sink to the bottom and not float and thus not choke the drains or pipelines

We have made it from scrap and worn out parts at home we have taken wooden plates and made a box with a chamber at the bottom this drawer has a glass door from where from where you can monitor the shrinking process inside we have heating rods and a metallic plate to reflect the heat directly on the on the polythene and a wire mesh to avoid the direct contact of the heating rod with the sample outside we have a temperature regulating sensor to monitor required temperature to shrink the polythenes but not melt or burn it this way the evolution of harmful gases are avoided

Through our experimentations we have noted that it may take up to 60°C to shrink lightweight soft polythene without burning or melting and hard polythene do so at 80° C this machine just take 3 to 4 minutes for the process as it's for a very short time that the machine works in shrinking polythene and electric consumption is also very nominal.

Care has been taken to make it completely cost effective and environment friendly with no harmful gas evolution.

Shrunken polythene can be reinforced with materials like plaster of Paris to create decorative items such as vases and pots. Its moldable nature allows for unique and customized DIY projects, offering a creative and sustainable outlet for crafting enthusiasts.When used in playground construction, serves as a resilient and impact-absorbing material. It can be incorporated in surfaces to create safer play areas, providing a cushioning effect that minimizes the risk of injuries during play.As a moisture-retaining material when added to

the soil. Its water-resistant properties prevent excessive water evaporation, contributing to improved soil moisture levels and plant growth.Used in educational settings for hands-on learning experiences. Students can explore concepts of recycling and sustainable materials by incorporating shrunken polythene into various projects, fostering environmental awareness.Can be explored in renewable energy as a potential material for the construction of lightweight and durable components. Its versatility makes it suitable for experimental designs in small-scale renewable energy projects.Shrunken polythene has demonstrated benefits, particularly in arid regions or for water-sensitive crops. Its moisture-retaining properties can be advantageous in promoting water conservation and efficient irrigation practices.In future, shrunken polythene could be explored for applications like lightweight components in solar panel construction or as insulation material in renewable energy systems. Research and experimentation will guide its potential contributions.

This can be a part of every household as it is portable,occupies bottle space and can be used for 5 minutes everyday it can shrink many polythene at the same time and turn it into a hard dense ball we have proposed it to community as it can be placed in market squares, malls, offices, schools ,airports and most important near the slum areas

We can end the problem of plastic pollution caused due to polythene to a large extent by putting it in judicious use and saving the environment.

5. **School Name:** Aspire Indian International School, Kuwait

   Winner - Middle East Zone

   Students: Elishaa Anna Niju, Hala Amer Ahmed, & Arfa Aala Ayoob Basha

   Project Supervisor: Ms. Varsha Arunkumar

   Project Name: Poaceae Eco Pads: A Sustainable Future for Feminine Hygiene

Scan the code to watch the video of the project

Problem Statement

Menstruation is a natural and healthy bodily process that occurs for approximately 26% of the global population, with about 800 million people menstruating each day. Disposable feminine hygiene products are personal care items designed for use during a woman's menstrual cycle. One of the most used menstrual products worldwide are sanitary pads.

These pads are made from 90% plastic – from the leak-proof base layer to synthetics that soak up liquid in the plastic packaging. Over the course of a lifetime, on average, a single user will use approximately 10,000 pads. After use, these are thrown out as solid waste and end up in landfills, where they are estimated to take 500 to 800 years to break down. Women from low- and middle-income families are unable to maintain good menstrual hygiene. The major reason for this is the lack of affordable feminine hygiene products. Poor menstrual hygiene can lead to an increased risk of urinary and reproductive tract infections. This situation is now referred to as "Period Poverty", defined as "the lack of access to menstrual hygiene products; water; soap; and private, safe, clean sanitation services to manage menstrual cycles."

Proposed Solution

Corn is the most produced crop globally, with 1.1 billion tonnes being produced every year. The amount of waste product is also large, with 4.4 million tonnes. We have used the waste corn leaves to extract fibres, which act as excellent absorbents. Cotton is another material which is accessible to most communities. Using these materials, we can create a sanitary pad which is affordable and environmentally friendly.

Poaceae Eco Pads consist of four layers:

- Two overlapping layers of cotton cloth,
- Layer of wax,
- Layer of plant fibre,
- Two overlapping layers of cotton cloth.

This is then stitched together in the typical size and shape of a disposable sanitary napkin.

The corn fibres were compared with the extracted fibres from pineapple crowns and bamboo leaves on absorption, tensile strength, flammability, and biodegradability. The results were in favour of the corn leaf fibres.

Conclusion

Our experiments have concluded that non-biodegradable disposable sanitary pads can be replaced by the more environmentally friendly and accessible Poaceae Eco Pads as a solution to both pollution as well as period poverty.
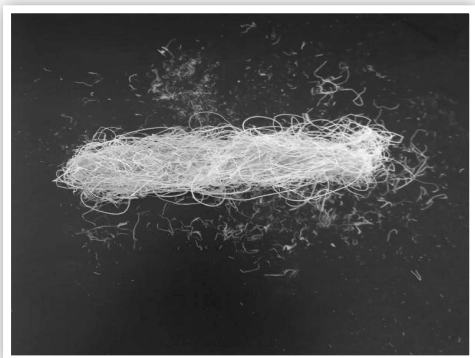
Corn Fibre Absorbent
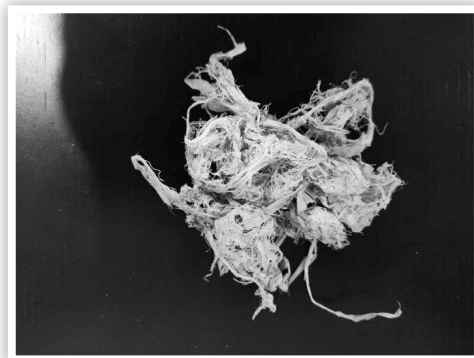
Pineapple Fibre Absorbent

Retting of Leaves

Poaceae Eco Pad- Final Product

6. **School Name:** The Jain International School, Nagpur

    Runner Up - West Zone

    Students: Mast Akshit Jagam, Miss Swara Sathe,
    & Mast Gagan Taori

    Project Supervisor: Mrs Ritu Sharma

    Project Name: pH Balance Lake

Scan the code to
watch the video
of the project

The effects caused due to pH imbalance are drastic. pH affects the solubility of the toxic chemicals and compounds which leads to water pollution. The pH affects a lot of people on a daily basis. Diseases like Metabolic acidosis are caused due imbalance in pH. When the pH levels are not correct, our body can experience fatigue, headache, vomiting and confusion. To balance the pH levels, which affect water pollution greatly, especially in the industrial areas, we have designed a pH balancer which will help to reduce water pollution and make the water a safe place to live for the aquatic plants and animals.

IV. **A few sentences explaining the need of work:** If the pH levels are imbalanced, the water will be greatly affected. We visited Ambazari Lake in Nagpur, as many aquatic organisms were dying, due to the pH imbalance and measured the pH level of water, it was 9.8. So, we made this model, that can help to avoid such threats, by balancing the pH levels of water and make sure that the aquatic species live a healthier and a longer life. Water pH has a strong effect on the soil and crop, when it comes to absorption of nutrients by the plant bodies. With properly regulating the pH level of the irrigation water, it is possible to create an ambiance where the symbiotic effects between the soil and the plant can be optimized.

V. **Scientific Principle(s)/ Concepts:** An IOT (Internet Of Things) Project, based upon collection of real – time data and the processing of the data gathered by the use of an API (Applicable Programming Interface) to gain useful insights of data, which is used them to modify the circuit parameters.

VI. **Materials Used:** Micro Controller, IC Regulator, Driver IC, Crystal Oscillator, pH Probe, Transformer, Capacitors, Rectifiers, LCD, LED, Ceramic Capacitors, Resistors, GSM Module, Humidity Sensor, Temperature Sensor, Pumps, Containers (Biodegradable plastic), Wires

VII. **Procedure/ Description:** The pH sensor whose output voltage is in microvolts, to convert microvolts into volts, we have used an amplifier circuit. These voltage signals are to be converted to 0-14 pH scale. For this, we have used a micro controller. As our control system requires 5V which will be drawn from a step down transformer of 220V AC. This transformer converts 220V AC to 12V AC, further this 12V AC is converted into 12V DC with the help of rectifiers. A regulator IC converts this 12V DC to a constant 5V. The 5V then flows to the Micro controller which controls the operation of the circuit.

Whenever the pH probe is dipped into the water, if the water is detected as **Basic** then the Micro controller will send a command to the pump submerged in the acidic solution to pour 15ml of the solution in the water to balance it. After every 20 Seconds the Micro controller will send command to the pump submerged in the Acidic Solution to pour 15ml of the solution till the time, the water isn't neutralized

If the water is detected as **Acidic** then the Micro controller will send a command to the pump submerged in the basic solution to pour 15ml of the solution in the water to balance it. After every 20 Seconds the Micro controller will send command to the pump submerged in the Basic Solution to pour 15ml of the solution till the time, the water isn't neutralized.

If the water is detected as **Neutral**, none of the pumps will function.

The pumps in these 2 containers are driven by rely. Since these pumps need 12 volt each, the driver IC acts as an amplifier and converts 5 volts into 12 volts. All this data will be shown on the LCD (pH, humidity, temperature). The GSM module will send the live data on IOT server after every 60 seconds. You can also get the data on your devices through an app called Thing show.

VIII. **Hypothesis:** Once the model is mobilized for the masses, the immediate benefit would be a major decrease in the water pollution. The pH Level of the lakes and ponds would be taken care of. The aquatic organisms would not be harmed.

IX. **Data Analysis:** The data will be shown on your mobile devices through an app called Thing Show. Even if you're out of town, the live feed of the information will be shown to you on remote devices.

X. **Results:** By using this model, we can save aquatic plants and animals i.e. our ecosystem and make our world a better place to live in.

XI. **References:** https://www.neeri.res.in

7. **School Name:** K. L. International School, Meerut
   Runners Up North Zone
   Students: Saksham Garg, Kashish Arora, & Ayanansh Singh
   Project Supervisor: Ms. Reshu Garg
   Project Name: Green Nano Carbon Capsule

Scan the code to watch the video of the project

Problem Statement-

- Generation of Agro-industrial Solid Waste (Onion Skin Waste). In India, the production of Onion skin waste alone is around 5 lakh tons.
- Problem of wastewater (Dye contaminated water). Dye effluent discharge from different industries like textile and paper in water bodies is about 7 lakh tons annually.

Proposed Solution-

- Obtaining Activated Carbon Nanoparticles from Onion Skin Waste.
- Application of ACNPs in the treatment of water contaminated with dyes, drugs, etc.
- Developing ACNPs-based Green Capsule formulation as a finished product.

Methodology for Activated Carbon Nanoparticles Synthesis-
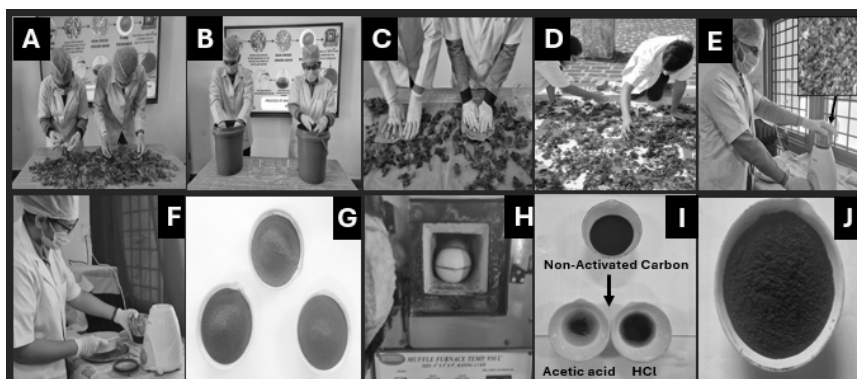
Fig I. Pictorial representation of various steps involved during recovery of Activated Carbon nanoparticles from Onion Skin waste (A. Sorting of Onion Skins; B. Washing with tap followed by distilled water; C. Blotted to remove excess moisture; D. Drying under sunlight; E. Homogenization; F. Sieving; G. Fine powder; H. Thermal treatment to obtained carbon; I. Treatment of carbon with dilute acetic acid followed by HCl; J. Activated Carbon Nanoparticles.

Results

Characterization Studies on Carbon derived from onion skin waste:

1. **X-ray Crystallography (XRD) -** XRD revealed amorphous and nanosized Activated Carbon particles, i.e., < 9 nm.

2. **Field-Emission Scanning Electron microscopy (FE-SEM)-** FESEM imaging of activated Carbon indicated nearly spherical shaped nanoparticles and showed pores, owing to the treatments given during the activation process.

3. **Energy-dispersive X-ray (EDX)-** Both activated carbon nanoparticles and non-activated carbon particles having high purity.

4. **Brunauer–Emmett–Teller (BET)-** The activated Carbon nanoparticles have greater pore volume and pore diameter than non-activated carbon particles. Overall, ACNPs offered higher surface area, leading to enhanced adsorption potential, which could promote their utilization for efficient treatment of wastewater contaminated with dyes, antibiotics, pesticides, heavy metals, etc.

5. **Fourier Transform Infrared Spectroscopy (FTIR)-** Characteristic peaks recorded at 3338, 2988, 1615, 1406, 1227, 873, and 712 cm-1 indicates the presence of functional groups corresponding to carbon bonds, i.e., C=C, C=O, -CH, $-CH_2$, and $-CH_3$.

6. **UV-VIS spectrophotometry -** The maximum absorbance (λmax) for activated carbon nanoparticles were recorded at 600-650 nm.

7. **Hydrodynamic diameter and Zeta potential-** The average hydrodynamic diameter of activated carbon nanoparticles was 10-100 nm. The ZP is negative, possibly due to negatively charged functional groups on the surface of ACNPs.

Applications of developed Activated Carbon Nanoparticles

- Removal of Iodine dye from aqueous solution

Aq. solution of
Iodine dye

AC
Nanoparticles

Dye solution containing AC
Nanoparticles

Colourless
Dye solution
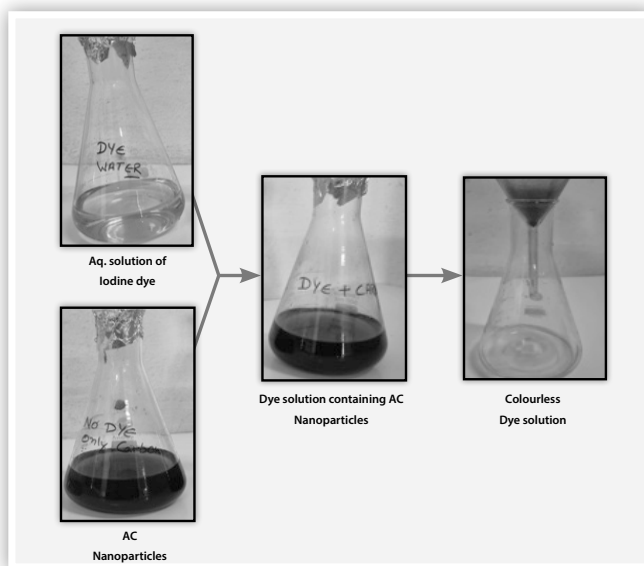
Removal of Diclofenac from aqueous solution

- Diclofenac is one of the emerging organic micropollutants in the water bodies and reported in Yamuna River (Delhi) as well.
- The activated carbon showed ~75% of Diclofenac sodium (bactericidal and painkiller drug) adsorption from aqueous solution within 2h of treatment.

Conclusions

- The activation process has rendered twin benefits to the carbon particles, i.e., high porosity and nano dimensions.
- Characterization Studies revealed that developed ACNPs (~9 nm size) have higher surface area to volume ratio (increase in pore diameter and pore volume) than non-activated carbon particles, leading to enhanced adsorption potential.
- Hence, the Onion skin waste has been successfully utilized to generate value-added products viz. ACNPs with multifaceted environmental applications.
- Overall, the study fulfills the turning trash to treasure or waste to wealth approach and promotes circular bioeconomy and sustainable development goals benefitting Rural economy and livelihood on the greater landscape.

Future Scope

- Develop technology for converting other agro-industrial wastes, such as rice straw, wheat straw, vegetable/fruit peel wastes, etc., into high-value carbon nanomaterials with multifarious utilities.
- Improve the efficiency of developed ACNPs via impregnation/doping/capping with conductive materials (like silver, copper, manganese, etc.) to treat different wastewater types.

8. **School Name:** International School (icse), Patna
    Runners Up East Zone
    Students: Mirsab Ghani, Tvesa Sinha, & Amit Anand
    Project Supervisor: Mr. Deepak Raj
    Project Name: Arduino Based Mobile

Scan the code to watch the video of the project

Introduction

Have you ever found yourself picking up your mobile phone with the intention of making a call or watching something significant on YouTube, only to discover later that you've unintentionally spent hours mindlessly scrolling through social media? This is a common scenario for nearly everyone who uses a mobile phone. People initially pick up their phones, expecting to spend just a few minutes, unaware of how those few minutes can effortlessly transform into an entire hour. In such a situation, our project, 'Arduino Based Mobile,' endeavors to redefine the way user engage with mobile phones.

With a deliberate focus on integrating Arduino Technology with Mobile Technology, Our project 'Arduino Based Mobile' aims to provide users with a cost-effective, distraction-free and customizable mobile experience. Leveraging the power and versatility of Arduino microcontrollers, this project explores innovative ways to enable users like students or office to have a distraction-free mobile experience.

The main aim of the project are:-

i. To Provide distraction-free experience:

    The use of Arduino and a small sized (preferably 18x32 inch) TFT LCD screen results in the project being low cost yet almost as effective as a mobile phone.

ii. To provide users with adaptable functions:

    The open-source nature of Arduino-based Mobile allows the user to adapt and tailor the functionality of their mobile phone device to suit their specific needs.

iii. To provide users with future customization:

    Imagine buying an iPhone 14, you have paid the full price of iPhone 14 but next year another new iPhone releases and there are some minor improvements except the back camera and you are really interested to use that camera. So generally in a situation like this you will have to pay the full price of the new IPhone- IPhone 15. But with the Arduino Based Mobile you don't have to pay the full price of the new phone to get any new feature, the new features can be added to the Arduino Based Mobile without much interference with the previous.

Conclusion

The Arduino-based mobile devices is a captivating intersection of technology, education, and creativity, which is capable to bring a revolution in the world of mobile technology. While our projects may not be the same as an actual smartphones that rival commercial counterparts, the low-cost and distraction-free aspects of the Arduino based mobile does tend to make it equal to that of an actual smart phone. The ability to modify code empowers users to go beyond the limitations of off-the-shelf devices, fostering a culture of experimentation and imaginative problem-solving. The code becomes a canvas, inviting users to paint their own digital landscapes, crafting mobile experiences that reflect their unique needs, preferences, and aspirations. Whether you're a student, teacher, or an office, the Arduino based mobile is a solution to your mobile phone distraction.

9. **School Name:** The Hindu Senior Sec School, indiranagar Adyar Chennai

   Runner Up - South Zone

   Students: Janani A V, & Saieswari

   Project Supervisor: Ms. G Gayathri

   Project Name: Lunar Lifeline

Scan the code to watch the video of the project

What is Chandrayaan-3?

Chandrayaan is the third installment in the Chandrayaan program, a sequence of lunar exploration missions orchestrated by the Indian Space Research Organisation (ISRO). This mission comprises a lunar lander, designated Vikram, and a lunar rover, named Pragyan.

Problem:

The 'Chandrayaan-3' mission successfully landed near the Moon's South Pole, but the rover 'Pragyaan' and the lander 'Vikram' did not survive the lunar night due to extremely low temperatures.

Our Idea:

- Set up a satellite in the moon's orbit with solar panels.
- Utilize abundant sunlight in space to convert into a high-power laser beam.
- Direct the laser beam into the photovoltaic cell of the lunar rover during the lunar night, providing the necessary energy for survival.

Advantages:

- Enables rovers to operate efficiently during the lunar night.
- Facilitates longer operational periods for collecting data from the lunar surface.
- Promotes global collaboration by sharing the satellite technology with other nations for their moon missions.
- Potential to earn funds through collaborative efforts.
- Enhances capabilities of lunar instruments for a better understanding of the moon's surface and conditions.

Limitations:

- The feasibility of setting up and maintaining such a satellite system in lunar orbit.
- Potential technical challenges in accurately directing the laser beam to the rover's photovoltaic cells.
- Consideration of international regulations and agreements regarding the use of high- power lasers in space.
- Assessment of the economic and logistical aspects of sharing the satellite technology with other countries.

10. **School Name:** Indian Education School, Kuwait
    Runners Up Middle East Zone
    Students: Shreevardhan Pradeep Kumar, & Dhyuti Manu
    Project Supervisor: Ms. Athira PV
    Project Name: Arduino Based Low-Cost Portable Ventilator

Scan the code to watch the video of the project

Today, respiratory illnesses are one of the main causes of health issues. Chronic respiratory conditions (CRCs) affect the lungs' airways and other pulmonary structures. The most prevalent ones include pulmonary hypertension, asthma, occupational lung disorders, and chronic obstructive pulmonary disease (COPD). Air pollution, dust from the workplace, and recurrent lower respiratory infections in children are other risk factors in addition to tobacco smoke. CRDs cannot be cured, although there are numerous ways of treatment that can dilate important airways and reduce shortness of breath can aid in symptom management and enhance the quality of life for those who have the disease. The respiratory system is also affected by the viral disease caused by the pandemic coronavirus.

Ventilator is the name of the medical device that is used to treat respiratory failures. Ventilators are used for patients who are unable to breathe, so the term "life support" is also used. If you're unable to breathe on your own, this device will assist you. Another name for it is a "mechanical ventilator." It's also frequently referred to as a "breathing apparatus" or "respirator." When caring for someone who is ill with a contagious illness, medical professionals are required to use respirators, which are masks. A bedside device called a ventilator has tubes that attach to your airways. A ventilator mechanically assists in supplying your body with oxygen.

PRINCIPLE AND METHODOLOGY

The software part programming is through Arduino Uno software. Easy to write code can be uploaded and C language is used for programming Arduino Uno kit. Motor driver and analog Potentiometer are used to control the speed of mechanical arm which will control the rate of contraction and expansion of an AMBU bag which produces artificial breathing. Here an oxygen reservoir bag is connected to the Ambu-bag.

When the motor is switched on the shaft coupler rotates around a point, the thread attached to it shortens. As a result, it compresses the AMBU bag. While compression a high pressure is induced inside the AMBU bag which creates a low pressure outside the bag leading to exertion of the oxygen from the bag due to the law of fluids. Vice versa, when the bag

is expanded/comes back to the original position a low pressure is created inside the bag which subsequently creates high pressure outside and hence oxygen is sucked inside the bag through the input port. Law of fluids states that the fluids always tend to move from high pressure area to low pressure area. Thus, using this principle, we are able to induce low pressure and high pressure which in turn leads to exertion and suction of oxygen into the AMBU bag which is used as the oxygen support for the patient.
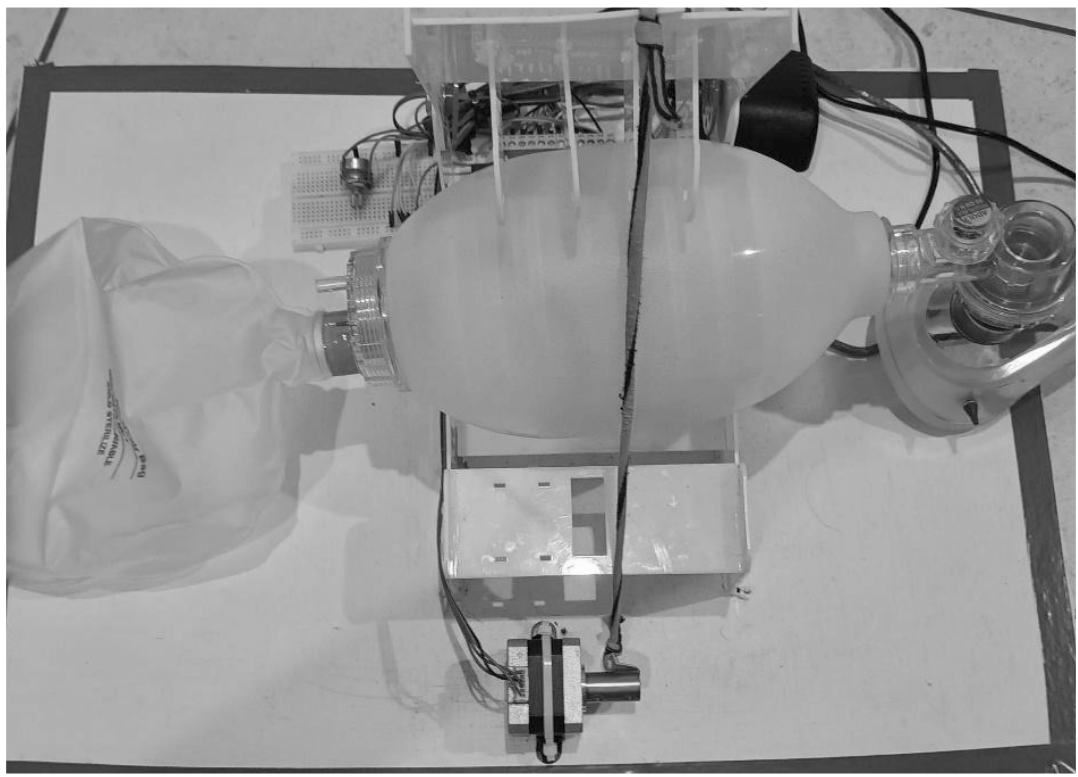
Code

```
const int pulPin = 2; // PUL- pin
const int dirPin = 3; // DIR- pin
const int enablePin = 8; // ENABLE+ pin
const int stepsPerRevolution = 200; // Common for many stepper motors, adjust if different
void setup() {
pinMode(pulPin, OUTPUT);
 pinMode(dirPin, OUTPUT);
```

```
 pinMode(enablePin, OUTPUT);
 // Enable the motor driver
 digitalWrite(enablePin, LOW);
 delay(1000); // Give a 1-second pause before starting the motor
}
void rotate(int steps, bool direction) {
 digitalWrite(dirPin, direction); // Set rotation direction
 for (int i = 0; i < steps; i++) {
 digitalWrite(pulPin, HIGH); // Generate a pulse
 delayMicroseconds(800); // Pulse duration can be adjusted for motor speed
 digitalWrite(pulPin, LOW);
 delayMicroseconds(800);
 }
}
void loop() {
 rotate(stepsPerRevolution, LOW); // Clockwise rotation
 delay(1000); // 1-second delay between rotations
 rotate(stepsPerRevolution, HIGH); // Anticlockwise rotation
 delay(1000); // 1-second delay before the next cycle
}
```

This project highlights the possibility of building a portable, low-cost ventilator that will have all the basic functions of a ventilator. This ventilator can be used in hospitals and in homes for a short span of time until professional help is provided.

11. **School Name:** Apeejay School, Bhubaneswar

Students: Rohan Mansingh, Amlan Swastik Behera, & Samikhya Patra

Project Supervisor: Ms. Bandana Panda

Project Name: Sensor Safety to Miners

Scan the code to watch the video of the project

Introduction:

Mining, a crucial industry, faces a staggering annual toll of over 15,000 deaths and countless injuries. Traditional safety measures, like mining suits, have limitations. To address this, our solution, Sensor Safety to Miners (SSM), introduces two innovative components – the Mine Exploration Rover (MER) and the Miner Safety Stick (MSS) – aiming to significantly enhance safety measures for miners.
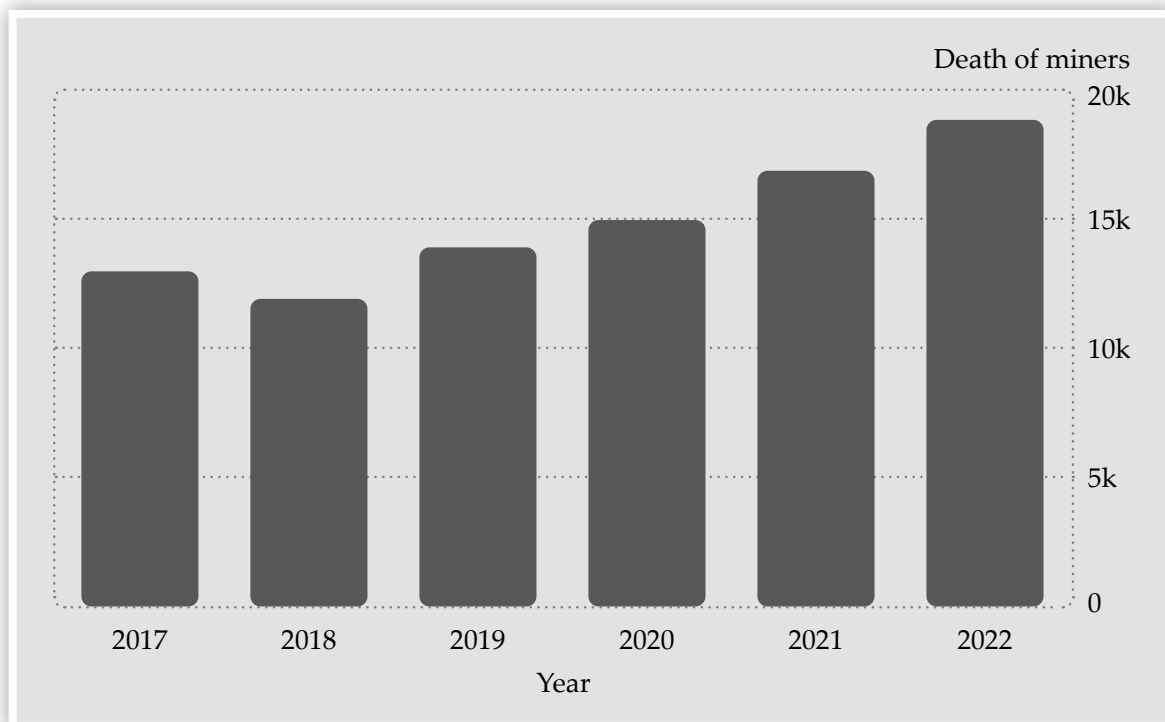
Mine Exploration Rover (MER):

MER is a specialised mining rover designed to navigate challenging terrains while monitoring critical safety parameters. These include:-

a. Temperature:- MER evaluates miners' tolerance levels through a 2-in-1 sensor, providing real-time readings to the server for immediate safety considerations.
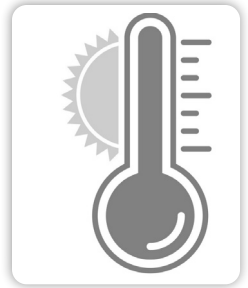
b. Atmospheric Pressure:- Utilising a 2-in-1 sensor, MER detects variations in atmospheric pressure, crucial for gas leak indicators, and relays immediate readings to the server.
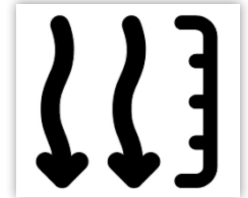
c. Harmful Gas Detection:- Equipped with a gas sensor to detect harmful gases, preventing accidents by providing reading to server.

d. Humidity Detection:- Using a humidity sensor, MER identifies changes, especially during water pocket leakages, contributing to safety by relaying readings to the server.

MER's analysis of these parameters allows the identification of low-risk mining points, facilitating the subsequent setup of the Miner Safety Stick (MSS). Additionally, MER includes GPS tracking for precise location identification.

Miner Safety Stick (MSS):

MSS is a rod-shaped device replacing the standard base rod, ensuring the safety of miners through its multifunctional features, including:

a. Temperature:- MSS assesses temperature in real-time, transmitting data to the server for timely safety measures.
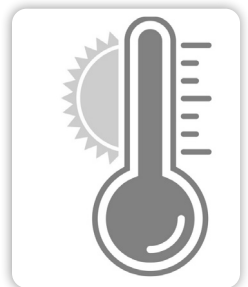
b. Atmospheric Pressure:- Utilising a 2-in-1 sensor, MSS monitors atmospheric pressure, crucial for detecting gas leaks or oxygen tube malfunctions, providing real-time readings to the server.

c. Fire detection:- A flame-detecting sensor activates a buzzer in case of fire caused by gas leaks or oxygen tube issues, alerting miners promptly.

d. Mine Collapse Detection:- MSS employs a load cell to detect potential mine collapses, signalling miners through blinking LEDs for early warnings.

e. Earthquake Detection:- Vibration sensors in MSS detect seismic activity, emitting alert signals through blinking LEDs to ensure miners' safety during earthquakes..

f. Harmful Gas Detection:- Equipped with a gas sensor, MSS detects harmful gases, alerting miners through blinking LEDs and providing real-time readings to the server.
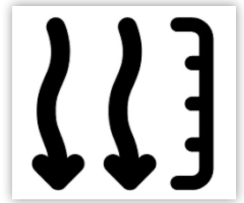
Advantages:-

✓ SSM's cost-effectiveness lies in its ability to protect multiple miners with a single set, reducing individual expenses.

✓ MER operates without internet, ensuring reliable communication in remote mining locations.

✓ It reduces the risk for miners working in mines.

✓ It can be used in underground mining and also in surface mining with little modification.

✓ MSS and MER's outer covering is constructed from reusable plastic, contributing to sustainability.

12. **School Name:** The Heritage School, Kolkata
    Students: Swapnil Pal, Shreyansh Das, & Sagnic Hajra
    Project Supervisor: Ms. Ishita Daw
    Project Name: Toritorongo

Scan the code to watch the video of the project

Purpose

Between 2022 and 2023, the annual consumption of electricity in India reached 1,390 TWh. It is becoming increasingly evident that the ever-depleting non-renewable sources such as coal and petroleum will be unable to sustain the growth of this densely populated nation. One of the most heavily endowed resources in our country is water. Our country has one of the largest coastlines, and an ocean to our name. Thus, tidal energy is said to be the future of renewable energy in our country, as it has been endowed with strong tidal currents, and is less prone to oceanic calamities.

However, the principle of most tidal energy or deep-sea plants involves the use of rotating turbines, positioned in the lower part of the ocean, and turned by oceanic currents. However, as per a recent study, more than 22.3%[1] of fish passing through a hydel or deep-sea plant suffer a painful death, with many more suffering from lingering injuries. These turbines scrape the seafloor, making the seabed unstable and threatening the lives and habitats of its inhabitants. The noise pollution produced by these turbines is detrimental to marine mammals and fish which use echolocation to communicate and find their shoals. The noise produced by the turbines interferes with the obstacle readings of aquatic life and leads to fatal injuries.
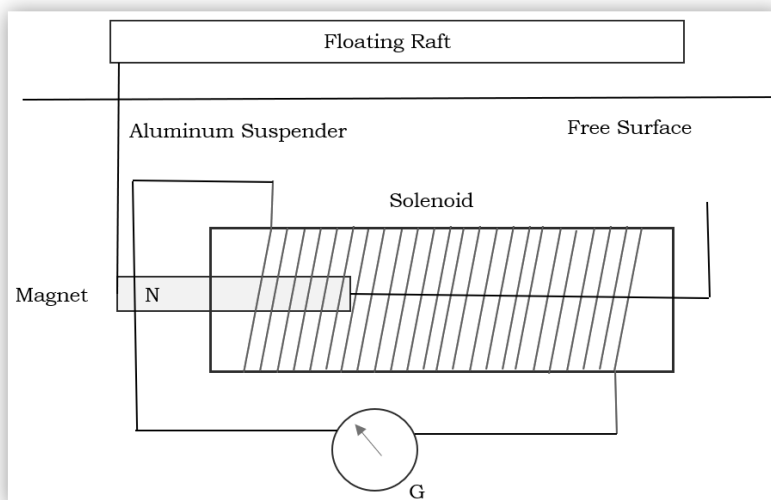
Our Methodology

Figure 1.2 – *A Model Structure for Toritorongo*

The primary design of the mechanism (Figure 1.2) is simple. It consists of a floating raft on the ocean's surface, made of cork wood which is buoyant such that the movement is greater. On it is suspended a powerful magnet by an aluminum connector. This not only ensures that the contraption is lightweight but also ensures it does not easily get magnetised and affects the magnetic flux adversely. The magnet moves with the waves, leading to horizontal displacement within the coil. This displacement leads to a change in magnetic flux, inducing an electromotive force (EMF) within the solenoid.

- **The project immensely reduces seafloor scraping** as it uses safer anchorage methods and does not utilise rotating blades which may damage the seabed.
- **The project reduces the noise pollution produced by up to 60%**. Since it does not utilise moving blades, and has no moving gears, the machine noise is drastically reduced.
- Since the model does not utilise rotating turbines, **the damage done in case of a natural disaster such as a tsunami is minimal**. It has a stable structure, less prone to damage in case of a natural calamity.

Conclusion and Future Prospects

While the current model serves as a proof of concept, there is more in store for Toritorongo. We await the deployment of a series of stations in the middle of the ocean, positioned at around 100 meters below sea level. These stations would be approximately 70m tall and 15m wide in diameter, made of durable titanium alloy, with wound copper wire. The integration of a powerful magnet, increased turns, and a larger cross-sectional area of wire aims will boost the efficiency of the machine. The wattage of the concept model is 51.2 microwatts. Additionally, we find that the cost per unit will be much less than the cost of standard turbine plants, and the simplistic design provides for an economical implementation.

13. **School Name:** St. Xavier's High School, Kedar Gouri, Bhubaneswar

Students: Ashutosh Das, Ayush Kumar Swain, & Anuska Pattanaik

Project Supervisor: Ms. Sutapa Seth

Project Name: Gajarakshak

Scan the code to watch the video of the project

Introduction:

There are about 27,000 Asian elephants residing in India as per 2017 census. This number has decreased from 2012(30,000) and is continuing to decrease at an alarming rate. The decrease in number is mainly due to poaching, electrocution and **train accidents**. It is the need of the hour to save the innocent elephants from dying. So, to prevent train-elephant accidents and save the magnificent creation of God, we present to you the **GAJARAKSHAK**, an indigenous solution to this problem.

Scientific principle

Our project works on the principle of photoconductivity according to which when light or electromagnetic radiation falls on any semiconductor material it conducts electricity by releasing free electrons from the metal surface.

In our project, the source of light is the laser and the semiconductor material is the LDR(Light Dependent Resistor) sensor which uses Cadmium Sulphide (CdS) semiconductor. When light falls on the LDR sensor, the resistance decreases subsequently, the current flowing through it increases. Thus, it conducts electricity and sends signal to the relay and the relay automatically stops the train by breaking the circuit.

Materials

Node MCU, Motor Powered Wheel represented as a dummy train , Light Dependent Resistors, Lasers, Adapter for power supply, Load cell which is a force transducer, relay for breaking the circuit to stop the train and an amplifier.

Description

For this project, we have used Node MCU which has ESP-8266. ESP(Electronic Stability Program) is the only device that has an IOT enabled. We have used Blynk IOT program which will be with the loco pilot and the Indian Railways Department. Internet has been used for the web dashboard is connected to internet and to access the signals internet is needed. A hotspot named ELEPHANT is used to start the motor powered wheel. When the hotspot is coded as ELEPHANT, the motor powered wheel will start.

Now, we have three levels of signal in our project. In Level 1, when the object is detected 1km away from the track, the signal turns green and the train is safe to go. In Level 2, when the object is detected 700m away the signal turns orange which means the train has to slow down and get ready to stop on getting further signals. In Level 3, when the object is detected 500m away the signal turns red and the relay module will cut off the power supply which will stop the train.

 We have also used a load cell. It is a type of force transducer that converts any type of force into a signal and sends it to the relay module. Whenever a heavy weight (2 or 3 tons) lies on the load cell, it sends a signal to the relay module. In our project, we have used a Strain Gauge Load Cell, which uses a Strain gauge(of fine wire) attached to the spring element. When a force is applied to it, it deforms resulting in a change in current and resistance thus, sending a signal to the relay.

We have also used an amplifier which increases the magnitude of a signal.

Future Perspectives

- *We will use image processing by camera (under development).*
- *We will use ultrasonic sensor as a backup.*
- *We will use a stack of laser connections*

14. **School Name:** National English School, Kolkata

Students: Sayan Samanta, Saksham Roy, & Deeptanshu Chandra

Project Supervisor: Mrs. Banhishikha Mazumdar

**Project Name: IoT Enabled Hand Gesture Drone**

Scan the code to watch the video of the project

Introduction

Sky High Drone – A team from the National English School, Kolkata, consisting of Saksham Roy, Sayan Samanta, and Deeptanshu Chandra, has developed a hand gesture-controlled drone. Drones are becoming popular for many tasks, but controlling them with remotes can be hard, especially for new users. Our solution is a drone that responds to hand movements, making it easier to control using a smartphone app. This drone is not only cool but also has many benefits, like being useful for aerial photos, surveillance, and search missions.

3D Design and Printing:
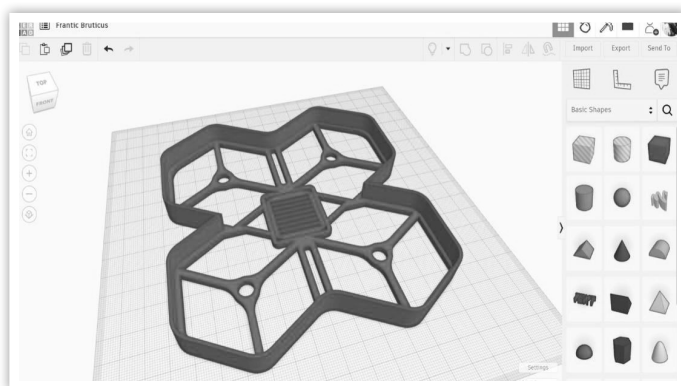
Our drone's design was carefully made using TinkerCAD, a free tool, and then 3D printed. It has a unique hexagon shape that looks great and saves money. We used Ultimaker CURA Software to make sure the printing was perfect.
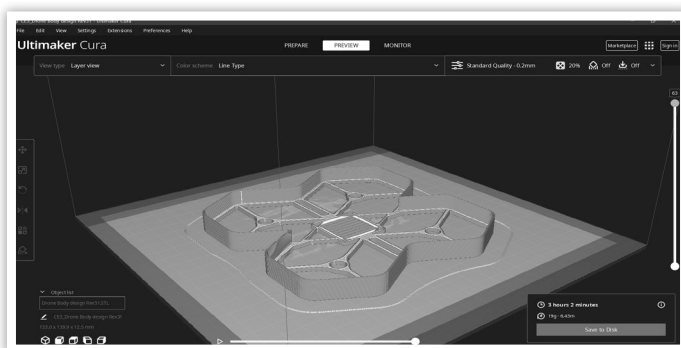
Circuit Diagram

The components used in this project are :-

1. Propellers (Clockwise and Counterclockwise)
2. Coreless Drone Motor (of 10000 rpm)
3. Flight-controller PAN2025850X
4. Electrical accessories (Switches, wires, etc.)
5. Charging-module-TP4056
6. Zyroscope-MPU6050
7. Arduino-Nano board
8. Lithium-ion battery (3.7V and 600mAh)
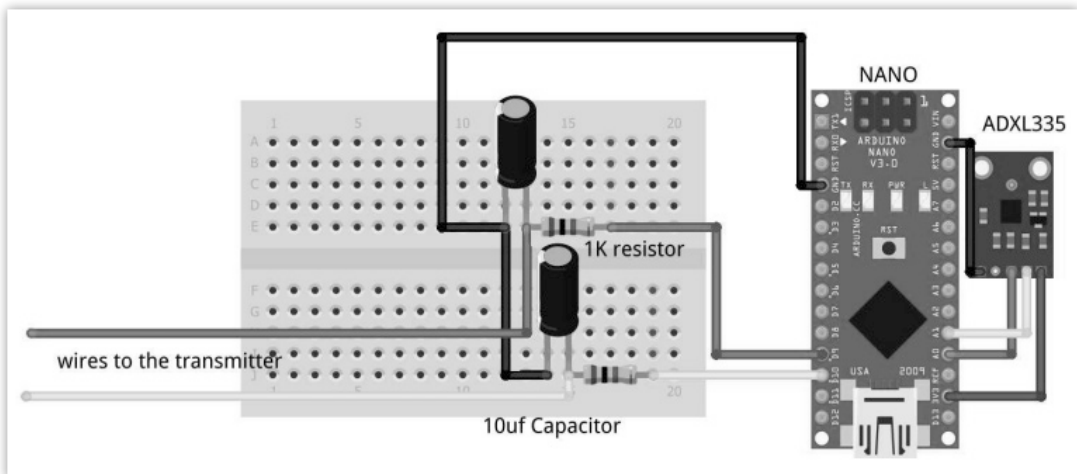
Remote Gesture Controlled Hardware Setup and Programming

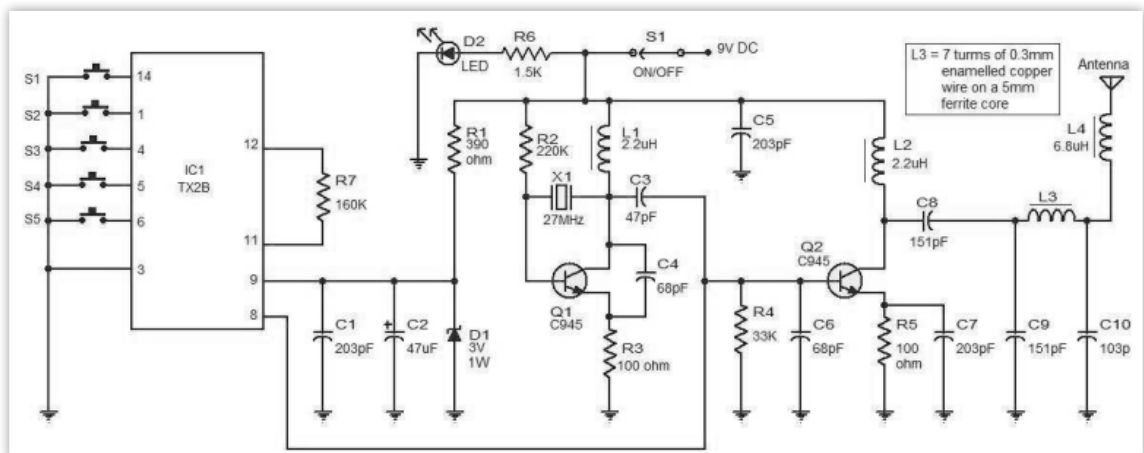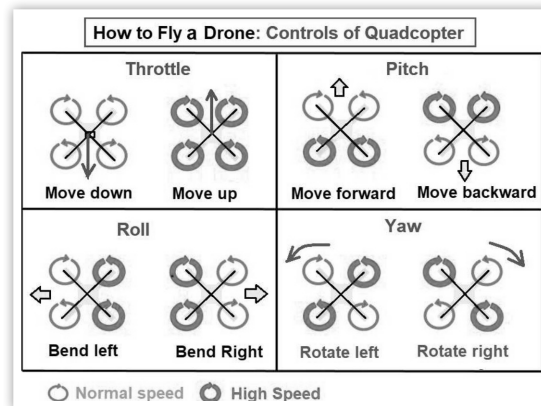**Fig.2.1** *Accelerometer configuration in Remote controller*

Fig.2.2 *Circuitry development for Remote controller*

How it works? (Demonstration)

Our drone works by sensing hand movements using a gyroscope in a glove. This sends signals to the drone's controller, telling it what to do. By changing the speed of its rotors, the drone can move in different directions, like forward, backward, and sideways.

Future scope and Improvements

Our drone could be a game-changer for agriculture, making tasks like spraying fertilizers easier and cheaper. Unlike other drones, ours doesn't need a skilled pilot, and it's more stable because it responds to hand movements. With more investment, we could add a camera for live videos or make the drone bigger for transporting things between cities.

Reference:

Studies by Zhu et al. (2019) and Lee et al. (2019) show that gesture-controlled drones work well and have many uses, like taking photos and surveying.

Conclusion

Our hand gesture-controlled drone, made with PAN2025850X flight-controller, Arduino Nano, and MPU6050 Gyroscope, is a big step forward in drone technology. It's easy to control and has lots of potential uses, from surveillance to agriculture. With more investment, it could become even more useful, helping people in many different ways.

15. **School Name:** Kerala Public School, Gamharia, Jamshedpur
    Students: Sahil Kumar, Abhinav Gupta, & Anushaka Kumari
    Project Supervisor: Mr. Santosh Kumar
    Project Name: Multipurpose Robotic Vehicle

Scan the code to watch the video of the project

Problem Statement

The large number of casualties during the covid era and the fear with which everyone including the doctors and nurses treated the covid patients was heart-breaking. Even the basic amenities eluded the sufferers. Many people claimed that their dear ones died not due to covid but due to the bad treatment given to them. When the patients longed for timely medicines, food, hot-water, oxygen cylinders etc., most of them either got them quite late or when it was too late for them to defeat the pandemic. This doesnt in any means undermines the efforts put in by our medical fraternity but when they see thousands of covid warriors getting contaminated and many among them succumbing to the deadly virus then to get apprehensive is not at all surprising. The difficulties faced by the medical staff in treating the covid infected patients and the ever increasing death toll made us all to contemplate over the possible remedial measures.

Proposed Solution

Our prime focus was on devising a machine which could not only be of great help for frontline warriors during their undaunting endeavour in treating infected patients but can also be further modified to meet similar challenges in future. In pursuit of constructing an assisting machine we came across this proposal of building a robotic vehicle which could be used by medical staff to provide timely treatment to the infected patients without getting tormented with the fear of contamination. The proposed vehicle could bring about a revolutionary change in the treatment of pandemics as it would be operated entirely through a cell phone.

Principle used

- Computer coding
- Energy conversion from electrical to mechanical
- Transmission through Bluetooth
- Balancing (Managing centre of gravity)
- Robotics concept

Technical detailing

- Arduino Uno
- Gear Motor
- Robot Wheel
- Motor Driver
- Ultrasonic sensor
- Li-Ion battery
- Jumper wires
- Switch
- Electrical pipes
- Electrical tape
- Battery holder

16. **School Name:** Gitanjali Devshala, Secunderabad
    Students: Sitaramana R. K, Manvit Jayasimha, & M. Chethan
    Project Supervisor: Mr. C. Srinivas
    Project Name: The O2 Yantra – "Future of Air Purification"

Scan the code to watch the video of the project

Problem Statement

Explosive urban growth due to population increase has led to lowered green cover due to felling of trees, for residential and commercial development. This in turn has resulted in increased global warming, elevating carbon dioxide, reducing oxygen and worsening of the greenhouse effect, compounding environmental issues. Rising carbon dioxide contributes to widespread air pollution, heightening respiratory problems and morbidity rates. In response, we have envisioned the O2 Yantra—a pioneering solution countering deforestation's impact by enhancing Oxygen production.

Scope of our Project

Unlike traditional approaches like tree planting, the O2 Yantra is designed for urban environments. Through innovative methods, we aim to replicate the positive effects of trees in a shorter time frame and with minimal space requirements, contributing to a more sustainable and oxygen-rich environment. Our O2 Yantra provides equal oxygen as a 20 year old tree provides. It takes less time to grow and much less effort to maintain it.

Objective

Our goal is to extract pure oxygen from single-celled microalgae which are known for their efficiency in photosynthesis, addressing the challenge of air purification in urban areas where traditional tree planting is impractical. The project is versatile, designed for installation in private and public places like bus stands, railway stations, and even houses. By using microalgae and integrating it seamlessly into urban infrastructure, our initiative aims to provide a practical and multifunctional approach to enhance air quality and oxygen levels.

Methodology

We started with an empty, clear aquarium, filling it with 10 liters of sterilized water. Commercially obtained liquid fertilizers, serving as a nutrient medium for algae, were added. Placed in a location with ample sunlight (around 35-37 degrees Celsius), the transparent aquarium effectively absorbed sunlight. An algae sample from a pond was introduced, and monitoring commenced. Within 5-6 days, the solution underwent a noticeable color change, becoming greener and opaquer. Additional liquid fertilizers were introduced after 15 days. Microscopic analysis affirmed the presence of algae in the evolving solution.

Observation

We took two reagents and tested the oxygen level in the water. On adding the reagents to the water, the colour of the water changes to shades of brown. The lighter the shade, the less the oxygen and the darker the shade, the more the oxygen. We observed that the colour of the water sample was very light brown on Day 1. But after growth of the microalgae and taking a re-sample, we observed that the colour changed to dark brown indicating a high oxygen level in the water.

Conclusion

The O_2 Yantra emerges as a potent tool to combat air pollution. Its compact footprint allows for easy installation, and notably, it serves as a source of pure energy. This innovation presents a sustainable and space-efficient solution to address air quality challenges in urban environments.

17. **School Name:** Carmel Academy CMI ICSE School, Chalakudy
    Students: Vivinesh Viswanath, Nidhin K. J & Ashin Joshy
    Project Supervisor: Ms Cicily Augustine
    Project Name: To Keep Away Overloaded Vehicles From The Roads

Scan the code to watch the video of the project

Introduction

This is our dream project aimed to reduce fatal road accidents, save precious lives and save loss of revenue to the State by not allowing overloaded vehicles to move. This is all about load carriers and foolproof method to prevent overloading it.

Background

It is a fact that vehicular traffic is increasing day by day in the world particularly in India due to induction of new vehicles on to the road. But the roads are not increasing in proportion to the vehicles being added in every year.

Every day we hear about many road accidents taking place around us resulting in lose of precious lives, money and damage to vehicles. Overloaded vehicles are one of the major causes in most of the accidents.

Maximum load is being transported through trucks and other load carrying vehicles. Nowadays more and more multi axle load carriers are being inducted where the existing roads are neither designed nor made to contain the heavy vehicles/loads.

The truck drivers overload their vehicles even twice more than the authorized weight for making easy money. It results in the following:-

- Overloaded vehicles malfunction and drivers lose control over it resulting in major accidents killing innocent people and damaging other vehicles.

- Overloaded vehicles move slowly. For the easiness of driving of over loaded vehicles, drivers violate the Motor Vehicle Act and move by the right side of the roads, which is meant for speeding vehicles and for overtaking. This will compel other vehicles to intentionally violate the said Act and many court orders by overtaking the heavy loaded vehicles from left side. This may also result in accidents.

- During sunny days, roads get hot and its bitumen become loose and softened. When the overloaded vehicles move over it, the bitumen move to opposite side of the tyres. When this keep on going, loosened bitumen get accumulated and settled on the sides making the road surface uneven.

  The uneven surface is dangerous for other vehicles particularly to two wheeler riders ending up in fatal accidents.

- Since the overloaded vehicles reduces the requirement of more vehicles to transport goods, the Government lose huge revenue in Road Tax, Permits and GST as required more vehicles are not bought but compensate with the existing vehicles by overloading.

- Overloaded vehicles consume more fuel and emit more unburnt fuel in the form of smoke which is an environmental hazard.

Solution

Here is the relevance of our Dream Project. We propose all load carrying vehicles must be equipped with sensors on all the axles where the body of the vehicle is connected. New generation vehicles are having onboard computers. Auxiliary all time powered all the sensors be are remotely connected to the onward computer of the vehicle through Bluetooth or like that. If the laden load is within vehicle's permissible limit, then the system allows the vehicle to ignite and start. If it is overloaded, based on the data received from the sensors, the onboard computer will cut off vehicle's ignition till the load is brought to the permitted level. Existing vehicles should also be converted to this system.

The entire system must be tamperproof. Still if anyone attempts to tamper it, the onboard system will automatically send out an instant message about the tampering attempt to the vehicle registering authority (RTO) or Parivahan, nearest police station and owner of the vehicle. This can foil the attempt itself and the lawbreaker can be booked as per the relevant law.

The manufacturers of load carriers must be made responsible to install the system and the RTO be made responsible to feed the contact numbers/e-mail ids of the above offices and owner to the onboard computer through their dedicated software, which none except authorized RTO official have access before the vehicle is delivered/registered.

The existing load carriers must also be converted to the new system by making necessary modifications.

With this modification all the present problems explained above can overcome and save precious lives, loss of citizens and government's revenue

Prototype

To explain the idea, we have made a prototype of the proposed vehicle. It is permitted to carry 20 Metric Tons and is already loaded to that extend. With that load, it can start and move easily. If we put some additional load onto it, say 500 Kgs and try to start, it will not start. If we try after removing the addition load, it will start and move. If any clever driver starts the vehicle and then try to overload it, then immediately the engine stops and cannot be restart till the additional weight is offloaded.

Since developing necessary software and to install onboard computer with loaded software on to the prototype is presently beyond our capacity, we have used a tiny switch to make the prototype works foolproof as envisage

18. **School Name:** Sri Kumaran Public School, Bengaluru

    Students: Athreta G Hiriyur, Aryaa Sridar, & Vaibav Sanjay Kanth

    Project Supervisor: Ms. Suchita Kadambi

    Project Name: PUrSE (Pick Ur School Easy) – An innovative School Search App

PUrSE (Pick Ur School Easy) aims to develop a groundbreaking application by utilizing artificial intelligence (AI) designed to empower parents in their quest to find the ideal school for their children. The main objective of this innovative app is to transform the school search process by customizing recommendations based on responses gathered from parents through a carefully curated questionnaire. A virtual assistant (VA) in the app will provide real-time assistance and guidance to enhance the user experience.


Problem Statement:

Parents are often overwhelmed with numerous factors while selecting the best school that align with their unique preferences and values for their children. While the traditional methods lack personalization, the challenge also lies in synthesizing this information to make informed decisions.

Solution:

An AI-driven mobile application with an integrated virtual assistant designed to streamline the school selection process for parents.

- Parents will complete a detailed questionnaire covering various aspects of schooling such as academic excellence, teaching methodologies, etc.
- AI algorithms analyze the responses and provide personalized school recommendations.
- Virtual assistant feature enhances user interaction, providing real-time guidance and support.
- User feedback loop in the app helps enhances and improves future recommendation.
- The AI model continually evolves through training, becoming more accurate over time.
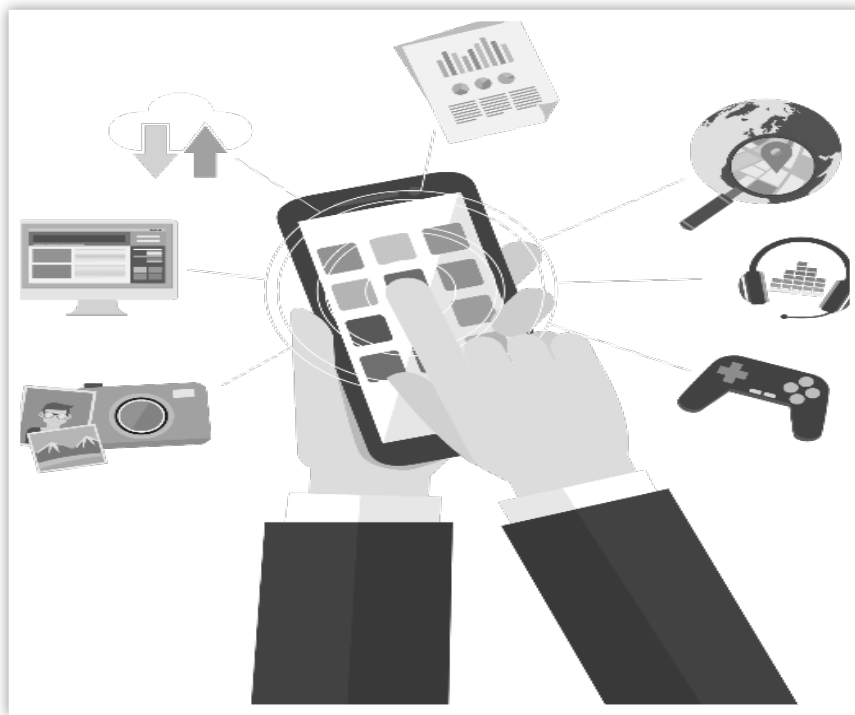
Principles and technologies:

Natural Language Processing (NLP) Libraries such as NLTK or spaCy to understand the Parents' responses precisely.

Machine Learning (ML) Frameworks like TensorFlow or PyTorch to build and train the recommendation engine.

Transparency and Explainability: The AI powered app explains the rationale behind each recommendation, building trust with parents in the decision-making process.

Secure Database Management to manage the vast amount of questionnaire data efficiently.

App Development Tools provide the parents with a seamless and user-friendly experience across both web and mobile platforms.

Unique Selling Points (USPs):

Personalized Recommendations: AI-driven approach and Virtual Assistant features provides personalized recommendations based on the unique preferences of each parent.

Data Security and privacy measures to protect user data and comply with data protection regulations.

User-Friendly Interface optimized for both web and mobile platforms, to enhance the overall user experience.

Continuous Improvement through a feedback loop to integrate and gather user input and learn from the data.

Instant access: A laptop or a mobile and an internet connection is all it takes.

Notification System to keep parents informed about application updates, school recommendations, etc.

PUrSE (Pick Ur School Easy) – the AI-powered app is set to revolutionize the school search process for parents and aims to be the pioneer standout solution to secure a bright and successful future for their beloved children. Yes, as the name suggests, the solution fits right in your purse.

19. **School Name:** Apple I English Medium School, Visakhapatnam
   Students: Akshaya Mishra, Rashmika & Sahasrini
   Project Supervisor: Ms. J. Vijaya Lakshmi
   Project Name: Door Security Sensor

Scan the code to watch the video of the project

Door sensors are a wonderful way to protect our homes, relatively inexpensive and easy to install.

Door sensors devices alert if someone opens a door or window of your house.

Sensor: a sensor is any device that detects changes in the atmosphere or environment. These changes can vary in nature, from temperature changes to motion and even chemical changes. Once a change gets detected, a signal triggers a device, often a warning or alert system. How they work depends upon the type of sensor. For example, thermometers are a sensor that use mercury to detect temperature changes. These changes show on a measured scale, allowing us to quickly process changes in data form.

Motion detectors or optical sensors are most commonly used in doors, which uses a magnet to control a circuit that triggers an alert or alarm. Infrared sensor(ir sensor) are primarily used in motion detectors.

Ir sensor is an electronic device that emits the light in order to sense some object of the surroundings. An **ir sensor** can measure the heat of an object as well as detects the motion. Usually, in the **infrared spectrum**, all the objects radiate some form of thermal radiation. These types of radiations are invisible to our eyes, but infrared sensor can detect these radiations.

An ir sensor consists of an ir led and an ir photodiode; together they are called as photo coupler.

Ir transmitter or Ir led

Infrared transmitter is a light emitting diode (led) which emits infrared radiations called as ir led's. Even though an Ir led looks like a normal led, the radiation emitted by it is invisible to the human eye.

Ir receiver or photodiode

Infrared receivers or infrared sensors detect the radiation from an ir transmitter. Ir receivers come in the form of photodiodes and phototransistors.

The emitter is an ir led and the detector is an ir photodiode. The ir photodiode is sensitive to the ir light emitted by an ir led. The photo-diode's resistance and output voltage change in proportion to the ir light received. When the ir transmitter emits radiation, it reaches the object and some of the radiation reflects back to the ir receiver. Based on the intensity of the reception by the ir receiver, the output of the **sensor** defines.

Buzzer: also known as sounder, audio alarm is a basic audio device that generates a sound from an incoming electrical signal. A piezo buzzer is an electric device used to produce a tone. These lightweight and simply constructed buzzers are inexpensive yet reliable. Piezoelectric components are made of special materials that exhibit the piezoelectric effect which converts mechanical energy into electric charge. Piezo buzzers feature following general properties.

a.   Operating voltage of 3 v to 250v

b.   Typical current consumption of < 30ma

c.   Approximate resonant frequencies of 2 to 6 khz.

Jumper wire: a jumper wire is an electric wire that connects remote electric circuits used for printed circuit boards. By placing the jumper wire on the circuit, it becomes possible to control the electricity, stop the operation of the circuit, and operate a circuit that does not operate with ordinary wiring.

Advancements

- Different types of home security sensors can alert us to any problems arising in the home that may be a cause of danger, from internal problems like gas leaks to external factors like intruders.

- Glass break sensor can also be placed on the windows, so that an alarm can be triggered and we can alert ourselves from the intruders.

- Have an unruly teenager who likes to sneak out of the house or break curfew, smart door alarm will help you monitor the comings and goings of your child. The smart door alarms will send text alerts to your smartphone, allowing you to know when the door has been opened. Such features help to keep your family safe in more ways than one.

20. **School Name:** IES Public School, Thrissur

Students: Iba Mohammed Rafi, Mirzal Pockulangara Sidik, & Kenza K Shafeer

Project Supervisor: Ms. Rathi An

Project Name: Wi-Fi-Based Rescue Vehicle

Scan the code to watch the video of the project

Without change there is no innovation, creativity, or incentive for improvement. Those who initiate change will have a better opportunity to manage the change and that is an inevitable factor.

A project to device an ultra-sensing Rescue Vehicle which could work on wireless connectivity working comfortably in rough terrains, was the initial idea. The search converged to a technically advanced ESP-32 webserver application.

In the realm of technological advancement, our **Wi-Fi-Based Rescue Vehicle** with ESP-32 emerges as a pioneering solution, crafted to redefine the landscape of rescue operations. Leveraging the power of IoT technology, this cutting-edge project introduces a remotely controlled vehicle, specifically designed for the intricacies of rescue missions. The core innovation lies in its adaptability and customizing prospect, facilitated by the incorporation of ESP-32 for wireless connectivity.

Constructed with precision, the Wi-Fi-Based Rescue Vehicle features a Wi-Fi- based microcontroller and a motor driver, intricately connected to four motors. This robust design empowers vehicle for precise control and manoeuvrability, making an invaluable asset in situations where access is challenging. It allows seamless integration of cameras, sensors, and other devices, extending its applications far beyond traditional rescue missions. The features are customizable according to the need of the user or the target group. The result is a versatile platform that transcends the limitations providing a comprehensive solution for a myriad of scenarios.

A standout feature of this project is its commitment to open-source principles The software driving the Wi-Fi-Based Rescue Vehicle is an open source, offering a unique level of flexibility and customization for users to tailor the project according to specific requirements. The emphasis on open source not only promotes accessibility but also fosters a collaborative ecosystem where innovation can thrive.

The journey of this project extends beyond the confines of the laboratory to on-ground testing and real-world implementation. Challenges encountered became opportunities for growth and refinement. Whether navigating rough terrains or overcoming unexpected obstacles, each challenge was met with resilience and a commitment to enhancing the vehicle's capabilities.

In the realm of functionalities, the Wi-Fi-Based Rescue Vehicle excels in providing wireless connectivity for remote control and data transmission. Its modular design enables the vehicle to perform a range of tasks, from surveillance to obstacle detection during rescue missions. The project's adaptability and versatility as a transformative tool is poised to address various scenarios effectively.

The project's emphasis on innovation is further underscored by its on-going commitment to research and development. The team continuously explores innovative solutions to push the boundaries of what the vehicle can achieve. This commitment is not only reflective of a passion for technological advancements but also a proactive approach to addressing evolving challenges in rescue operations.

In conclusion, the Wi-Fi-Based Rescue Vehicle with ESP-32 stands as a technological marvel, pushing the boundaries of what is possible in the realm of rescue operations. The project not only addresses current challenges but also lays the groundwork for future innovations in loT -driven solutions for real-world problems.

21. **School Name:** Delhi Scholars International School,
Sec -88, Faridabad

Students: Vedant, Keshav, & Yashita

Project Supervisor: Mr. Prashant Rai

Project Name: iMaps

People travel on roads almost daily and now even going to further places by using their vehicles and on such a journey we travel through many routes for the very first time.

So, people use google maps for such a journey because google maps shows all possible routes to reach our destination and recommends the fastest route but it is not important that the fastest recommended route will be the safest one, because some roads are quite risky to drive during night, or on some roads frequent past incidents.

There are many types of incidents that take place on the roads for example :

- Kidnapping
- Theft
- Frequent vehicle accident
- Land slides
- Wild Animals on the roads
- happened that leads that road unsafe to travel but traveler don't know weather the road is safe or not.

So to overcome this problem we are introducing an app called *iMaps*. Which not only suggests the fastest route but also the safest one. We focus on this problem because it has not been bought to light by google maps.

How does imaps work to solving this problem?

imaps brings light to the incidents that are frequent on a particular route and shows the history of that route and if any of the curious drivers want to know more they can always click the pop-up message to get all the information of the incidents happened on the road.

22. **School Name:** Silver Oaks School Dabwali Road, Bathinda

Students: Deepesh Chug, Rabhya, & Navnoor

Project Supervisor: Ms. Manmehak Sidhu

Project Name: Utilizing Stubble for Paper Production and Harnessing Biochar for Sustainable Agriculture

Scan the code to watch the video of the project

The increasing environmental concerns associated with the burning of agricultural stubble have led to the exploration of alternative methods for its disposal. One such method is the conversion of stubble into paper, offering a sustainable solution to both waste management and paper production. This project aims to investigate the feasibility and viability of producing paper from agricultural stubble.

Biochar, a form of charcoal produced from biomass via pyrolysis, has gained considerable attention for its potential to address challenges in sustainable agriculture. This report delves into the production, properties, applications, and environmental benefits of biochar.

Objective:

The primary objective of this project is to assess the suitability of stubble as a raw material for paper production and to develop an efficient process for converting stubble into high-quality paper.

The primary objective for the biochar is to give a replacer and suppliment for fertillizer in field.

Methodology of sustainable paper:

Stubble Collection: Stubble from various agricultural sources, including wheat, rice, and other crops, was collected from local farms

Preparation: The collected stubble was processed to remove impurities such as soil, stones, and other debris.

Pulping: The cleaned stubble was then pulped using caustic soda by boiling it inwater to break down the fibers and separate them from lignin and other substances.

Bleaching: The pulp was bleached using eco-friendly bleaching agents to improve brightness and remove any remaining impurities.

Papermaking: The bleached pulp was then spread on a cloth or newspaper.

Drying and Finishing:then the pulp is left drying in sun for about 2 – 3 days.

Methodology of Biochar:

Biochar is produced through the pyrolysis process, where organic material is heated in the absence of oxygen. Feedstock selection, temperature control, and duration of pyrolysis significantly influence biochar properties.

Environmental impacts:

Biochar sequesters carbon in soils for centuries, mitigating climate change by reducing greenhouse gas emissions. It enhances soil fertility, promotes microbial activity, and reduces nutrient leaching, contributing to sustainable agriculture and ecosystem

Utilizing stubble for paper production significantly reduces the environmental impact associated with burning, offering a sustainable alternative.

Conclusion:

The project successfully demonstrated the feasibility of producing paper from agricultural stubble, providing a sustainable solution for both waste management and paper production. Biochar heps to reduce the fertilizer cost and can even enhances the growth of crops as it is a natural fertilizer in farms.

Future Directions:

Investigate alternative pulping methods to improve fiber quality and reduce environmental impact.

Explore potential collaborations with agricultural communities and industries toscale up stubble collection and paper production.

Conduct lifecycle assessments to quantify the environmental benefits of stubble-based paper compared to conventional paper production methods.

Target that every village in india should produce biochar instead of burning stubble.

23. **School Name:** Scholars Home International School, Ayanagar, New Delhi

   Students: Ojasv Pratap Singh, Chinmay Bisht, & Pratyush Bisht

   Project Supervisor: Ms. Shruti Bijlwan

   Project Name: Wireless EV Charging and parking lot

Scan the code to watch the video of the project

Problem statement: With the rapid growth of electric vehicles (EVS) on our roads, the demand for efficient, convenient, and user-friendly charging solutions has been higher.

One of the biggest concerns for electric vehicle (EV) owners is knowing when and how to charge their electric vehicle. It makes sense. The average people has spent their life driving around in gas-powered cars, filling up at one of the hundreds of thousands of gas stations as the gauge creeps towards empty. Charging one's EV takes a little more planning, but with the growing demand and incentives for alternatives to gas-powered cars, Level 2 public EV charging stations are becoming a more common sight. Traditional plug-in charging methods have served their purpose, but this is very time taking process and sometime you can also forget to charge it. So our project is the solution of this problem. You just have to park the car in parking lot and your car starts charging automatically

Principle Used:

- Metals are good conductor of electricity
- Inductive power transfer(IPT) Wireless transmit electricity
- Creation of magnetic field by charged coil

Purposed solution:

Our project- Wireless electric vehicles charging and parking lot. In this project, we are going to show the future idea that came to the mind. At its most basic, an EV charger pulls an electrical current from either a 240v outlet or the grid it's hardwired to and delivers that electricity to the vehicle, just like any other appliance or device you charge by plugging into the wall. Inspite of plugging the charger, Wireless Electric Vehicle Charging (WEVC) utilizes inductive power transfer (IPT) to wirelessly transmit electricity from a charging pad on the ground to a receiver coil mounted on the underside of the EV. This process involves creating a magnetic field between the transmitting coil in the charging pad and the receiving coil in the vehicle. The alternating magnetic field induces a current in the receiver coil, which is then converted into electrical energy to charge the vehicle's battery Also placed IR sensor at each parking lot.. An infrared sensor (IR sensor) is a radiation-sensitive optoelectronic component with a spectral sensitivity in the infrared wavelength range 780 nm … 50 μm. This will help us to find out which parking lot is empty. This system frees an electric vehicle (EV) of the need for a cable when charging, further advancing the convenience of EVs for charging at home or work.

Advantage:

- Level of convenience
- Safer for user and pedestrians
- Simplification of process
- No need of additional space
- Reduce green house gas emission

Future Outlook

Wireless electric vehicle charging technology is poised to play a significant role in shaping the future of transportation. With advancements in efficiency, standardization, and infrastructure deployment, wireless charging has the potential to become the preferred method of charging for electric vehicles worldwide. By offering unparalleled convenience, safety, and user experience, wireless EV chargers will contribute to the widespread adoption of electric transportation and pave the way towards a sustainable and emission-free future.

Conclusion:

Wireless electric vehicle charging represents a transformative leap forward in the evolution of electric transportation. By eliminating the limitations of traditional plug-in charging methods, wireless charging technology promises to make EV ownership more accessible, convenient and environmentally sustainable.

24. **School Name:** California Public School, Khukhrana, Moga

Students: Sahibjot Singh, Saffronjot Kaur, & Harsimran Kaur

Project Supervisor: Ms. Rishu Asija

Project Name: AI Integrated Waste Minimization During Combustion

Scan the code to watch the video of the project

Scope of the project

The aim of our project is to reduce the air pollution caused during combustion as well as to put every bit of side product and energy produced to its best use.

Problem Statement

Combustion activities, such as stubble burning are a common practice in North India. This activity in Punjab, Haryana and Uttar Pradesh has in fact been cited as a major cause of air pollution in Delhi since 1980. The stubble burning generates a thick haze of fog and dust, producing what has been described as a "toxic cloud" in New Delhi, resulting in declarations of air-pollution emergency. There already are alternatives to stubble burning, but they are beyond the reach and affordability of farmers, thereby rendering them ineffective.

The Hypothesis

We researched on various alternatives to stubble burning and each one of them was found to fail when it comes to being cost effective. We then changed our approach and thought of finding out a solution that does not eliminate combustion processes, rather aims at cutting off the wastes and any environmental harms rendered during the process. To make it better and even more competent, we integrated Artificial Intelligence into our waste minimization approach.

Proposed Solution

We are acquainted with the fact that heat energy produced during combustion can be used to operate turbines. But our project works on utilizing light energy as well as ashes produced and also on reducing pollution caused during combustion activities, such as stubble burning. The material to be burnt is collected in a combustion chamber. We have used AI operated solar panels surrounding the combustion chamber to extract light energy and to generate electricity. The ashes produced are shifted to another chamber in which some amount of water and fevicol and added. The mixture is agitated using a motor and a beautiful grey paint is obtained. For capturing the smoke and harmful gases, a high speed exhaust fan is used that pulls the smoke into a pipe. The smoke is then collected into another chamber connected at the other end of the pipe, containing 53% aqueous potassium hydroxide solution. Thus, pollution can be reduced to a great extent while also generating electricity.

25. **School Name:** Disha Delphi Public School, Kota
    Students: Aarav Jain, Daksh Singh, & Harshit Panwar
    Project Supervisor: Ms. Chitrangada Vyas
    Project Name: Desensitization Zone

Scan the code to watch the video of the project

Problem Statement:

In today's digital age, students are increasingly becoming addicted to gadgets and social media, leading to a decline in physical activity and overall well-being. This addiction hampers their academic performance, social interactions, and mental health. There is a pressing need to provide students with alternative activities that can engage them meaningfully and help them break free from this cycle of addiction.

Hypothesis:

By creating a designated Desensitization Zone filled with diverse physical activities, we hypothesize that students will be less inclined to use gadgets and social media excessively. Engaging them in these activities will divert their attention, reduce their dependency on technology, and improve their overall physical and mental health.

Proposed Solution:

The Desensitization Zone will be a dedicated area on campus equipped with a variety of engaging physical activities. These activities may include sports facilities, art and craft stations, gardening areas, outdoor adventure setups, and interactive learning zones. By providing a range of options, students can find activities that resonate with their interests and preferences. The zone will be designed to create a vibrant and inviting atmosphere, encouraging students to participate actively and spend less time on gadgets and social media.

Future Prospects:

As the Desensitization Zone gains popularity and proves its effectiveness, there are several potential future prospects. Firstly, it could serve as a model for other educational institutions grappling with similar issues of gadget addiction among students. Secondly, collaborations with mental health professionals and educators could enhance the zone's impact by incorporating therapeutic elements and educational programs.

Additionally, partnerships with local community organizations and businesses could expand the range of activities and resources available in the zone, further enriching the student experience.

Conclusion:

In conclusion, the Desensitization Zone project offers a proactive solution to address the growing problem of gadget and social media addiction among students. By providing a stimulating environment filled with diverse physical activities, we aim to reduce students' reliance on technology and promote their overall well-being. With careful planning, implementation, and ongoing evaluation, this project has the potential to positively impact the lives of students and contribute to a healthier campus culture.

26. **School Name:** St. Patrick's Academy, Dehradun
Students: Paarth Kumar, Vijay Rudraksh Swami, & Mahin Bilal
Project Supervisor: Ms. Natasha Rathour
Project Name: Modifying Propulsion System

Scan the code to watch the video of the project

We look to the outstanding accomplishments of missions like Mangalyaan for inspiration in our aim to advance space exploration into new frontiers. In light of this, our research aims to adapt propulsion systems by fusing Nuclear Thermal Propulsion (NTP) and Xenon Ion Propulsion (XIP) technologies, drawing inspiration from Mangalyaan's achievements. We want to increase effectiveness, reduce expenses, and expand exploratory potential for next missions with this creative combination.

The combination of XIP and NTP technologies offers a significant improvement in propulsion efficiency over conventional bi-propellant systems. NTP provides significantly greater thrust efficiency with reduced propellant consumption thanks to its exceptional specific impulse values, which reach 800 seconds. Comparably, XIP, which runs on ionised xenon gas, has unmatched propulsion efficiency by achieving specific impulse values between 3,000 and 5,000 seconds. Through the integration of these technologies, our proposal maximises propulsion efficiency, allowing for faster mission durations, longer transit periods, and larger cargo capacities.

One of the main benefits of changing propulsion systems is that mission expenses may be decreased. Due to the large propellant amounts required by traditional chemical propulsion systems, mission costs are increased. On the other hand, NTP and XIP technologies need lower propellant loading, which means lower launch and operating costs. Moreover, by permitting extended mission durations and several orbital manoeuvres, their long operational lives substantially reduce mission costs.

Moreover, the combination of NTP and XIP offers faster travel over interplanetary distances, enhancing mission flexibility and adaptability. Whereas XIP provides effective low-thrust propulsion for continuous propulsion, NTP provides strong high-thrust propulsion for initial acceleration. The exploration of far-off celestial bodies, such as asteroids and outer planets, is made possible by this symbiosis, which expands the boundaries of scientific research and resource use.

Furthermore, the implementation of NTP and XIP technology advances the environmental sustainability of space exploration. These devices lessen the environmental effect of missions by reducing propellant use and emissions, which helps to preserve celestial settings for future exploration. Furthermore, they reduce dependency on Earth-based logistics by using resources wisely, which increases mission autonomy and resilience.

Finally, motivated by the victories of Mangalyaan, our research aims to adapt propulsion systems through the integration of NTP and XIP technology. We want to usher in a new age of space exploration with increased cost-effectiveness, efficiency, and exploratory capabilities with this coordinated effort. Continuing the success of missions such as Mangalyaan, we steer the human race towards new exploration projects that will take us closer to the infinite horizon.

Problems – more cost, Less payload capacity, Less speed, More travel time.

Solution – less cost, More payload capacity, More speed, Less travel time with more distance.

27. **School Name:** Sanskriti School, New Delhi

Students: Agastya Sinha, Anahita Abhijeet Tembe, & Harr Kabir Singh

Project Supervisor: Mr. S. Anil Kumar

Project Name: Puzzl

Scan the code to watch the video of the project

In the digital age, where convenience and efficiency are paramount, the demand for seamless navigation experiences has surged exponentially. Yet, despite technological advancements, existing navigation systems frequently fall short of meeting these expectations, plagued by a multitude of issues ranging from inaccuracies and limited functionalities to outdated interfaces. Consequently, users often find themselves grappling with frustration and inconvenience, encountering unreliable route suggestions, lack of real-time updates, and difficulties navigating through complex terrains.

One of the primary concerns users face is the unreliability of route suggestions provided by current navigation systems. Whether due to outdated maps or insufficient data integration, users frequently encounter situations where the suggested routes do not align with real-world conditions, leading to wasted time and increased frustration. Furthermore, the lack of real-time updates exacerbates this issue, as users are unable to adapt to sudden changes such as traffic congestion or road closures, further disrupting their travel plans.

Moreover, navigating through complex terrains, such as densely populated urban areas or remote rural regions, poses significant challenges for existing navigation systems. Inaccurate mapping data and limited functionalities often result in suboptimal routes, leaving users stranded or forced to rely on alternative methods of navigation. Additionally, language barriers further compound these challenges for international travelers, as navigation systems may struggle to accurately interpret and provide directions in unfamiliar languages.

Inconsistent weather forecasts present another obstacle to seamless navigation experiences, as users must contend with unpredictable weather conditions that can significantly impact travel plans. Without access to reliable weather updates integrated into their navigation systems, users may find themselves ill-prepared to navigate through adverse weather conditions, putting their safety at risk.

Addressing these pain points is imperative not only to enhance the efficiency and safety of navigation systems but also to improve overall user satisfaction. By leveraging advanced technologies such as artificial intelligence and machine learning, navigation systems can analyze vast amounts of data in real-time to provide more accurate route suggestions and

proactive updates. Additionally, improved integration with weather forecasting services and language translation capabilities can help mitigate the impact of external factors on travel planning and execution.

Furthermore, a user-centric approach to interface design is essential to ensure that navigation systems are intuitive and easy to use for individuals of all backgrounds and skill levels. By prioritizing user feedback and continuously iterating on design improvements, navigation systems can evolve to meet the evolving expectations of modern travelers and deliver truly seamless navigation experiences.

In conclusion, while the challenges facing existing navigation systems are significant, they also present opportunities for innovation and improvement. By addressing issues such as inaccuracies, limited functionalities, and outdated interfaces, navigation systems can enhance efficiency, safety, and overall user satisfaction, ultimately providing travelers with the seamless navigation experiences they demand in the digital age.

28. **School Name:** Dnyanada English School, Chh. Sambhajinagar

Students: Shreyash Mahesh Chaudhari,
Tanish Suryakant Shriramwar, & Sanskruti Kailas Dabhade

Project Supervisor: Ms. Sangita Shrikant Pathak

Project Name: Multipurpose Tracker

Scan the code to watch the video of the project

If your child gets lost or got stuck in any of the emergency where there is no one to help him out on the random location. If your child goes to tuition or any of the unknown place where he can't be given a smart phone to use or gadgets similar to it. Well in this type of situations this project can help the parents by just placing this device in the child's bag to monitor him or her via the parent's smartphone.

Aim

To reduce the cases of kidnaping and for the safety of women.

Summary

We have designed this project for child security and to monitor the activities of a child on a single click via parent smartphone. The parent can monitor the real time location of his child with the google map link via SMS and GSM module inbuilt in the A9G board, we can also listen to the conversation happening around him. We have also added Emergency SOS button so that in emergency situations by pressing the SOS button on the board the parent will receive the alert with the SMS and call from the tracker device. If we give the message to the device that 'SEND LOCATION' it will send the location on the smart phone and we can call on the device it will automatically receive the call and we can hear the activities happening around it.

Materials Required

1. A9G BOARD
2. XIAO C3[ESP32]
3. Push Button
4. 3.7V LITIHUM BATTERY

Working

In the xiaoc3 we have embedded the code that's why whenever we will push the SOS button for 5 sec it gives the signal to xiaoc3 after that xiaoc3 gives signal to A9G board. Then A9G makes the call and sends location to the mobile number saved in the sim card which is in A9G board.

Applications

1. CHILD SAFETY
2. VEHICLE TRACKING
3. PARCEL AND COURIER TRACKING

## Advantages

1. It is chargeable and it can charged by both type cable normal and C type of cables.
2. It is cost effective i.e. affordable to common man around Rs.1350 only.

Future Prospects

1. We will try to minimize the size of our device

   So that it can fit in our pockets.
2. Further, Parents can select a specific area so that if the child goes out of that area automatically the parents will receive the call and SMS on their smart phone.
3. We will install the camera so that RMN (Registered mobile number) we can see what is happening around the users.

Circuit diagram
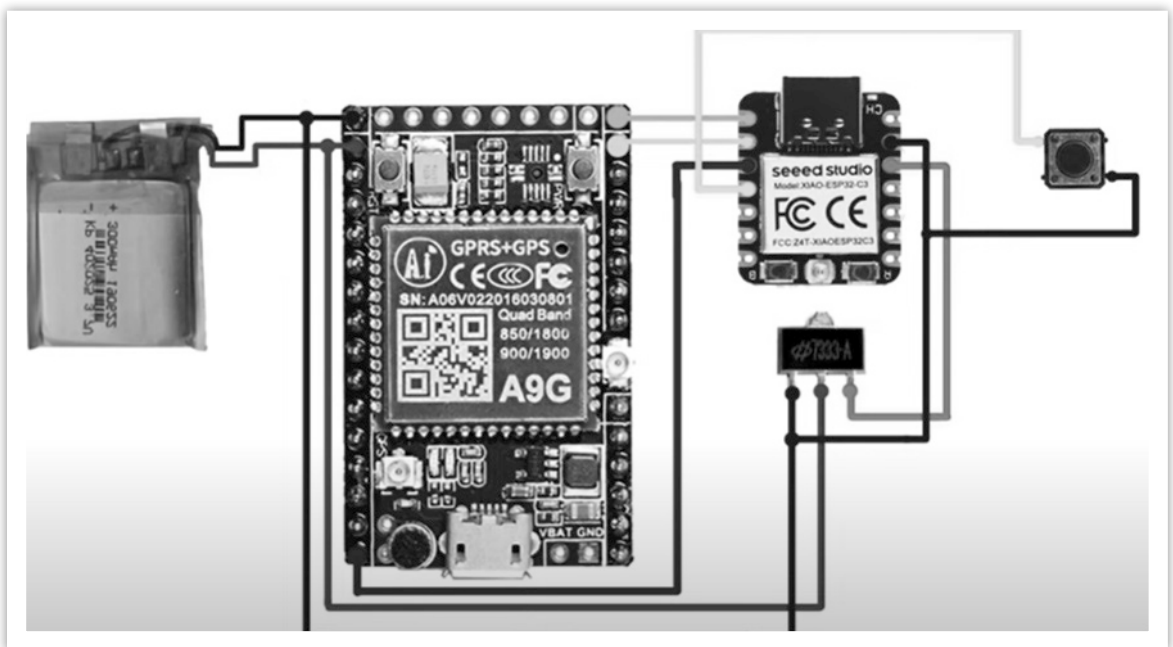
Limitations

The Tracker wan t open sky because it need's proper range of network sometimes in the closed room does not get range that's why it does not work properly.

29. **School Name:** Sadhu Vaswani International School, Sanpada, Mumbai

Students: Kavya Mange, S. Mihir Mithyan, & Kashyap Shinde

Project Supervisor: Ms. Suchismita Moitra

Project Name: Automatic Lawn Mower

Scan the code to watch the video of the project

Introducing 'Solar-Powered Autonomous Lawn Mower' an innovative project crafted by Mihir Mithyan, Kashyap Shinde, and Kavya Mange. This venture introduces a Solar-Powered Electric Lawn Mower, offering an improved and environmentally conscious approach to lawn maintenance.

Traditional lawn mowers present a considerable financial barrier due to both significant energy costs and substantial upfront expenditures, rendering them inaccessible to many, particularly small-scale farmers and gardeners. Addressing this challenge head-on, our Solar-Powered Lawn Mower emerges as a transformative solution by substantially mitigating operational costs. This innovation stands as an accessible and cost-effective alternative, catering to individuals with diverse budget constraints.

Powered by an Arduino Uno board, the system incorporates motor drivers for precise wheel control, a Brushless motor (BLDC Motor) for effective cutting and a perimeter wire setup allowing the robot to cut efficiently.

The motor drivers controls the movement of the DC Gear Motors, ensuring reliable and smooth movement. The BLDC motor guarantees a neat cut, while inductors used as sensors sense when the robot closes in on the perimeter wire.

Challenges Faced and Solutions Implemented : -

Excessive Vibration:

- Problem: The lawn mower exhibited instability and excessive vibration, leading to the cracking and falling of the BLDC motor mount.
- Solution: We addressed this issue by increasing the surface area of the mount and securing it in place with additional screws, ensuring stability during operation.

Avoiding Grass:

- Problem: The ultrasonic sensor was avoiding grass blades instead of obstacles, causing the mower to skip cutting tall grass.
- Solution: To overcome this, we transitioned from an ultrasonic sensor to a perimeter wire setup, ensuring accurate obstacle detection while allowing the mower to cut grass effectively.

Weak Blade:

- Problem: The original aluminum blade was prone to breaking, especially when encountering hard objects during operation.
- Solution: We replaced the blade with a more durable pure steel blade, mitigating the issue and enhancing overall cutting performance.

Unreliable Sensor:

- Problem: The ultrasonic sensor provided inconsistent readings, with random outputs higher than the actual distance.
- Solution: We adapted the code to account for the sensor's variability, ensuring the robot's functionality was not compromised by unreliable sensor readings.

BLDC Motor Stall:

- Problem: The BLDC motor would occasionally stall, especially when encountering dense and tall grass.
- Solution: Sharpening the blade addressed this issue, enabling the robot to cut through grass more effectively without stalling.

Reasons why our Lawn Mower stands out:

1. **Cost Efficiency:**
   o Our solar-powered electric lawn mower addresses the affordability issue associated with traditional lawn mowers, making it a more budget-friendly option for a wider range of users.

2. **Environmental Consciousness:**
   o The use of solar power reduces energy consumption and minimizes the environmental impact of lawn maintenance, aligning with a more sustainable and eco-friendly approach and can be termed as a step towards making a Green Product.

3. **Autonomous Features:**

   o The integration of an Arduino Uno board, motor drivers, BLDC motor, servo motor, and ultrasonic sensor for obstacle detection showcases a sophisticated autonomous system that can efficiently navigate and maintain lawns without constant human intervention.

4. **Convenience and Efficiency:**

   o The autonomous nature of our lawn mower prototype offers a time-saving and efficient alternative to manual lawn care, providing users with a more convenient way to maintain their lawns.

5. **Educational Value:**

   o The project is made using an Arduino uno as its micro-controller, which can also serve as an educational tool for enthusiasts, students, and those interested in learning about robotics and automation.

Join us as we explore the technical aspects and environmental benefits of this notable project, marking a step toward a more convenient and eco-friendly approach to lawn maintenance and be a part of this revolution of making this society a better place.

30. **School Name:** Nashik Cambridge School, Nashik

Students: Darshraj Kiran Shewale, Yuvraj Umesh Vyas, & Harsh Nitin Pawar

Project Supervisor: Ms. Mayuri Ashish Mahale

Project Name: CarboHeal: Pioneering Carbon Negative, Eco Friendly and Self – Healing Construction

Scan the code to watch the video of the project

Introduction:

In the pursuit of sustainable living, the construction industry stands at a crossroads. Traditional building materials, contribute significantly to environmental degradation. The conventional manufacturing process involves excavation, leading to soil erosion, air pollution from brick kilns, and the release of carbon dioxide, making it a major contributor to global carbon emissions. In this context, CarboHeal emerges as a solution, aiming to address the environmental pitfalls of conventional construction materials.

The Problem:

Traditional brick kilns globally produce around 1500 billion bricks annually, with Asia alone accounting for 87% of this production. Moreover, the global construction industry's carbon footprint, responsible for 38% of CO_2 emissions which is equivalent to 14 gigatonnes of greenhouse gas emissions every year. Many people also experience low ventilation and high energy bills due to ACs and with global warming the need for this is growing.

The CarboHeal Solution:

CarboHeal tackles these challenges head-on by introducing specialized cow dung bricks and a layer of self-healing hydrogel. The composition of the bricks, include cow dung, kaolinite clay, lime, and eco-friendly additives, not only provides structural integrity but also addresses the environmental impact associated with traditional brick manufacturing. The bricks also allow for easy ventilation and can also help in natural temperature control by reducing the surrounding temperature by 7 degrees, eliminating the need for ACs. The self-healing hydrogel, utilizing chloroplasts from spinach leaves, APMA, glucose containing polymethacrylamide and glucose oxidase, sets CarboHeal apart by creating a self-repairing polymer matrix, which can repair cracks when formed, enhancing the longevity, requiring almost no maintenance costs.
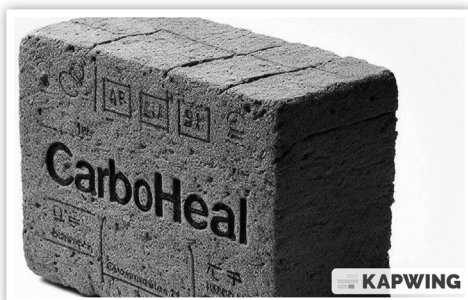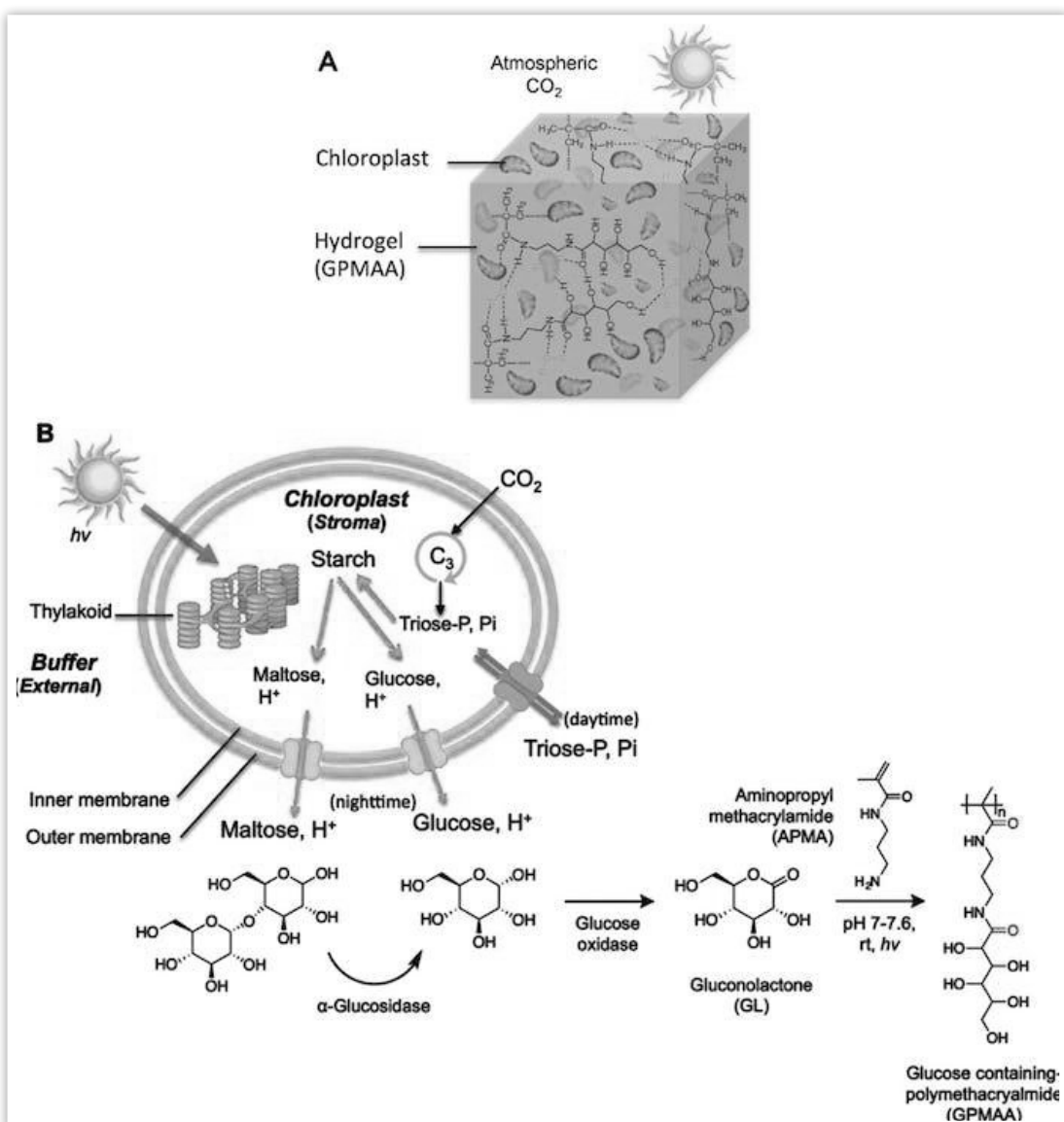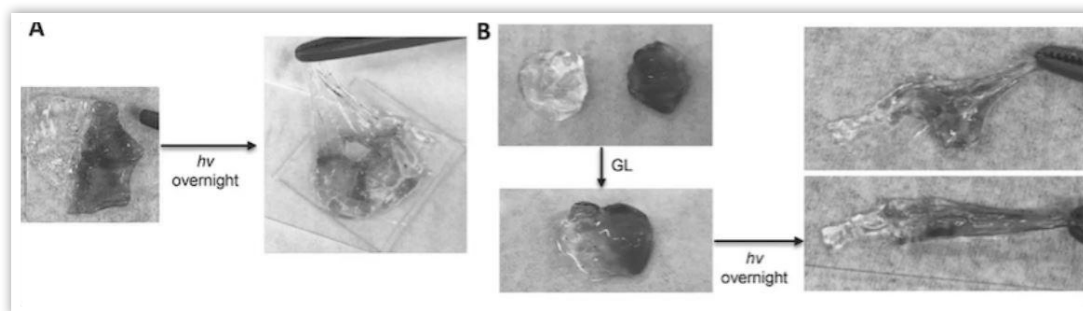
Carbon-Negative Footprint:

CarboHeal goes beyond being just a sustainable construction material; it presents a carbon-negative and zero - maintenance solution. By mitigating the environmental impact of traditional brick manufacturing, CarboHeal directly addresses the urgent need for carbon reduction in the construction sector. The incorporation of locally available materials, coupled with a lower overall cost, positions CarboHeal as both an economically viable and environmentally responsible choice.

Conclusion:

In essence, CarboHeal is not merely a construction material; it's a commitment to a sustainable, carbon negative and self-healing future. As the world grapples with the environmental implications of rapid urbanization and industrialization, CarboHeal lights the way forward.

31. School Name: D.Y. Patil Dnyanshanti School, Ravet, Pune
Students: Aarav Patel, Sunit Hiremath, & Vihaan Dhauskar
Project Supervisor: Ms. Rashmi Gopan Nair
Project Name: Hydraulic Plane Launcher

Scan the code to watch the video of the project

We the students of D.Y.Patil Dnyanshanti School(Aarav,Sunit and Vihaan) of grade VII are pleased to showcase our project Hydraulic Plane Launcher.

Our project is based on Hydraulic Pressure and Elasticity. The project was inspired by the rich history of aircraft, the principles of hydraulic power and elasticity in physics, and the significant impact of integrating these two elements.

The historical evolution of airplanes and missile launchers proves to be captivating. Before the advent of aircraft, a remarkable machine was devised to provide a crucial boost for takeoffs, given that early aircraft could only glide and land. This machine served as a vital assistance in the era before the development of powerful motors. Interestingly, it is strategically positioned on security bases, particularly on Navy Ships. In cases of emergencies or attacks, this machine ensures a swift response, as aircraft may need to cover substantial distances, making a timely defense backup imperative.

PRINCIPLE

The Hydraulic Plane Launcher is based on Pascal's law which states the pressure in an enclosed fluid is constant in all directions.

For the Hydraulic system to function efficiently, the continuous flow of fluid, the second principle, must be followed.

Pressure and flow control, as the third principle must be followed to protect the system from excessive pressure and prevent it from damage.

The fourth Principle is fluid selection and maintenance, as selecting the right fluid is imperative for efficient power transmission and system performance.
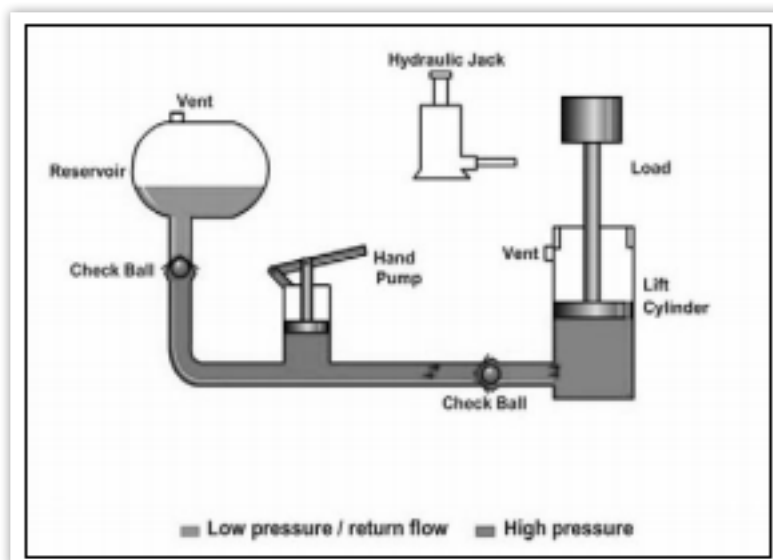
Our Project, Hydraulic Plane Launcher mainly functions on two forces:

➢ Hydraulic pressure is the force that is used in our Hydraulic Plane Launcher to activate the trigger.

- Using two syringes, a **Master Syringe,** and a **Slave Syringe**, we control the trigger using the slave syringe and control the slave syringe using the master syringe.

➢ Elasticity is the force that adds velocity / generates momentum to our plane.

- A **Super Elastic Substance**, when stretched, generates tension and builds up as Energy.

- When we release it, it releases all the energy stored, by returning to its original format.

So, when it is released, it transfers the energy to the plane which will generate momentum to the plane.

Such launchers are used in Aircraft Carriers and Navy Ships because some ships have short runways and some military planes have weaker motors. So, this plane launcher is used as a solution to this problem.

This is also used in Missile Launcher but GAS is used instead of liquid substance.

The combination is also used in cars as bumpers and shock absorbers.

32. **School Name:** Choithram School, South Campus, Indore
Students: Shivansh Malivya, Arjan Shahi, & Abeer Shrivastava
Project Supervisor: Ms. Rohini Songaonkar
Project Name: Hand Sign To Speech Converter-Medipipes

Scan the code to
watch the video
of the project

Sign language is the primary communication mode for Deaf and Dumb (D&M) individuals, overcoming speech-related challenges through nonverbal hand gestures. With over 70 million deaf individuals globally relying on sign languages, a user-friendly Human-Computer Interface (HCI) is sought using American Sign Language. The project python in computer software to interpret hand gestures, delivering output in text and audio formats. This initiative aims to facilitate communication for both deaf individuals and those unfamiliar with sign language, fostering integration into communities. Two data acquisition methods are explored: costly and precise electromechanical glove-based systems and cost-effective vision-based methods utilizing computer webcams. Despite challenges in vision-based hand detection, the approach eliminates additional device requirements, promoting natural interaction between humans and computer.

MECHANISM

The code starts by importing necessary libraries, including mediapipe for hand tracking, cv2 for computer vision, datetime for time-related functionalities, pyttsx3 for text-to-speech synthesis, Tkinter for GUI, and PIL for image processing.

The GUI is set up using Tkinter with a full-screen window, labels for the clock and calendar, and buttons for exit and sound.

Clock and Calendar Updates:

The clock and calendar labels are updated continuously to display the current time and date.

Mediapipe Hand Tracking and Gesture Recognition:

The code defines a class Sign Language Converter for hand gesture recognition using the mediapipe library.

The detect gesture method processes the webcam feed using mediapipe to identify hand landmarks and determine the current gesture.

The gestures include "Okay," "Dislike," "Victory," "Hi," and "Point," each recognized based on the position of specific hand landmarks.

The get current gesture method returns the current recognized gesture.

Voice and Exit Buttons in GUI:

Buttons for exit and sound are implemented using Tkinter, where pressing the sound button triggers text-to-speech synthesis for the current recognized gesture.

Webcam Feed and GUI Display:

The code continuously captures frames from the webcam, processes them using the SignLanguageConverter class, and updates the GUI to display the webcam feed along with the recognized gesture.

Label Updates:

Labels in the GUI are dynamically updated with the current recognized gesture.

Infinite Loop:

The application runs in an infinite loop using win.mainloop(), ensuring continuous webcam feed processing and GUI updates.

Overall, the code combines computer vision with GUI elements to create a real-time sign language recognition application. The mediapipe library is leveraged for hand tracking, and the recognized gestures trigger corresponding actions in the GUI.

33. **School Name:** Udgam School for Children, Ahmedabad

Students: Shivansh Malivya, Arjan Shahi, & Abeer Shrivastava

Project Supervisor: Ms. Anita Sharma

Project Name: Wheel Chair Cum Crutch

Scan the code to watch the video of the project

Many times, we see people struggling to be independent while being on a wheelchair. Noticing this problem, we have made a miniature model to help the specially-abled people be independent on their own. This solution will help millions of people.

Features of this model:

We have made the sitting more comfortable and the crutch chair even comes with a remote-control feature. It even has backward and forward motion. This device alerts us with a red light when the battery is low too.

A question arises, what inspired us? Well, our classmate Dhyaana Shah who has weak leg bones uses wheelchair daily. Her being a great encouragement, we were motivated to create a miniature model of the crutch chair as a solution.

Materials:

- PVC pipes
- Large rubber wheels
- Foam
- Black velvet cloth

How to use:

- Remove the crutches from the side of the wheelchair
- Pull the handle to the desired length
- Use them as you need

34. School **Name:** Delhi Private School, Dubai

Students: Arav Rastogi, Raahil Sajaad Sheikh, & Prabhjeev Singh Sethi

Project Supervisor: Ms. Sonu Bobby

Project Name: Dyson Sphere

Scan the code to watch the video of the project

In the realm of hypothetical mega-engineering projects, two concepts stand out as potential game-changers: the Dyson Sphere and the Stellar Engine. While these ideas exist primarily in the realm of theoretical speculation, they offer tantalizing glimpses into the boundless possibilities of humanity's future in space exploration and energy harnessing.

The Dyson Sphere, originally conceived by British-American mathematician and science fiction writer Olaf Stapledon and later popularized by Sir Arthur C. Clarke, represents a monumental leap in energy harvesting technology. At its core, a Dyson Sphere is a mega structure enveloping an entire star, designed to harness its energy output. Our representation of this concept utilized simple materials like transparent plastic balls, cardboard boxes, mirrors, tubes, lights, and paint to create a scaled-down model. By encircling a star with solar collectors, a Dyson Sphere could potentially transform the entire star into a colossal energy-producing machine, providing civilizations with virtually limitless energy for millions of years.

The implications of a Dyson Sphere extend far beyond energy production. With such vast resources at our disposal, the prospect of constructing other mega structures in space becomes a feasible endeavor. From expansive space habitats to ambitious interstellar travel projects, a Dyson Sphere opens up a universe of possibilities for humanity's expansion into the cosmos.

However, the dynamic nature of the universe presents its own set of challenges. Stars, including our sun, are constantly in motion within their galactic orbits. Additionally, the threat of asteroid impacts looms large, albeit potentially predictable thousands of years in advance. This is where the concept of the Stellar Engine comes into play.

Working of the model
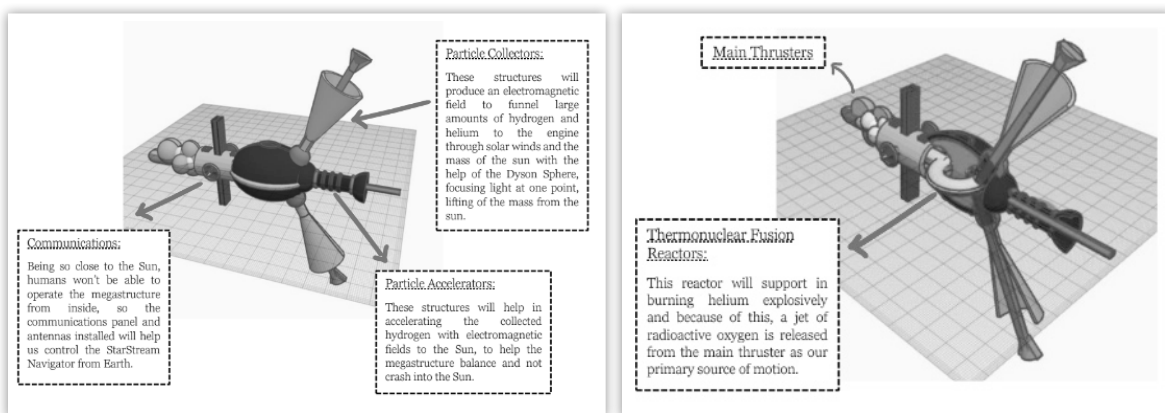
A Stellar Engine is a hypothetical megastructure capable of moving entire solar systems by harnessing the energy of their parent stars. In our representation, we depicted a Stellar Engine using a 3D model of the main engine attached to a car covered in cardboard, symbolizing the movement of celestial bodies under the influence of this technology. By gathering matter from the sun to fuel nuclear fusion and expelling the exhaust in the opposite direction, a Stellar Engine could theoretically alter the trajectory of our solar system to avoid catastrophic collisions with asteroids or other celestial hazards.

The key to powering a Stellar Engine lies in the utilization of a Dyson Sphere. By redirecting sunlight back to the sun, the Dyson Sphere can provide the necessary energy to fuel the thruster of the Stellar Engine. This process involves gathering hydrogen and helium from the solar wind and using them as fuel for nuclear fusion reactors. The resulting propulsion could enable the redirection of the entire solar system in its galactic orbit over the course of a million years.

Crucially, the extraction of matter from the sun for propulsion purposes would have minimal impact on its overall mass and lifespan. In fact, by burning helium in nuclear fusion reactors, the sun's lifespan could potentially be extended, offering a sustainable source of energy for future generations.

In summary, while both the Dyson Sphere and the Stellar Engine remain firmly entrenched in the realm of speculative science, they serve as powerful catalysts for imagination and innovation. These concepts prompt us to ponder the vast potential of humanity's future in space exploration and technological advancement, offering glimpses into a future where the boundaries of our universe are limited only by the bounds of our imagination.

35. **School Name:** Habitat Private School, Ajman

Students: Joshua Joby Antony, Arham Anees Sheikh, & Surya Sreekumar

Project Supervisor: Ms. Anu Sreejith

Project Name: Automated Self Parking System

Scan the code to watch the video of the project

Summary:

Parking the car is one of the most elemental of driving tasks, but for some drivers, it's also one of the most difficult. Sometimes it's hard to figure out where the car ends and obstacles begin, and many vehicles on the road have the scratched paint, dented bumpers, and damaged wheels to prove it. And who among us hasn't suffered a door ding because of other motorists parking too close and letting their doors fly open?

Problem:

With the rising population in the world, time is of the essence and hence needs to minimise the time taken by trivial activities such as finding a place to park in a busy area and avoid traffic congestion.

Basic Idea:

In our project, we propose a smart and automated car parking model, the vehicle will park automatically once in the parking zone. The system also identifies the parking area for a physically disabled person and does the parking automatically.

The sensors constantly monitor the occupancy of parking spaces and update the system with its findings. Ultrasonic sensors play an important role in these systems. Continuously improve its parking capabilities based on real data and user feedback. This results in more adaptive and efficient parking operations.
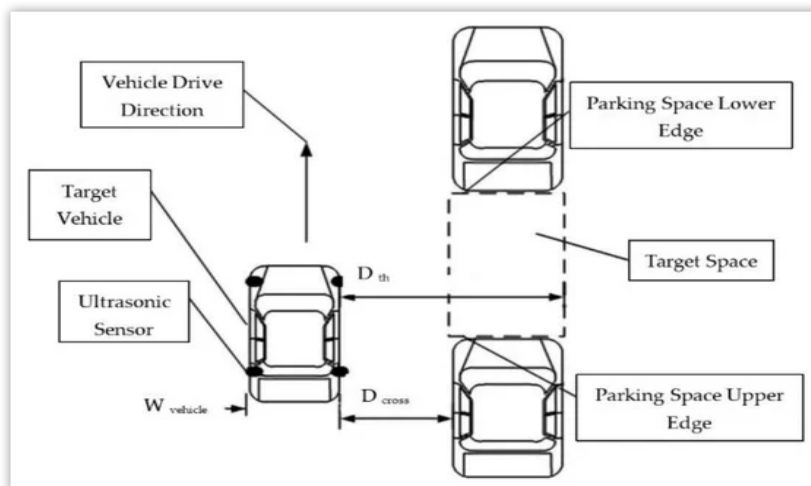
The basic working model of self parking system

Material needed for the project:

1. Mbot
2. Cyberpi
3. Servo motors
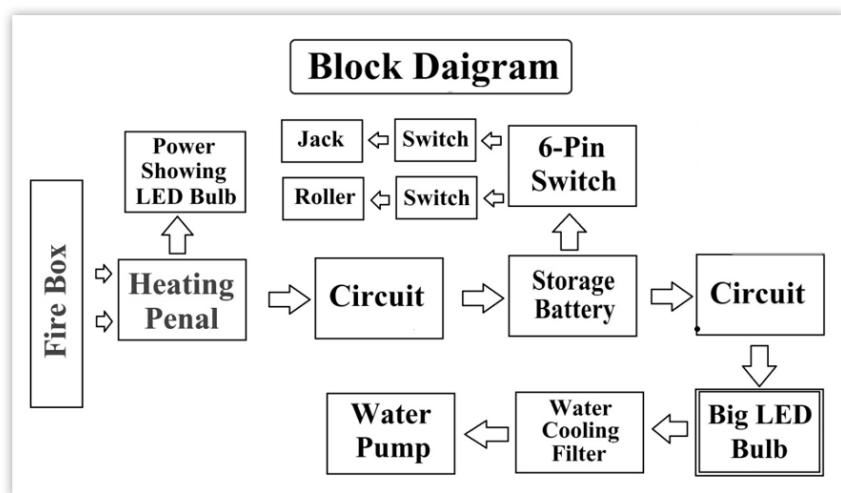4. Ultrasonic sensor
5. RGB sensor
6. Arena

36. **School Name:** Indian School Nizwa, Nizwa

   Students: Nandana Baiju, Sushmita Chaudhari, & Sneha Chamoli

   Project Supervisor: Ms. Vijayalekshmi Anilkumar

   Project Name: Generation of Electricity from Waste - Reducing Carbon Emissions

Scan the code to watch the video of the project

Block Daigram

Fire Box → Heating Penal → Circuit → Storage Battery → Circuit

Heating Penal → Power Showing LED Bulb

Jack ⇐ Switch ⇐ ; Roller ⇐ Switch ⇐ → 6-Pin Switch

Storage Battery → 6-Pin Switch

Circuit → Big LED Bulb → Water Cooling Filter → Water Pump

Aim:

The project aims to generate electricity from waste material while mitigating carbon emissions through the use of carbon filters.

Materials Used:

Zaar box, Heating Panel, LED Bulb, Resistor, DC motor 3000 RPM, Battery PCB, Roller System, Mini switch.

Working Principle:

The project focuses on generating electricity by burning waste in the Zaar box. Heat produced is absorbed by four heating panels, converting it into electrical energy. This energy powers the LED bulb, with surplus stored in a rechargeable battery.

A Heating panel works by allowing photons, or particles of light or heat , to knock electrons free from atoms, generating electricity. Heating panels comprise many, smaller units called photovoltaic cells. {Photovoltaic means they convert heat or light into electricity.}

A p-n junction is formed by placing p-type and n-type semiconductors next to one another. The p-type, with one less electron, attracts the electrons from the n-type to stabilize itself.
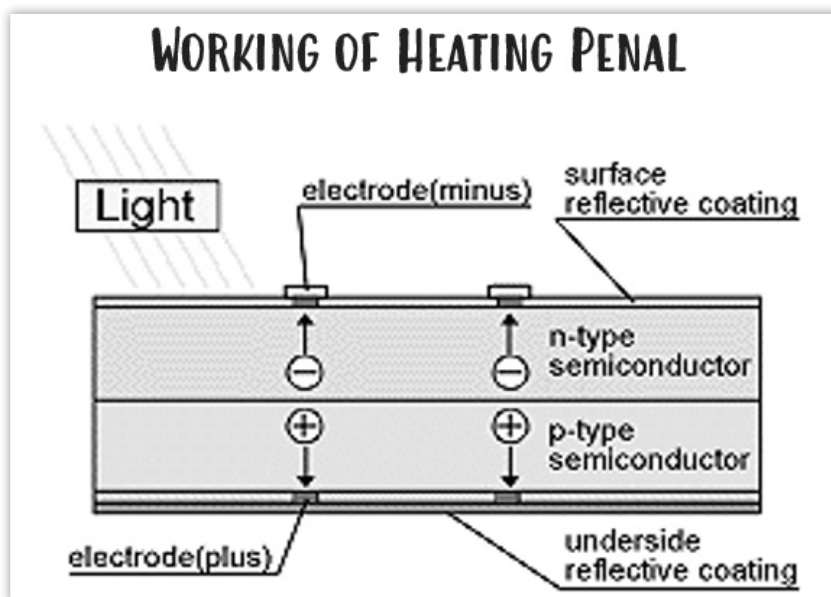
Working Principle:-

When heat hits the semiconductor, an electron springs up and is attracted toward the n-type semiconductor. This causes more negatives in the n-type and more positives in the p-type, thus generating a high flow of electricity. This is the photovoltaic effect.

Carbon waste produced during heating is managed using carbon filters. Smoke is directed to a water tank through a pipeline. Carbon waste mixes with water, is heated, and then cooled and cleaned by a filter. The roller collects the remaining carbon waste, effectively controlling pollution.

Advantages:

- Rapid generation of electricity from toxic waste.
- Adjustable electricity generation based on panel voltage and Zaar box size.
- Collected carbon on the roller can be repurposed for various products.

Finalists:

1. **School Name:** Navrachana Higher Secondary School, Vadodara
   Winner: Grand Finale and West Zone
   Students: Aarav V. Shah, Vidita Naik and Shipra Pradeep
   Project Supervisor: Ms. Sudha Naddi
   Project Name: Solution For Noise Pollution

Scan the code to watch the video of the project

Problem Statement

Noise pollution is defined as any disturbing or unwanted noise that affects or deteriorates human or wildlife. Although noise constantly surrounds us, noise pollution generally receives less attention than, for example, water quality and air quality concerns, because it cannot be seen, tasted or smelled. Nonetheless, it is an indisputable fact that noise has a negative impact on everyday life especially if we observe urban areas. One of the main sources of noise is traffic. Our project works on reducing the same with efficient means.

Proposed Solution

While there is an extensive range of solutions for water and air pollution, after our research, we found that Noise pollution is a field that remains vastly untouched. One solution that is used today to prevent noise pollution, is noise barriers. Noise barriers can be defined as a certain sound "obstacle" between the sound source and the observer. Conventionally, noise barriers are made of materials such as wood, metal, glass, cement and plastic. Our idea is to use recycled rubber obtained from local industries to make noise barriers. At present, rubber is used in indoor areas for acoustics, but not outdoors. There are many properties that make rubber suitable for this. It has great acoustic properties, i.e., it absorbs sound well. Rubber, at present, is used for acoustic purposes in indoor areas. It is extremely cost effective. Rubber, on the whole is comparatively cheaper than conventionally used materials for noise barriers. Recycled rubber is even more so. It is durable and can withstand extreme weather conditions. Being recycled, our material is sustainable and eco-friendly. Our main target locations are highways and railway tracks.

Principals used

    a.   Deflection and absorption of sound waves by noise barriers.

    b.   Acoustic properties of rubber

Other Applications

In the future, The applications can be widened with experimentation to cater to places such as party plots and residential compounds.

2. **School Name:** Somerville School Noida, Noida,

    Runner Up: Grand Finale (Joint) and North Zone

    Students: Aadit Pandey, Samarth Bharadwaj and Mayukh Chatterjee

    Project Supervisor: Ms. Sharmila Chakravarty

    Project Name: I-bin

Scan the code to watch the video of the project

Summary

The rise in urban waste generation in India comes from the consumerist behaviour and the ever-increasing population density in the cities. A vast majority of this collected waste is dumped into landfills. Every year, in India alone, approximately 40 million tonnes of urban municipal waste is generated. The two major waste handling methods widely implemented are landfilling and incineration. A landfill is an area of land in which waste is dumped and disposed. These landfill sites produce leachate that contains concentrated toxic chemicals. As waste decomposes, a combined chemical, thermal, and biological reactions release gases which are a mixture of methane and carbon dioxide. This gas being inflammable can cause a fire hazard at any given point . Hence landfill should be avoided to the maximum possible extent. Incineration is the process of burning solid wates at a very high temperature.This is achieved by combustion of waste thereby liberating energy which is mainly used to generate electricity. The gaseous emissions from solid waste incinerators have positively been recognised as carcinogenic. Incinerators also require a massive capital investment.

Presently the segregation is done by manual labourers. This mostly proves to be inefficient and time-consuming. The handpicking method of sorting waste leads to a serious threat to the welfare of labourers who are constantly exposed to toxic substances.

 So we have developed the I Bin that can effectively separate the waste into biodegradable and non-biodegradable categories. This will drastically reduce the ill effects caused otherwise. It also saves the time spent on the process and the cost involved with it. The sorting also helps the local authorities to handle the waste with ease. Since the investment is not high it proves to be economical.

Materials used

Arduino UNO

Servo motors

Webcam

Laptop

Plastic bin

Card board

Connecting wires

Working

The webcam was taught to detect waste items as biodegradable and non-biodegradable, using Google teachable machine. After detection, the webcam sent a command to the Arduino, which in turn, commanded the servo motors to open the respective flap of the bin for waste disposal.
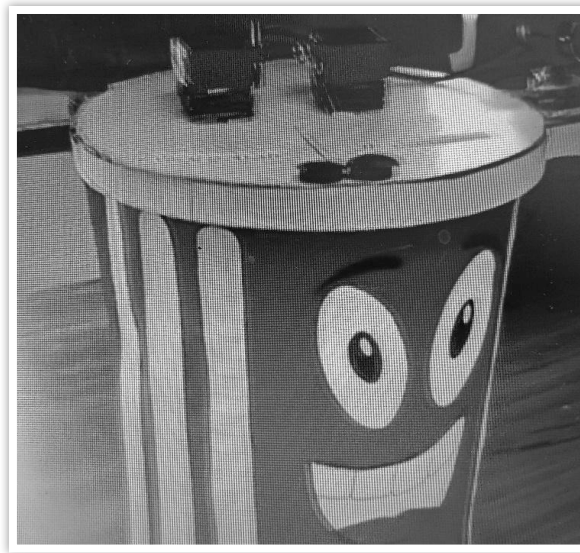
Advantage

Wastes can be segregated at the source without manual labour.

Treatment of different kinds of wastes become easy.

Small effort to achieve SDG 12, 13 and 14.

Limitations

As the I Bin senses images of the wastes, it can sometimes fail to recognize the waste type if the wastes are similar in appearance.

3. **School Name:** Aspire Indian International School, Jleeb Al Shuyoukh

   Winner: Middle East Zone

   Students: Fida Anushad Poovanchery, Abdul Rehman Tauqir Ahmed and Jeron Jaison

   Project Supervisor: Ms. Varsha Arunkumar

   Project Name: Alu Blister Alum-a Water Treatment Flocculant

Scan the code to watch the video of the project

Pharmaceutical packaging has come a long way, from stone jars to plastic and glass containers. One type of packaging, called blister packaging, has the most widespread usage around the globe. These are excellent in isolating the pharmaceuticals from gases and moisture. But such kinds of packaging have also caused detrimental effects to the environment, and after use, end up in landfills. With increasing use of medication, means an increase in use of such packaging, leading to more landfills as each day passes. Therefore, it is important that technology should be developed to prevent environmental pollution.

Solution Proposed

Blister packs collected from students and teachers from our school, were first weighed on a digital scale and then treated with a solution of KOH. The aluminium blister pack was allowed to dissolve completely in the solution. The potassium aluminate solution is heated and then cooled. Dilute H_2SO_4 is added to the solution drop by drop, until all the precipitate completely dissolves which is later heated for 3 to 4 minutes and is transferred to a crucible kept in an ice bath, which immediately starts to form the potash alum crystals and is weighed using a digital weighing machine.

Our research helped us to prepare potash alum for water purification which in turn help in the recycle of blister pack in a cost-effective manner. The prepared alum was used for flocculation test.
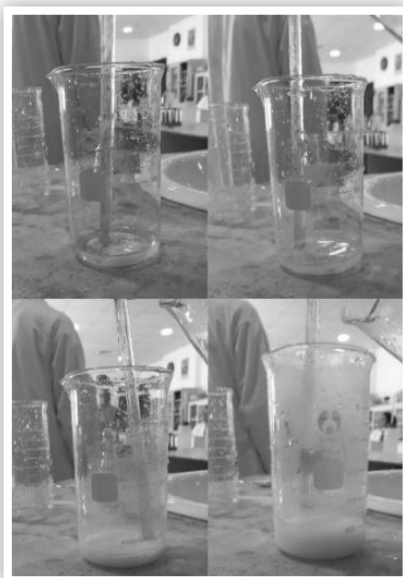
Conclusion

Our product provides an eco-friendly, alternative, low-cost water purification method, and would be effective in cleaning landfills as well as contaminated water sources.

Weighing of blister packs Dissolving blister packs in KOH

Filtering and Heating of Potassium Aluminate

Addition of Sulphuric Acid and Heating of the solution

4. **School Name:** Ddms Ams P. Obul Reddy Public School, Hyderabad

    Winner: South Zone

    Students: Naman Pattanaik, Soham Bilolikar, Debansh Mishra

    Project Supervisor: Ms. Sharmila Maroli

    Project Name: Iv Fluid Indicator

Scan the code to watch the video of the project

Problem

Most often when a person is hospitalized, he/she is given saline treatment.

There are instances when Saline/IV Fluid Level gets very low. In such cases, the blood of the patient can reverse flow and also result in air embolism. Due to this, the patient may face risk to life undergoing anxiety, high BP etc. This poses a threat to the healthcare staff. The paramedic staff have to check on many patients and have a tough time monitoring the IV Fluid/ Saline levels of all of them. During COVID – 19 outbreaks, this work increased tenfold when hundreds of people were admitted to hospitals on everyday basis.

Solution

To keep a check on the Intravenous fluid level, the team has designed an 'IV Fluid Indicator'. This device will detect the level of Saline left in a bottle and an LED fixed to it will glow along with an alarm to alert the nurse if it is low. A message with the bed number will display on the nurse's phone through a connected app.

Principle

The device is operated using Arduino which detects the level of Saline in the bottle through a load cell that measures the weight of the bottle helping to know when the fluid level is low. This Arduino is connected to an LED and a Buzzer which alerts when the Saline goes to a low limit. A HX711 amplifier will send signals to GSM Module, sending a notification to the nurse mobile or on the display screen whichever is connected.

A knob on the stand is used to adjust the low-level points.

Unique Selling Proposition

Accessible

Anytime, Anywhere by Anyone.

Automated device is

Affordable and

Alerts the medical staff at the right time.

5. **School Name:** Udgam School For Children, Ahmedabad
    Runner Up: West Zone
    Students: Satya Joshipura, Aashi Gandhi and Nimay Mavani
    Project Supervisor: Ms. Anita Sharma
    Project Name: Pumper Net

Scan the code to watch the video of the project

Problem

Worldwide many plants and crops die as they wither. The main reasons for it are going away from them for vacations etc. or you fall ill or the gardeners don't come to work etc. I and my teammates have gone through this situation very closely where we were out of town and our plants were dead.

Our Idea

Our basic idea was to make a water pump which can be controlled through Wi-Fi from anywhere in the world. To make this possible we had to use IoT.

What is IoT

IoT's main work is to operate particularly designed sensors by providing some kind of information to them through their environment.

The Solution

To make this possible we made a simple ON/OFF switch in an IoT supporting app and then designed the circuit of our project PumperNet. Then we connected the components which were NodeMCU ESP8266, BC547 Transistor, 220 Ohms Resistor, 5v Relay and 1N4007 Diode.

Advantages

- It is a huge relief to people who go away from their homes very often.
- It is very easy to use and economic. It costs 582 rupee only.
- It has infinite range i.e. it can be operated from any corner of the world.

Limitations

- With this variation of the model one cannot monitor the water supply.
- You always need at least a stable 3g Network.
- Solutions for monitoring water supply-
- We can use a soil moisture sensor.
- We can measure the water pumped in a minute to assume how much water our plant requires.
- This is just the basic model of what we can do with a pump. Other changes can be made for any other uses.

6. **School Name:** St. Joseph's Public School And Junior College, Kanjirapally

   Runner Up: South Zone

   Students: Ahad Ali Nazar, Jithin S and Amin Shajahan

   Project Supervisor: Ms. Tresa Mani George

   Project Name: Nerobot

Scan the code to watch the video of the project

Water is essential for all forms of life on earth, however in recent years water bodies are being contaminated due to various causes. Also in our hometown alone there is a river called Meenachill River, after the great deluges of 2018 and 2022, plastics debris entered and contaminated the water. Therefore, a single drop of water cannot be taken to use for our daily needs.

To solve this problem, we the students of St. Joseph Public School Kanjirapally, Kerala, under the able guidance of our teachers Sri. Aromal A and Mrs. Tresa Mini George, we have chosen the topic Environmental Science along with the help of Robotics (A branch of Science). We have built this robot and named "NeroBot". 'Nero' means water in Greek and Bot stands for robot. So, NeroBot means Water Robot, which is a solution for water pollution.

Our Nerobot uses a robotic-arm for picking the debris and two compartments on the two sides for collecting the floating waste material over water bodies such as plastic materials etc. Our Robot uses the technology called the DTMF to function.DTMF are the tones produced by the numbers of the dial pad when being pressed. So the dialpad of a mobile phone act as a Remote Control for the project.Here first, we should make a phone call, to the mobile phone connected to the DTMF Decoder, and by pressing the dial pad on the mobile phone, which we use to call to the connected phone, we can control the whole project. We have set up each number as each controls.

We have used many hardware components in our prototype. We have implemented a DTMF Decoder to decode the DTMF frequencies from the controlling Mobile Phone. Here we have used Arduino UNO as the Micro-Controller board, where we code the instructions that how the robot works and this Arduino UNO board consists of a Microcontroller called ATmega 328p. We have used two ULN2003 stepper motor driver for the forward and

backward movement of the Robotic Arm. We have used a L293D and a L298N motor driver for controlling the DC motors on the either side of the robotic vehicle. We have used a NEMA14 stepper for the whole movement of the robotic arm. A Tower-Pro Servo Motor of the opening and closing of the gripper. Two DC motors for the movement of the propellers and two DC motor Drivers and two Stepper Motor Drivers. For the battery backup, we make use of a 2500 Mah Battery and a booster circuit for charging the Nerobot.

Our work utilizes a Sensor Mechanism along with DTMF technology to function. So from all of this it shows that our robot is a low cost effective way for the collection of floating waste and it did not harm the Environment. Further developments can be done in the design of the robot and the robotic arm. We can use a PIR sensor to detect whether the obstacle is a living thing or not. We can use Raspberry Pie instead of Arduino UNO but Raspberry Pie is more expensive than Arduino UNO and also we can use metals instead of PLA in Robotic Arm which helps the robotic arm to lift heavy waste materials. We hope that our work can save millions of lives.

Together, let's build & hope for a better future.

7. **School Name:** Holy Cross School, Bokaro
   Runner Up: East Zone
   Students: Aastha Kumari, Sanprit Ranjan and Eklabya Mishra
   Project Supervisor: Ms. Nicky Smita
   Project Name: Algae:secret Weapon For Green Energy

Scan the code to watch the video of the project

Scope of our project

The aim of our project is to obtain biofuel from green algae.

The problem statement

We saw many ponds filled with green algae near our locality. This was not only making the environment stingy and unbearable for the people living around but was also killing the aquatic ecosystem so we thought of making biofuel from algae.

The hypothesis

We pondered and researched on different ways of how can we cultivate algae and and how algae can be used to make biofuel. And we found that by adding certain chemicals like n-hexane, and baking soda we can activate algae to produce biofuel from its lipid layer and other bi products.

The objective

The objective of our project is to cultivate algae in a controlled manner and extract biofuel from it along with four more bi products. On one hand it consumes CO_2 and on the other it emits lots of O_2 in the atmosphere. Also it generates biofuel which can be used as an alternative for fossil fuels.

Methodology

So we created Omega structure model to cultivate algae. In a reservoir we collected industrial waste water which passes through floating structure on the waterbody. Industrial wastewater contains magnesium sulphate, carbon dioxide, and nitrate which gives favourable condition for algae to grow rapidly. Also closed pipe keeps it contamination free. This floating pipe gives algae perfect temperature 25 – 30° Celsius with electromagnetic waves. After 2 weeks when algae is fully grown, it goes to another container where we filter it. Collected algae is mixed with hexane and sodium bicarbonate in 10 :1:1 ratio. After that we grinder it and left it for 24 hours to settle down on the upper layer. Once we get oil surface we can collect it in another container with the help of decantation method.

Observation

We observed our mixture for 24 hours and found a layer of bio fuel(floating) over the surface of the container and filtered and separated it.

This obtained biofuel can be used in bio and Chemistry laboratories
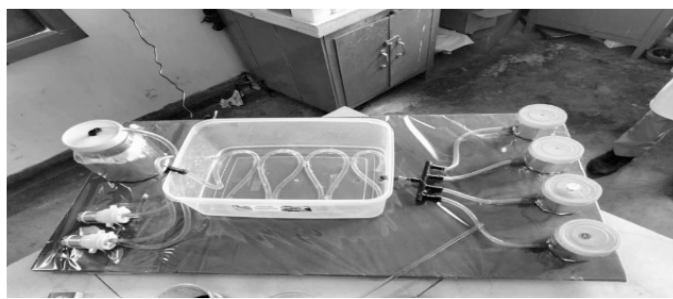
Conclusion

1. By the above experiment we found out that from 500 grams of algae, 50 ml of bio fuel can be obtained.

2. Also 4 other biproducts can be obtained like organic fertilizer,cosmetics,Electricity and fish feed.

Limitation

This bio fuel can only be obtained from green algae.

Practical implications of the project

In Chemistry lab, and Bio lab on the place of spirit lamps this biofuel can be used. If produced on large scale it can be a perfect alternative of Fossil fuel.

8. **School Name:** Sevasadan Saksham School, Nagpur
   Finalist: West Zone
   Students: Diya Patle, Devanshi Thakur and Arjun Kedar
   Project Supervisor: Ms. Ritu Sharma
   Project Name: Solution For Solid Waste Pollution

Scan the code to watch the video of the project

"Waste Segregation refers to sorting and separation of various waste types in order to facilitate recycling and correct onward disposal." Have you ever wondered that is this waste segregation actually being followed? We noticed at our homes, in school and also at other public places that waste is not properly segregated. By observing this we thought that waste segregation is a very major and critical problem in a country like India. A plan of waste segregation came up in the year 2014 but still the waste was dumped in a single bin without segregation due to busy schedule of people. As a solution to this problem, we came up with the idea of automatic waste segregator which segregates the waste automatically into wet and dry.

Technical Detailing

Our model is based on the Arduino uno microcontroller, which calibrated the different components by coding the Ardiuno in C++ language to form an automatic dry and wet waste separator. We have used the following components

1. Arduino uno
2. Ultrasonic sensor
3. Moisture sensor
4. Servo motor

The waste will fall on the platform of the dustbin , where its presence would be detected by ultrasonic sensor and after that the moisture sensor will measure the moisture content present in the substance and give the value in between the parameters of 0 to 1023. Where 0 means completely wet and 1023 means completely dry. On the basis of this information the sensor will classify the waste into dry and wet. Once this is done the moisture sensor will send the signal to servo motor and it will move in either angles depending on dry and wet waste. Motor will move 0 degree if the waste is wet and 180 degree if the waste is dry, the waste will fall in suitable bin. In this way our segregator works.

Advantages and future prospects

1. One of the major benefits of our smart bin is that it is substantially cost effective.
2. It helps us achieve various sustainable development goals:
    *   Good health and well being of people is looked into.
    *   Sustainable cities and communities
    *   Climate action (Keeping the environment clean).
    *   Life on land
3. We are also thinking of adding a dropper like structure to our bin. By using it , the waste will fall one by one on the sensors and further segregation will take place.
4. We are also planning to incorporate a separate conveyer belt system for distinctive metal and E-waste segregation.

9. **School Name:** Silver Oaks School, Bathindia
    Finalist: North Zone
    Students: Mir Arhaan Altaf, Samridhi Kakkar & Soham Patyal
    Project Supervisor: Ms. Manmehak Sidhu
    Project Name: Litter Glitter

Scan the code to watch the video of the project

As the name suggests, our project is based on importance of light but with eco-friendly means. We can even say best out of waste.

The use of plastic bottles in this way to provide indoor lighting from daylight was developed by Alfredo Moser of Brazil. Using the technology as a social enterprise was first launched in the Philippines by Illac Diaz under the My Shelter Foundation in April 2011. In order to help the idea to grow sustainably, Diaz implemented a "local entrepreneur" business model whereby bottle bulbs are assembled and installed by local people, who can earn a small income for their work.

Within months, one carpenter and one set of tools in one community in San Pedro, Laguna, expanded the organization to 15,000 solar bottle bulb installations in 20 cities and provinces around the Philippines, and began to inspire local initiatives around the world. My Shelter Foundation also established a training center that conducts workshops with youth, business companies, and other groups who are interested in volunteering their time to build lights in their communities. In less than a year since inception, over 200,000 bottle bulbs were installed in communities around the world.

In Philippines, people are very poor and do not have any electricity supply. So, the people here have started making bulbs out of waste bottles without any electric supply. Making this bulb costs lesser than 50 rupees.

To make it we need to cut two metal pieces in a circular pattern around the bottle, then we need to cut the inner circle. After that we need to bend small strips of the metal piece in upward direction. Next, we fill the bottle with water and add 10 milliliters of bleach or chlorine into it. This makes it glow in the day like a 45-volt bulb. But what about the night?

We know just what to do. We add a solar panel, a battery and a LED to it. This makes the bulb glow throughout the day and the night. The solar panel we added inside that store 10 hour of daylight. The device functions like a deck prism: during daytime the water inside the bottle refracts sunlight, delivering about as much light as a 40–60-Watt incandescent bulb to the interior. A properly installed solar bottle can last up to 5 years.

This project is helping millions of homes to light up. Let's come together and spread brightness everywhere. This was our project litter glitter, brightening the world!

10. **School Name:** Thakur Public School, Mumbai
    Finalist: West Zone
    Students: Shaurya Saraf, Niket Jain & Chaitnya Jaiwall
    Project Supervisor: Ms. Priyanka Haritwal
    Project Name: Water Cleanser Boat

Scan the code to watch the video of the project

This is an Eco-friendly water cleaning device. The boat is made up of two segments. One segment is the motorized segment and the other is the plastic compressor. A board has been attached under the segments to lower its density so that it could float on water. Two turbines are attached on each segment. There is also a net under the board for the collection of plastic. Later this plastic is transported to the 'Plastic Compressor' segment. Then the substance collected is dissolved in a solvent(Styrofoam in Acetone). After compression it turns into a soft mold which can be given a desired shape. After 1-2 days it gets turned into hard yet light substance which can be used for construction purpose

The gaseous pollutants can escape through the passage provided on the top of the boat. The solar panels are attached on the top of the boat. The secondary battery gets charged by the solar panels after the discharge of the primary battery. The boat has lights for visibility at night. The inner surface of the boat is also coated with a fire-resisting substance (Starlight - name given by the team). It works on the Principle-'On coming in contact with fire, Starlight releases carbon dioxide'. The boat is equipped with a water filtration plant which filters the water.

Highlights

This device cleans dirty water in an Eco-friendly manner.

It works on electricity and also has solar batteries which automatically get switched on during day time.

Solves the problem of dirty water and creates avenues for cleaner and hygienic spaces

11. **School Name:** Alpine Convent School, Gurugram
    Finalist: North Zone
    Students: Nikunj Maheshwari, Aarna & Samyak Jain
    Project Supervisor: Ms. Gunjan & Ms. Twinkle
    Project Name: Self Secured Smart Handbag

Scan the code to watch the video of the project

Oh my god! Where did I keep my bag now? This happens with almost every other woman in the world. There's nothing more anxiety-inducing than fruitlessly searching for your purse or wallet.

Now a days, one thing that every other woman carries with her whenever she ste[ps out for anything …be it grocery shopping, clothing, hanging out with friend for a brunch …here and there… handbag is a necessity. Unfortunately, carrying handbag in public is not safe. Every now and then we hear a lot purse snatching cases.

So, we the students of Alpine Convent School , Gurugram have come up with an amazing solution, that will take all your anxieties away.

A Self Secured Handbag

We decided to make a self-secured handbag in which you can keep in your valuables and they will be safe wherever you go. This bag can protect itself by allotting authorisation to the person who owns it. So, the heart of our system is an *Arduino nano* which is a micro-controller board which has the entire coding of the system. Our project make use of GSM connectivity for network access which can send/ receive sms to get the accurate location of the purse. The owner can get the location anytime by sending an sms to the registered number installed in the purse. It also makes use of Bluetooth connectivity to further secure it against any unauthorised access. It has a physical lock which can only be unlocked using the paired phone. In case the Bluetooth connection is no longer there, The alarm systems will activate and the purse will sound a loud alarm in-case anyone tries to touch it.

We have used a power bank as the source of energy. A provision of physical lock has been added as a security feature to prevent an unauthorised access. Physical lock can be enabled /disabled from the app. Also, physical lock is an independent 3D printed design whose prototype has been designed by us. We have also designed an app to connect, lock & unlock.

Use of GSM has added as an advantage of Internet Connectivity. Internet can be accessed from anywhere in the world. Also, since GSM can provide the location data using its NSS (Networking Switching Subsystem).

Motion sensors have also been implemented to work as an anti tamper/anti theft mechanism. A loud beep is sounded by the buzzer as a warning in-case motion is detected. After giving a warning tone, if someone tries to move it further, the loudness of the beep sound will increase until the user's phone is connected.

Our Future Prospects

1. We will be working on a more robust and discrete circuit.
2. Also, a good anti tamper mechanism using a good conducting fabric along with improvement in GPS technology.
3. We will be also adding a Global Positioning system (GPS) to enable the user to track the purse in case of theft.
4. Improvement in lock designing and making it more compact.

Write down Your Idea

Participate in Macmillan Budding Scientist 2025-26

Eligibility

- **Classes:** 6 to 8
- **Team Size:** 3 students and 1 mentor teacher

Categories

- **Internet of Things & Artificial intelligence**
- **Environmental Science**
- **Biological Sciences**
- **Physical Sciences**
- **Chemical Sciences**

Last date to register September 30, 2025 | **Last date to submit video October 31, 2025**

Scan the QR Code
for the nomination form

OR

Enter this URL in your browser

https://macmillaneducation.in/macmillan-budding-scientists/

Things to consider

- The last date for submission of the video is **October 31, 2025**. Entries will be judged by an independent jury comprising scientists and academicians.
- Top 8 Teams of each zone along with their mentor teacher will be invited to showcase their working model/experiment/idea to the jury at their regional IIT Campus.
- The winner and runner-up teams will be eligible for participation in the grand finale.
- Participants are eligible to receive digital certificates of participation upon successful submission of the video.

Nominating your team is as easy as 1 - 2 - 3!

1. Fill in all details accurately in the nomination form and submit. The video upload is optional at this step.
2. After successful nomination, the mentor teacher receives an email from **forms-receipts-noreply@google.com** with a copy of the responses. To make changes, access this email and click **"Edit Response"**.
3. To upload the **3-minute video**, use the same email and click **"Edit Response"** again. Upload the video in the last field of the nomination form.
4. Please note: Submission of video can be done only once.

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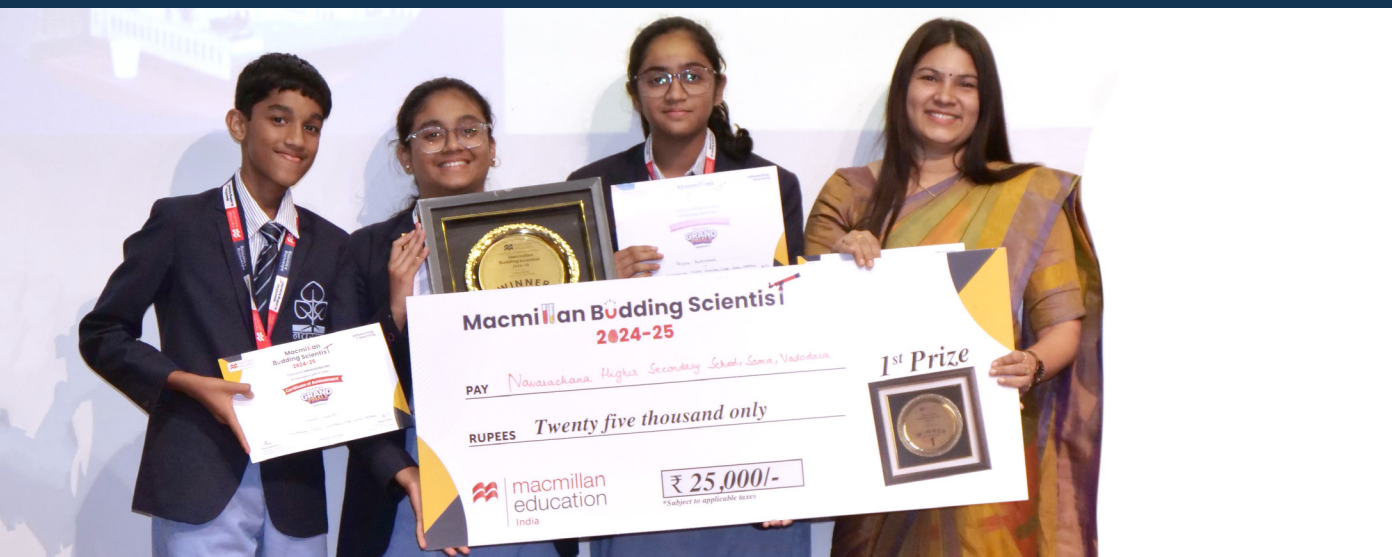
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