



Macmillan Budding Scientist 2024-25

~ Fostering Scientific Acumen ~

POWERED BY **SPRINGER NATURE**

IN ASSOCIATION WITH **INDIAN INSTITUTES OF TECHNOLOGY**

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Project Reference Book

Macmillan Budding Scientists 2024-25

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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, Bhubaneswar 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



At Manav Rachna International School, located in sector 46 Gurugram we strongly believe in nurturing an interest, in science that goes beyond textbooks. Our aim is to create an environment where curiosity is encouraged and innovation flourishes.

Right from an age we introduce the concept of “innovation” through our Skill Development Program called Future Skills and Sustainability. This program equips students with future oriented skills such as design thinking, computational skills, adaptive learning and artificial intelligence. We believe that these skills will be essential for their success not in education

but in the ever-evolving landscape of the world. To support this vision, we have set up an ‘Atal Tinkering lab’ under the Atal Innovation Mission of the Niti Aayog. This lab provides students with tools like 3D printers and robotics kits to turn their knowledge into practical applications.

Our team of educators goes beyond teaching methods by incorporating hands on experiments, interactive discussions and real-world examples to help students understand scientific principles deeply. In addition to our curriculum, we organize science fairs invite guest speakers who're pioneers, in the field of science and technology and arrange educational trips to foster a well-rounded understanding of STEM concepts.

We take pride in the accomplishments of our students, in science competitions and their valuable contributions to cutting edge research projects all aimed at building a more sustainable world.

At MRIS 46 Gurugram, our utmost dedication lies in shaping citizens who not excel academically but also possess the creativity and ingenuity to make meaningful impacts on the community. Let us continue to ignite inspiration and provide unwavering support to nurture the generation of leaders.

Warm regards,

Ms. Dhriti Malhotra

Director Principal

Manav Rachna International School Sec-46, Gurugram

46, Gurugram

From the Principal's Desk



K. L. International School prioritizes scientific acumen. The curriculum has been reworked to align with advancements, integrating practical experiments. The Science Club (Innovators) and Eco Club (Friends of Earth) encourage independent research, fostering curiosity. Collaborations with local experts provide insights into practical aspects, while well-equipped labs ensure access to modern instruments for a deeper understanding. Extracurricular activities such as WM contests, science quiz contests, and field trips enhance learning. The school participated in the CBSE Science exhibition, wherein the project based on the extraction of activated carbon from onion skin was selected for the National level. I also had the privilege of receiving the National Award in 2023 on Teachers' Day from the president, Mrs. Draupadi Murmu, in recognition of my efforts in fostering the growth and development of students.

The teaching staff undergo continuous professional development to stay current, ensuring a dynamic learning environment. The teachers attended the 10th National Annual Virtual Labs Nodal Centre Coordinator's Meet. The school stimulates participation in National and International science Olympiads, nurturing a competitive spirit and exposing students to global standards.

In cultivating a culture of inquiry, hands-on exploration, and collaboration, our school aims to produce scientifically literate, innovative individuals poised for success in an increasingly complex world.

Mr. Sudhanshu Shekhar

Principal, K. L. International School, Meerut

From the Principal's Desk



According to Dr. A.P.J. Abdul Kalam, 'creativity is the key to success in future and the primary education is where teachers can bring creativity in that level'. We, at La Martiniere for Boys, Kolkata, encourage and instil creative and scientific bent of mind at an early age. Children are encouraged to participate in Tinker Fests and Inter-School Science Fests under the guidance of mentor teachers. Children are commended for their performance in the morning assembly. We have also initiated a Science Fest on STEM subjects exclusively for the Middle School children. Competitions like the Macmillan Budding Scientist help children to dream big, initiate and invent. They are not afraid to face challenges head on, and they never lose sight of what they are passionate about. Teamwork and leadership qualities are developed at an early age, with the encouragement and by the guidance of the teachers. Scientific progress paves the way for sustainable development of a nation. Since it is a process that envisions a favourable future for human societies, children have to be made conscious of the need for sustainable development from an early age.

P. A. John Stephen

M.Sc.(Chem), B.Ed.

Acting Principal,

La Martiniere For Boys

From the Principal's Desk



I extend my heartfelt gratitude to Macmillan Education team for providing an invaluable platform to our students that allowed our school to shine in the Macmillan Budding Scientist Contest 2023-24. As the Principal of Minhajul Huda English School, witnessing our students successfully progress to the zonal round of the competition has been a source of immense pride.

In our school, fostering scientific thinking is not merely a curriculum component; it is a dynamic approach ingrained in our educational ethos. Our commitment to nurturing scientific growth

among students goes beyond textbooks, emphasizing hands-on experiences and critical inquiry.

Through interactive experiments, our students learn to question, observe, and analyze, fostering a curiosity that fuels their scientific thinking. Our science curriculum is designed not just to convey facts but to instill a deeper understanding of the scientific method. We encourage students to formulate hypotheses, conduct experiments, and draw conclusions, cultivating skills essential for a scientific mindset.

Moreover, our dedicated faculty members serve as mentors, guiding students in independent research projects and facilitating participation in science competitions. Field trips, guest lectures, and collaborations with local industries expose our students to the practical aspects of scientific endeavors. Our commitment extends to creating an environment that nurtures creativity and problem-solving. We integrate technology and provide access to state-of-the-art laboratories, ensuring our students are well-equipped to embrace the ever-evolving landscape of scientific discovery.

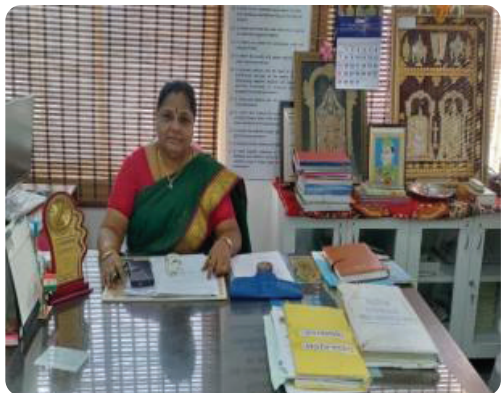
In essence, our approach to fostering scientific growth goes beyond the classroom. We strive to create a culture where students not only excel academically but also develop a passion for exploration and innovation. Our goal is to empower the next generation of scientists, thinkers, and problem-solvers who will shape the future through their scientific endeavors.

Once again, thank you Macmillan Education team, for providing our school with this enriching opportunity. We look forward to continued collaboration and the prospect of further participation in future events organized by your team.

Jayan Kambrath

Principal, Minhajul Huda English School

From the Principal's Desk



The Hindu Senior Secondary School is dedicated to fostering scientific acumen, cultivating curiosity, inquiry, and innovation. Through a comprehensive approach to science education, the school equips students with the knowledge and skills for success in the dynamic world of science. An integral initiative involves integrating hands-on experiments into the curriculum, with well-equipped science laboratories providing practical exposure in physics, chemistry, and biology. This not only enriches theoretical understanding but also instills scientific curiosity.

Emphasis on developing critical thinking and problem-solving skills is evident in science fairs and competitions where students showcase innovative projects, boosting confidence and nurturing scientific inquiry.

Beyond the core curriculum, the school organizes workshops, seminars, and guest lectures by scientists, offering insights into the latest advancements and diverse scientific perspectives, inspiring a passion for exploration.

Dedicated robotics classes instill a passion for innovation from an early age, allowing students to design, build, and program robots, gaining practical insights into engineering concepts.

Extracurricular activities, including science clubs and astronomy sessions, create a collaborative environment for discussions, idea-sharing, and group projects, enhancing scientific acumen.

By combining theoretical knowledge with practical applications, encouraging innovation, and providing exposure to real-world scientific developments, the school shapes students into well-rounded individuals prepared to meet the challenges of the scientific realm.

Lakshmi Arulaalan

Principal

The Hindu Senior Secondary School, Chennai, Tamil Nadu

From the Principal's Desk



It is with great pleasure and delight that I share with you the unwavering commitment and zeal with which our institution cultivates a profound scientific acumen within our student community. As the principal, I firmly believe that fostering a comprehensive grasp of science is pivotal for the all-round development of our students.

In the realm of education, the pursuit of scientific knowledge is not merely an academic endeavour but a holistic

journey. At Carmel, we firmly believe that a deep-rooted understanding of science lays the foundation for future thinkers who will navigate the complexities of life with insight. Our educators employ pedagogical strategies that unravel the complexities of science with a finesse that stimulates young minds.

Our laboratories transform scientific curiosity into a radiant flame of discovery. Through avant-garde teaching methodologies, we seamlessly interlace scientific principles into the warp and weft of daily existence. Project-based learning, emphasis on hands-on experiences, collaborative activities, state-of-the-art infrastructure equipped with cutting-edge technology, science fairs, workshops, and seminars prepare logical and critical thinking minds, giving rise to a confluence that begets innovation and revelation. We aim not just to disseminate scientific knowledge but also to inspire a yearning for scientific exploration.

We are grateful that you have endowed us with the honour of nurturing the scientific luminaries of tomorrow.

Sr, Ann Joicy

Principal

Carmel Convent Sr. Sec. School, Bhel, Bhopal

From the Principal's Desk



The culture of science and scientific thought and understanding is all pervasive in our campus and amongst the students of The Jain International School. This culture is emphasised by a democratic environment in the school which promotes and encourages questioning. What we emphasise is that science has an answer and explanation for everything. We also promote divergent thinking that underlines the need to think beyond the obvious. Science in our school is not seen as only a textbook subject but a skill that goes a long way in developing creative and critical thinking and great problem solving using unique solutions. Teachers are trained to give a scientific basis to their teaching be it via reasoning, measurement, data collection and analysis, observation skills and documentation.

We question long standing beliefs and systems within and outside of the classrooms and welcome all inputs from students. Technology and activity-based learning is widely incorporated in our teaching-learning process. Projects which are heavily dependent on data /evidence collected and conclusions drawn thereof are very much a part of our curriculum and this we have noticed fosters scientific reasoning and thinking and finally creates confident and smart children capable of rising to any occasion and performing.

We strive to make science accessible and engaging!

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

From the Principal's Desk



The students at The Heritage 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.

Science makes them inquisitive. The process of observation, experimentation, making hypothesis and drawing inference enriches our lives and makes learning meaningful.

The school organises a Science fest 'Khoj' every year where the students are given relevant topics to research in groups, find evidence for all their research and make presentations before the entire class.

The school ensures that the library has enough books on Science and autobiographies of scientists for students to get inspiration.

The school is a member of BITM and participates in all the programmes it offers.

Trips to Science City, spending time in the Zoo, the botanical gardens and other places of interest are a part of the curriculum.

We are proud to mention that a sizeable number of our alumni body are into academics, education and research be it IITs / NUS / Stanford or MIT.

Science is fun!

Mrs. Seema Sapru,
Principal,
The Heritage School, Kolkata

From the Principal's Desk



In today's world, schools are pivotal in cultivating a scientific mindset among students. Science exhibitions, experimental verifications of laws, and model making competitions serve as key avenues for achieving this goal.

Science Exhibitions: These platforms allow students to showcase their scientific knowledge and creativity. They encourage exploration of real-world applications of theoretical concepts, fostering problem-solving skills and collaboration among students.

Experiment Verification: Encouraging students to verify scientific laws through experiments enhances their understanding and critical thinking skills. Hands-on activities deepen their comprehension and cultivate a lifelong appreciation for science.

Model Making Competitions: These competitions challenge students to apply scientific knowledge creatively. They foster teamwork, time management, and communication skills, essential for academic and professional success.

In conclusion, by promoting scientific endeavors through various activities, schools nurture a generation of curious and innovative thinkers. These experiences not only enhance academic performance but also prepare students to address future challenges and contribute to scientific advancements.

Mrs. Archana Mishra,
Principal,
St. Xavier's High School,
Kedargouri,
Bhubaneswar

From the Principal's Desk



The students of National English School, Kolkata have made outstanding achievements in the Macmillan Budding Scientist Competition. Our dedicated efforts towards fostering scientific curiosity and innovation have borne fruit as our students have qualified for the Final Round at IIT Bhubaneswar.

National English School takes pride in conducting regular classes for AI and Robotics, providing a cutting-edge educational experience. These initiatives empower our students with essential skills, preparing them for the future. Our commitment to hands-on learning has cultivated a passion for science and technology among our students, evident in their success at prestigious competitions.

I commend our students for their hard work, dedication and passion. Together, we continue to nurture a culture of excellence at National English School.

Mrs. Mousumi Saha,
Founder Principal
National English School, Kolkata

From the Principal's Desk



Science is the harmonious symphony of questioning, exploring, and discovering, playing the melody of understanding in the grand orchestra of knowledge.

At the core of my role as principal is a steadfast dedication to advancing science education in our school. I actively engage in curriculum development, ensuring that our science programs align with contemporary standards and promote a deep understanding of scientific principles.

I prioritize the recruitment of highly qualified science teachers and provide ongoing professional development opportunities to keep them abreast of innovative teaching strategies and emerging scientific trends. The teachers encourage the students to cultivate a scientific temperament in their approach to experiments, emphasizing precision, logical reasoning, and adherence to scientific principles in their investigations. Our commitment to inquiry-based learning is reinforced through the establishment of a science club called Kalam club, where projects are funded by the management by withdrawing a small portion of money collected through social works, funds from Science Olympiad. We also ensure students participation in regional science webinars , workshops and inter-school competitions.

Moreover, I actively seek feedback from students, parents, and faculty to continually refine our science education strategies. By fostering a collaborative and dynamic learning environment, we empower our students to become critical thinkers and problem-solvers, laying the foundation for a lifelong appreciation of science.

Together, we aim to instill a love for learning and inquiry, preparing our students to navigate the complexities of an ever-evolving scientific landscape.

Ms. Rashmi Sinha
Kerala Public school, Gamharia

From the Principal's Desk



In the realm of discovery, scientific equipment is the lantern that illuminates the path from curiosity to understanding. In today's time imagining education without AI and Robotics is challenging given their increasing integration into various aspects of learning. Fostering scientific acumen in school students involves creating an environment that nurtures curiosity, critical thinking, and a hands-on approach to learning.

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.

Technology can make abstract concepts more accessible and lively engaging the students. We arrange for Virtual classroom wherein the students get an opportunity to see live the concepts given in the text books.

Establishing Science Clubs has been platforms that have provided opportunities for students to delve deeper into specific areas of interest and showcase their knowledge at various levels.

For a meaningful teaching learning process, I truly appreciate and value enthusiastic and well-informed teachers. Thus professional development of my teaching Faculty Members is a priority to us along with integration of a robust science curriculum that aligns with national standards, NCF & NEP.

Resource allocation for pupils has been a key factor. The school ensures that adequate resources, including well-equipped laboratories, updated textbooks, and technology, are available to support effective science education.

Winning an award is always a special moment that pushes you little further. Believing in the essence of such wonderful words, the students are awarded tokens of recognition to keep themselves motivated.

By actively embracing these responsibilities, the school has played a transformative role in shaping a school environment where scientific acumen is valued, nurtured, and celebrated preparing its pupils to meet their future roles and challenges.

Farahat Hasan,
Principal, International School, Patna

From the Principal's Desk



At our institution, we are dedicated to nurture a passion for science among our students, fostering a dynamic environment that stimulates curiosity and innovation. One of our prominent initiatives is the annual science fair, where students showcase their scientific skills through hands-on projects and experiments. This event not only hones their research and presentation skills but also instills a sense of scientific inquiry from an early age

Recognizing the importance of exposure beyond classroom walls, we actively send our students to external science exhibitions providing them with an opportunity to witness cutting-edge developments in the scientific world.

Participating in STEM Science Olympiad and Science Olympiad Foundation competitions allows our students to engage in healthy competitions, encouraging them to explore various facets of science and technology. To further enhance the scientific acumen of our students, we have established specialized clubs such as Robotics club and Nature's club that facilitate outdoor exploration and environmental studies, instilling an appreciation for the natural world.

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.

Mr. Atanu Rath,
Principal,
Apeejay School, Bhubaneswar

From the Principal's Desk



At Gitanjali Devshala, we aim at developing a scientific temperament from a young age which will equip our students with the skills and habits necessary to make informed decisions and contribute positively to society. The ability to question, think, introspect, evaluate, assimilate and finally innovate in all areas of one's life is what we hope to achieve. Firstly, we encourage curiosity and the habit of asking a lot of questions and seeking answers to those questions. Critical and logical thinking with an open mind for inventive elucidations are encouraged at all times using the principles of design thinking. Most importantly, children are made to feel secure so they don't feel vulnerable and they can problem solve without any fear of the consequences. Lastly, the resilience to keep looking for multiple solutions till they find the one that works best is encouraged. At Devshala, scientific thinking is more a comprehensive way of life towards problem solving rather than a special subject added to their curriculum.

Mrs. Madhvi Chandra
Principal, Gitanjali Devshala

From the Principal's Desk



Developing science skills in students involves creating an environment that fosters curiosity, explanation and critical thinking. Here we present, how we develop science skills in students of Carmel Academy. We implement the following measures to enhance the scientific mindset among the students on a regular basis.

- a. Encourage inquiry based learning – In Carmel Academy, the classes are based on the 5 A's i.e. Aim, Action, Analysis, Application and Assessment so that the students will be more thorough with the concepts of the lesson. Inquiry based learning is an approach that encourages students to ask questions and explore the world around them.
- b. Provide hands on experiences – Science is best learned through hands on experiences. We provide students with opportunities to explore science through experiments and weekly science club activities.
- c. Project work – Project work promotes interpersonal skills like communication skill, innovation and critical thinking on topics like food adulteration, rusting of iron, biogas plant, vermin composting etc.
- d. Science Exhibition–In Carmel Academy every year science exhibition is being conducted based on still models, working model, chart presentation and group work. They aim to enhance students' understanding of the world and the scientific method while igniting curiosity and promoting passion for science and technology. Based on this, we have taken the students of class 11 and 12 to participate in the "Science Enrichment Expo" conducted by the nearby college which benefited our children much.
- e. Quiz competitions – Quizzes are intended to encourage fun learning methods while also enhancing general knowledge. Students can "think outside the box". A team comprising of five students from Carmel Academy participated in 'Space Station Design Challenge' conducted by ISRO, Thiruvananthapuram and won the first position in the same. Recently two of our students won the 'ENQUESTA- All Kerala Inter School Quiz Competition'.
- f. Field trips – Industrial visits and field trips are regularly conducted covering all the three terms of the year. This year we took the students to industries like Nita Gelatin Private Limited, Khadi Bhavan, Agronomical Research Centre etc. Based on the visit, each student had to prepare a detailed report of it and to learn the different aspects of the working mechanism of industries. Thus field trips also help in improving students' social and interactive skills.

All these activities are methods used for inculcating scientific and research mentality in our students.

Fr. Yesudas Chungath CMI
Principal, Carmel Academy, Chalakudy

From the Principal's Desk



In our school, we have a multifaceted approach to promote scientific understanding. We belong to the CISCE stream which has a robust curriculum, delving into each branch of Science with adequate depth, thus ensuring students receive a comprehensive and up-to-date scientific education.

Through integration of hands-on experiments and interactive learning methods, students learn to apply theoretical knowledge in practical scenarios. Collaborating with professional organisations, we arrange professional development programs to keep the teachers abreast of the latest pedagogical techniques and scientific advancements, ensuring they can effectively convey complex concepts to students.

Furthermore, we actively support and initiate extracurricular activities such as science fairs and exhibitions. These initiatives provide students with opportunities to delve deeper into scientific exploration beyond the confines of the standard curriculum.

Moving forward, we would like to arrange guest lectures, workshops, and field trips to expose students to real-world applications of science. By fostering a culture of inquiry, exploration, and innovation, we hope to instill a lifelong love for science and equip our students with the skills necessary for success in an increasingly scientific and technological world.

Mrs. Jayasree Ramesh
Principal, Sri Kumaran Public School.

From the Principal's Desk



Science education is a journey of discovery, exploration, and limitless possibilities.

We, at apple i school encourage the students to question, analyze, and seek answers. Through our student centric teaching approach we ensure that students learn beyond the text book, think critically and embrace challenges with confidence. In order to instil deep curiosity in the minds of students and passion for science, we provide platforms to them in the form of science exhibition, project demonstration in classrooms, participating in science competitions in different schools and through lab activities. This encourages to unleash their creativity by shaping their minds to nurture and cultivate their innovative ideas.

Science plays a pivotal role in our school curriculum. Science instils a sense of intrigue that enables our students to develop understanding, foster a mindset of innovation and nurture problem solving skills.

Mrs. Pamela Mukherjee

Principal,

Apple I English Medium School, Visakhapatnam

From the Principal's Desk



It is really a proud moment for IES Public School that our students got an excellent opportunity to participate in the south zonal round of young budding scientist award constituted by Mac Millan.

The holistic approach of our institution and exemplary vision of our faculty members and students had turned our ATL lab and Research Centre to become laboratory, where critical thinking and problem solving skills merges to a focal point of design and innovation.

IES Society of Research Scholars actively participate in the research programmes and had successfully come up with several research papers. Students pursue their interests through research and innovation in a challenging way and it develops their potential to find solutions to many problems in our society. We promote all the activities that facilitates efficient learning by exploring and investigating. This out of box thinking arouses curiosity and makes them Gen Alpha Idealites.

As educators facilitating our students to unleash their talent making innovation prime priority, a batch of eighth graders MIRZAL, IBA and KENZA, showcased their innovative work in the realm of technological advancement, using the Wi-Fi-Based Rescue Vehicle with ESP-32 which undoubtedly will emerge as a pioneering solution designed to redefine rescue operations and extend its applications beyond conventional boundaries. The team created this innovative model which can be customized according to the choice. I am also glad to find our children explore beyond the confines of the laboratory to the real-world implementation and testing at such young age, navigating and overcoming unexpected obstacles with resilience.

Let me take this opportunity to thank Macmillan for this exclusive programme of budding scientist to encourage and enlighten young minds

I wish the team of young promising Idealites - good luck for their Innovative endeavour.

Mrs Sujatha P

Principal, IES Public School, Thrissur

From the Principal's Desk



Silver Oaks School is well known for its scientific skills which are best taught through hands-on activities and experiments. Students are not only provided with supportive and proper guidance but also provided with maximum opportunities to achieve their goal in life. To ensure the right spirit of competitiveness, Silver Oaks School motivates the students to participate in various brainstorming sessions, expert talks, learning-by-doing experiments.

To make Silver Oaks students more conscious about the surrounding and more considerate about the global issues and the environment, the school has initiated small projects, namely "Eco Ink", where students made marker ink using soot coming out from the generator and "Parali Murals", in which the students found innovative ways to reduce stubble burning, which were acknowledged and applauded by renowned personalities from the scientific community. We emphasize critical thinking in all our classroom learning. Critical thinking is an essential skill in science. Motivating and encouraging students to analyze data, evaluate evidence, and come up with their own conclusions is also the top priority of the school. Science is a collaborative field, and students should be encouraged to work together to solve problems and explore new ideas and ultimately foster collaboration. Moreover, technology can be a powerful tool for science education.

Macmillan Education, India is providing wings to the budding scientist. Moreover, they gave our students a platform to express themselves. The thought behind it was to develop curiosity and scientific temper in young learners and promote research and innovation for sustainable development. It gives me immense joy and pleasure when the young talented and inquisitive minds are engaged and enrolled in such scientific acumens.

Ms Ravinder Sra

Principal, Silver Oaks School,
Dabwali Road, Bathinda

From the Principal's Desk

Today's generation is full of intellect and enthusiasm only the duty of us is to direct these brains towards the productive ideas and channelize their energy for new innovation. This can happen by providing more opportunities and platform for them to do and think in new way, bringing the problems of today in front of them by sharing or instilling in them and ask them to find solutions of these. Surely they may bring better solutions for the problem and innovative ideas with them on harnessing physically can bring a new revolution in the technology and science.

Macmillan Budding Scientist provided one such platform to the students having thirst for science and wishes to change their ideas into hypothesis.

Indeed it is the dream of every young scientific mind of India to explore IIT and get into it after their class 12th. This platform provided by Macmillan surely will inspire young scientific mind to think beyond and bring new innovation in future.

I sincerely pay my gratitude to Macmillan team to bring such a beautiful and inspirational programme to the young mind and would like to appreciate the efforts of my teachers & students who in their 1st attempt let us pride to be at IIT Delhi.

I also pay my sincere thanks to Macmillan team to cooperate all the time during this journey and managing this event such a grand.

Ved Prakash Sharma

Principal, California Public School Moga

From the Principal's Desk



In the dynamic landscape of modern education, where the allure of electronic screens often overshadows traditional values, Disha Delphi Public School stands as a beacon of hope. Renowned for its innovative approach, Disha Delphi seamlessly integrates timeless traditional games such as Hopscotch, Marbles, Gullidanda, Kho-Kho, Lattoo, Kabaddi, Pithoo, and more into its holistic curriculum. These cherished pastimes, woven into the fabric of our educational framework alongside

value-imparting programs like Sanskar Shivir, serve as pillars of resilience against the rising tide of online addiction among children.

By encapsulating the essence of traditional games within our curriculum, aligned with the principles of the National Education Policy (NEP), we not only honor our cultural heritage but also provide a nurturing environment where students can explore, absorb, and learn at their own pace. In a world dominated by virtual experiences, traditional games emerge as catalysts for physical activity, cognitive engagement, and meaningful social interaction, countering the sedentary and isolating effects of modern technology.

It is with immense joy and pride that we witness our young, talented, and inquisitive minds engaging in scientific acumen programs like Macmillan Education, further enriching their educational journey. As we harness the power of tradition to shape a brighter, more balanced future, Disha Delphi Public School remains steadfast in its commitment to nurturing well-rounded individuals equipped to thrive in an ever-evolving world.

Dr. Poonam Jain

Principal, Disha Delphi Public School, Kota

From the Principal's Desk



We at Sanskriti School, feel that nurturing scientific acumen in schools is essential for imbibing critical thinking, problem-solving skills, and a deeper understanding of the natural world in our students. Here are some of the strategies that we employ to promote scientific acumen in our school:

- **Hands-on experiments:** We encourage our students to engage in hands-on experiments and investigations, providing opportunities for students to develop practical skills and a deeper understanding of scientific concepts.
- **Cross-curricular connections:** We integrate science with other subjects such as mathematics, language arts, and technology. This helps students experience the interdisciplinary nature of science and how it connects to various aspects of their education and the real world.
- **Use of technology:** We incorporate technology such as simulations and interactive software to enhance the learning experience. This allows students to explore scientific concepts in a dynamic and engaging way.
- **Real-world applications:** We connect scientific concepts to real-world problems and applications helping students to explore how science impacts their daily lives and society as a whole, fostering a sense of relevance and importance.
- **Encourage collaboration:** Promotion of collaborative learning environments through projects where students work together to solve problems and share ideas. Collaboration helps students develop communication skills and learn from each other's perspectives.
- **Critical thinking skills:** Emphasis on the importance of critical thinking in evaluating scientific information and evidence teaches students how to analyze data, identify bias, and make informed decisions based on evidence.
- **Encourage exploration:** Providing opportunities for students to explore different branches of science and pursue their interests helping them develop a deeper appreciation for the diversity of scientific disciplines and potential career paths.
- **Celebrate scientific achievements:** Highlighting the accomplishments of scientists and their contributions to society to inspire students by sharing stories of scientific discovery and innovation, fostering a sense of excitement and possibility.

Richa Sharma Agnihotri
Principal, Sanskriti School

From the Principal's Desk

Dnyanada English school is one of the best educational institutes where students receive instructions, typically organised into grades or levels, covering various subjects to acquire knowledge and skills. It serves as a structural environment for learning, fostering, social interaction, and personal development.

In our school, Promoting a child's holistic development includes principles such as providing a supportive environment, encouraging curiosity, organising age-appropriate challenges such as Sci Festa, Quizzes, Subject wise competitions designed by the respective subject teachers. Also , our school has started robotics and coding classes in school time so that it can help to develop critical thinking, problem-solving, and creativity in students. Additionally, it equips them with valuable skills for the modern workforce as technology continues to play a prominent role.

These classes foster digital literacy, encourage teamwork, and promote an interactive approach to learning, preparing students for a tech - driven future.

Also every year, We take our students for educational visits especially related to science. This year as well we took them to SNSP (Suresh Naik Space Park), and Homi Bhabha Nuclear Park and also got an opportunity to visit IUCAA University, Pune.

This tour was arranged to create interest in Science and technology as well as imbibe a scientific approach with life skills and classical reasoning bringing awareness, and easy solutions for day-to-day problems in the upcoming generation and the future of our nation.

We believe that these types of educational trips have various positive impacts on students in school. For this, We encourage our students to participate in different competitive, national exams like the Homi Bhabha exam, NSTSE, STEM, NSO, IMO, etc. & also conduct career counselling sessions for them so that they should be able to decide their career...

Every year, the Macmillan team diligently reaches out to us; providing a valuable platform for students to perform their talents. Through this initiative, students have the opportunity to display their skills and abilities. This year our school has been selected by Macmillan and we sincerely appreciate this golden chance. Your consideration means a great deal to us, and we are grateful for the chance to showcase our capabilities.

Mrs. Mamta Jaiswal

Principal, Dnyanada English School , Aurangabad

From the Principal's Desk



Science competitions serve as a platform for students to showcase their knowledge, creativity, and problem-solving skills. Beyond the thrill of competition, these events encourage collaborative learning, critical thinking, and hands-on application of scientific principles.

Our dedication to fostering scientific acumen extends beyond competitions. We've integrated interactive learning tools, hands-on experiments, and real-world applications into our curriculum. Our teachers undergo continuous professional development to employ innovative teaching methods, ensuring our students receive a well-rounded and dynamic science education.

Additionally, we encourage participation in science clubs, organize field trips to scientific institutions, and invite guest speakers to provide valuable insights. These experiences broaden horizons and demonstrate the relevance of science in diverse fields.

Together, let's continue to inspire the next generation of scientists, engineers, and innovators.

Mrs. Samriddhi Roy

Principal, Sadhu Vaswani International School,
Sanpada, Navi Mumbai

From the Principal's Desk



We are delighted to share the strides our school has taken in fostering a robust scientific temperament among our students. Recognizing the importance of instilling a passion for science, we have embraced various innovative teaching techniques to create an engaging and effective learning environment which we are describing as under:

One notable approach is the incorporation of hands-on experiments and practical demonstrations in our science curriculum in the class as well as in laboratories. These activities not only make the subject more tangible but also nurture critical thinking skills. Our students actively participate in experiments, allowing them to explore scientific concepts firsthand, fostering curiosity and a deeper understanding.

To enhance conceptual clarity, we have embraced modern technology, incorporating multimedia presentation that makes learning and sharing of knowledge more interactive but also cater to diverse learning styles, ensuring that every student can grasp complex scientific principles.

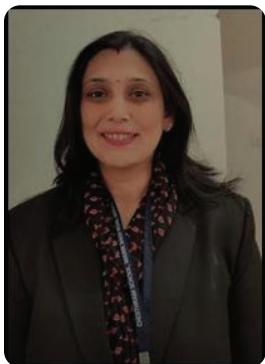
Furthermore, we have implemented project-based learning initiatives that encourage students to collaborate, research, and present their findings. This not only develops their scientific inquiry skills but also hones their communication and teamwork abilities.

In addition to traditional methods, our teachers regularly organize science fairs, workshops, and guest lectures to expose students to real-world applications of scientific knowledge. Field trips to research institutions, industries and nature parks also provide firsthand experiences that connect classroom learning to the outside world.

By integrating these diverse teaching techniques, we witness the blossoming of a true scientific temperament, one that will guide them throughout their lives, shaping them into curious, critical thinkers and lifelong innovators.

Mr. Shunmugasunder
Principal, Nashik Cambridge School, Nasik

From the Principal's Desk



The school has embraced a holistic learner-centric Science Educational Paradigm that develops scientific, ethical, and socially responsible individuals. We provide ample scope to be imaginative, creative, innovative and emotionally refined thereby developing scientific temperament to equip students with the skills and habits necessary to make informed decisions and contribute positively to society. Throughout the year, Science-based activities are conducted wherein the mentors demonstrate, conduct experiments, organise guest lectures or plan a field visit to instil scientific concepts among learners. Subject enrichment activities are always experimental activities where the students are engaged in Problem-based learning projects in groups to enable the child to think critically, be resilient, troubleshoot and be solution-driven. Investigatory projects are given to ignite young minds and instigate their curiosity and excitement for STEM. Students frame problem statements, experiment, make observations, draw conclusions and provide necessary solutions. We also promote Interdisciplinary learning where the parameters are based on the Logic of Math, Social ethos, Artificial Intelligence, Language, Research and Analytical skills to encompass scientific and creative development. Seamless Scientific and Holistic learning is elucidated as we provide the opportunity to students to participate in various Science competitions- Intraschool as well as at the Interschool level. We have well-equipped Physics, Chemistry, Biology, Biotechnology and Computer Science laboratories. Atal Tinkering Lab in our school give accessibility, affordability with abundant usage of various ICT tools along with Robotics thereby creating a comprehensive and interconnected learning experience. Integration of Art with Science makes the students more expressive. We have various clubs like the Health and Wellness Club, Robotics Club and Eco Club to cultivate a sense of unity by providing work experiences. This way, we foster scientific acumen in our school.

Ms. Anshu Chopra

HOD Science Senior Choithram School,
Manik Bagh, Indore (M.P.)

From the Principal's Desk



We at D Y Patil Dnyanshanti School believe that our students are gems of tomorrow so as to make them competent and skillful to outperform in this world of every day growing competition we conduct different curricular and co-curricular activities to develop scientific acumen among our students. Some of the activities include **use of Eduvate kit across grades III to IX**, wherein sparkle box provides number of age appropriate activities such as to understand and demonstrate the working of grinder, to understand the working of water sprinkler system, working of hand mixer tool etc.

Our students participated in the Avishkar G20 event which was held on 14th October 2023 at S.B.Patil Public school. The theme for the event was **Biomimicry**. Many of our students secured **1st position in Model making completion, 2nd position in Jingle making competition, 1st position in sketching etc.**

To enlighten our students with deep sense of care and love for nature and environment various activities were conducted across Grade I to X. Some of the examples of these activities include **Poster making on 'Reduce E waste'** by grade VIII students, **Reciting poem on 'Single use plastic reduce'** by grade IV students, **Role play on 'Go green'** by Grade IV students, **Skit on 'Healthy lifestyle'** performed by Grade VII students, Power point presentation on 'Sustainable food system adopted' and 'Reduce Solid waste 'by Grade V and Grade VI students respectively.

Our goal at DYPDSS is to provide our learners with an environment to inculcate scientific temperament and inquiry based learning. To achieve this, we conduct various activities such as **field visit at Zoological park, Mauli agro farms etc.** where students witnessed Working of Biogas plant, making compost out of Biodegradable waste, botanical garden showing various species of flowers etc.

To enhance scientific acumen of our children we organize Science Exhibition at school where students are provided with a stage to showcase their talent and cater their curiosity. Students exhibit different working models based on various scientific principles.

Geeta Pillai,

Principal, D.Y. Patil Dnyanshanti school, Ravet, Pune

From the Principal's Desk



Udgam School for Children is grateful to Macmillan group for encouraging innovation among school students and giving us a chance to showcase the ignited minds of our institution. The students who have qualified to visit IIT Bombay to showcase their innovative, sustainable product are driven by a passion to bring positive change. We believe in 'Going Vocal for Local'. The experience in IIT Bombay will certainly be a lifetime experience for our teacher and students. We do hope the value of their product design and prototype is appreciated and acknowledged as a pioneering step in the right direction by the judges.

Thank you once again.

Dr. G. Vijayalakshmi

Principal (Morning Shift), Udgam School for Children, Ahmedabad

From the Principal's Desk



“Science is the art of asking the right questions, the journey of discovery fueled by curiosity and the illumination of truth that transforms our understanding of the universe.”

The story goes that Isaac Newton asked himself why apples always fell straight to the ground, leading him to formulate his theory of universal gravitation, a key milestone in the history of science.

Science begins with curiosity and inquiry but proceeds with opportunities for

experimentation and exploration. Encouraging children to ask questions about the world around us helps in cultivating an empirical temperament. Supporting open discussion and exploration of topics in the classroom is of great impact. Showcase how science impacts everyday life to the students. An environment of working in groups and team on a project teaches valuable coordination and communication skills. Offer mentorship programs and interaction with experts in the field. Classrooms should transform into learning labs.

Fostering scientific acumen in students from early childhood had multifaceted importance. Foundational skills empower students to question, analyze and assess information effectively. Through hands on activities and exposure to real world applications, students must be encouraged to identify challenges, develop hypotheses, and devise evidence-based solutions. Additionally, nurturing scientific curiosity sparks creativity and innovation, propelling students to explore new approaches and transform challenges to opportunities. Providing students with the right resources, books and guidance by the teachers encourages them to pursue their scientific inquiries. Furthermore, a solid foundation in science opens the door to diverse learning opportunities in STEM preparing students for success in high demand professions in the 21st Century. Scientific acumen in students equips them with the skills and mindset needed to thrive in the constantly and fast evolving world.

Let's work together to cultivate a generation of curious and analytical learners.

From the Principal's Desk



Fostering Scientific Minds: The Journey Towards Inquiry and Innovation

In the pursuit of nurturing the next generation of innovators and thinkers, our school has adopted a dynamic approach to foster scientific acumen among our students. At the core of our philosophy lies the belief that hands-on experimentation is not just an educational tool, but a cornerstone of deep, lasting learning. We empower our students to venture beyond traditional textbook education, immersing them in practical, experiential learning. This approach significantly enhances their grasp and comprehension of scientific concepts, fostering a deeper and meaningful understanding.

Our teaching framework is deeply rooted in inquiry-based learning strategies. This method plays a crucial role in igniting curiosity and fostering critical thinking skills in our students. We motivate them to be inquisitive, to form hypotheses, and to actively involve themselves in their educational journey. This approach cultivates learners who are not mere passive recipients of information, but active participants who scrutinize, interrogate, and utilize their knowledge.

Integration of real-world applications into our science curriculum further underscores the relevance and omnipresence of science in daily life. Through this, students not only learn scientific concepts but also understand their practical implications, thereby seeing the world through a lens of inquiry and discovery.

Collaborative learning is a key element of our educational strategy. By engaging students in group projects and collaborative problem-solving activities, we do more than just sharpen their scientific skills. We are simultaneously nurturing vital life competencies like teamwork, effective communication, and empathy. This holistic approach ensures that our students develop not only as proficient scientists, but also as well-rounded individuals equipped with essential social skills.

Furthermore, we emphasize the development of a growth mindset. Our educational environment encourages students to view challenges as stepping stones, embrace failures as learning opportunities, and develop the resilience necessary to persevere in the face of scientific inquiries.

In conclusion, our school's commitment to hands-on experimentation, inquiry-based learning, real-world application, collaborative projects, and nurturing a growth mindset, collectively contribute to cultivating scientifically literate, curious, and resilient young minds. It is with this robust foundation in scientific acumen that we are confident our students will excel academically and make significant contributions to the scientific community in the future.

Mr. Anand Victor,
Principal, Indian Education School, Kuwait

From the Principal's Desk



“Science begins with wonder, scientific temperament and rational thinking”

DPS Dubai encourages intellectual curiosity, sustained hard work, rational and critical thinking, independent learning and innovative solutions among students. They feel comfortable and secure in their surroundings and are more willing to take risks, and get along well with their teachers. DPS Dubai has a team of highly qualified and experienced faculty. Students at DPS Dubai are urged to apply their scientific process abilities and creative thinking to build a foundational grasp of science. Students “learn by doing” in our school and by reflecting on the experience. Our school’s well-designed, monitored, and evaluated experiential learning programs foster

interdisciplinary learning, civic involvement, career development, cultural awareness, leadership, and other intellectual and professional abilities. These activities also encourage academic research, boost student engagement by promoting cooperation and scaffolding among students, improve learning efficacy, help with memory retention, connect theory to practice, and foster the development of skills. Students are creative thinkers and connect their learning with real life activities. We have STEAM labs in primary and middle school and well-equipped Chemistry, Physics and Biology laboratories to foster students’ scientific skills. Through project-based learning, students investigate, respond to, and handle challenging, thought-provoking, real-world questions as they gain information and build skills. The projects are focused on helping kids learn by taking charge of their education and cultivating 21st-century abilities like communication, collaboration, critical thinking, and creative thinking. Our lessons are integrated with technology and students are provided choices in their tasks. Students participate in inter and intra school science exhibitions, create prototypes and present innovative solutions to many real life problems. They have won many prizes in state and national competitions.

Mr. Rashmi Nandkeolyar,
Principal, DPS Dubai

From the Principal's Desk



I am delighted to extend my warmest congratulations to all the participants of the Macmillan Budding Scientist competition. It gives me immense pleasure to witness the enthusiasm and dedication our students have shown towards scientific inquiry and research.

We firmly believe in providing platforms that encourage our students to explore and innovate in the field of science. Here are several strategies that we employ at Habitat School, Ajman.

Curriculum Development: Our school leadership team works with teachers and curriculum developers to ensure that science is integrated throughout the curriculum.

Professional Development: We provide ongoing professional development opportunities for teachers to help them stay current and innovative in their instruction.

Partnerships with Scientific Institutions: We establish partnerships with local schools, universities, research institutions, and STEM-focused organizations to provide students with opportunities for hands-on learning experiences, mentorship programs, and access to experts in the field.

Extracurricular Activities: We encourage and support extracurricular activities such as science clubs, science fairs, Digital Fest, Harvest Festival, Coding Clubs, and field trips to scientific institutions that can further engage students and foster their interest in science.

Inclusive Environment: Our School creates an inclusive environment where all students feel welcome and supported in pursuing their interests in science regardless of their background or identity is crucial. This includes efforts to address gender and racial disparities in STEM fields and provide accommodations for students with disabilities.

Emphasis on Critical Thinking and Inquiry: We encourage critical thinking skills and inquiry-based learning in all subjects which help our students develop a scientific mindset and approach to problem-solving.

Once again, congratulations to all the participants of the Macmillan Budding Scientist Award. May your passion for science continue to illuminate the path to success.

Mr. Bala Reddy Ambati
Principal, Habitat School, Ajman, UAE

From the Principal's Desk



"The pursuit of science is a never-ending journey into the unknown, fuelled by curiosity and guided by reason."- Neil Armstrong

At ISN, collaboration is paramount in our educational approach, where teachers pool their best practices to create a rich learning environment. Together, we deliberate on effective teaching strategies that prioritize concept-based learning over rote memorization, empowering students to think critically and draw their own conclusions. Our school boasts of state-of-the-art science labs, providing hands-on experiences that deepen understanding and encourage practical application of knowledge. Projects undertaken by our students delve into global issues, fostering budding scientists through extensive research and exploration. We place a strong emphasis on holistic development, nurturing not just academic prowess but also character, values, and 21st-century skills. Our goal is to provide students with ample opportunities to explore their interests and passions. The Macmillan Budding Scientists programme serves as a platform for students to showcase their scientific knowledge, instilling confidence and a sense of accomplishment. We encourage our students to dream big and pursue ambitious goals, reminding them that every challenge is an opportunity for growth and innovation. True education extends beyond textbooks, encompassing a learning environment that inspires curiosity and self-discovery. Such hands-on-experiences can mould the students and help them to confidently face the challenges that come their way. By providing ample opportunities for exploration and discovery, we empower our students to become lifelong learners and innovators in the field of science. Together, let's ignite their passion for discovery and equip them with the skills they need to thrive in an ever-changing world.

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

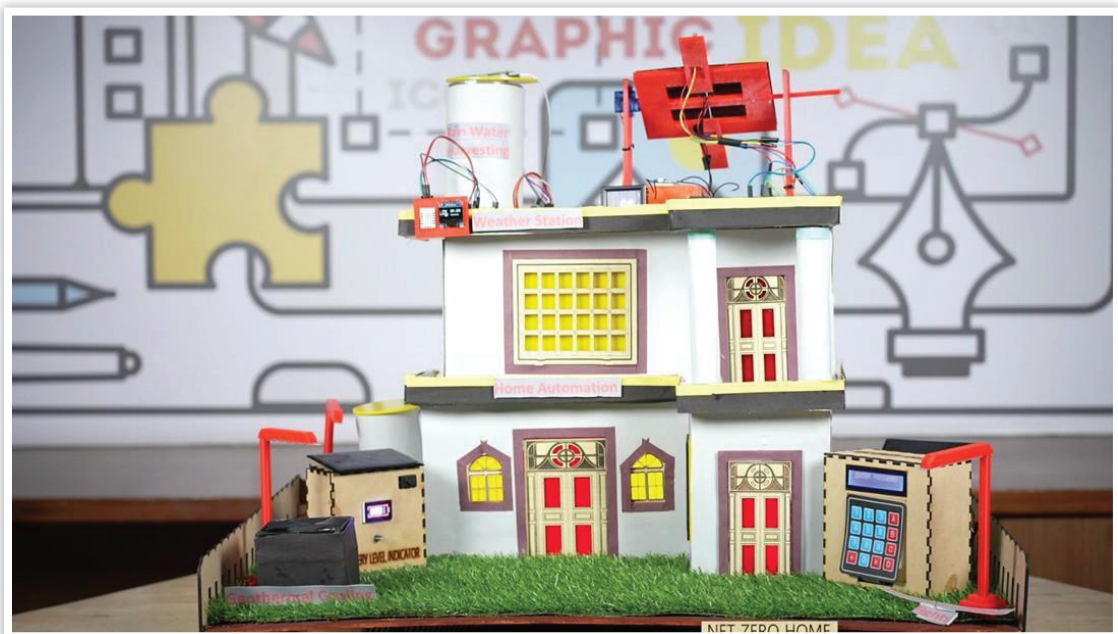
Project Name: Net Zero Home

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.

Shrunk 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:

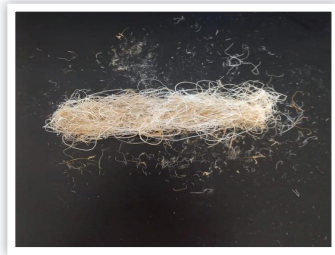
- Two overlapping layers of cotton cloth,
- Layer of wax,
- Layer of plant fibre,
- Two overlapping layers of cotton cloth.

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

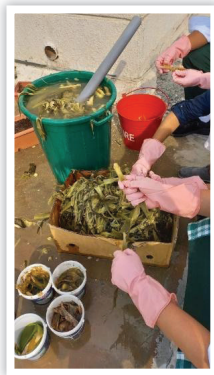
Our experiments have concluded that non-biodegradable disposable sanitary pads can be replaced by the more environmentally friendly and accessible Poaceae Eco Pads as a solution to both pollution as well as period poverty.



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.

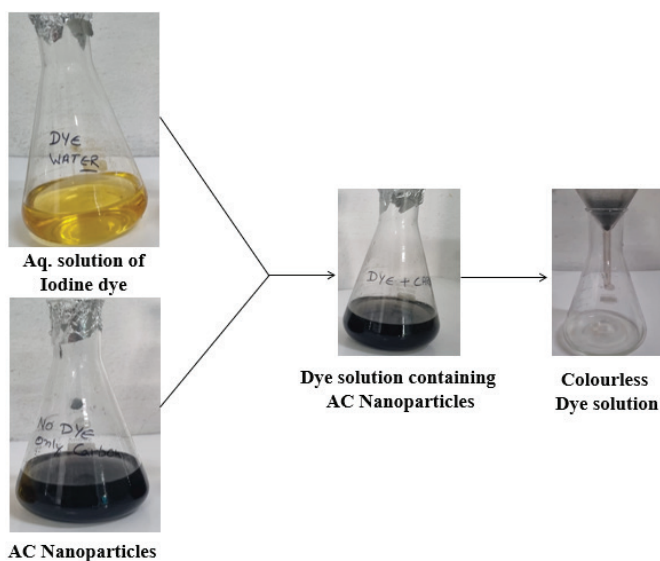
Results-

Characterization Studies on Carbon derived from onion skin waste:

1. **X-ray Crystallography (XRD)** - XRD revealed amorphous and nanosized Activated Carbon particles, i.e., <math>< 9\text{ nm}</math>.
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, -CH₂, and -CH₃.
6. **UV-VIS spectrophotometry** - The maximum absorbance (λ_{max}) 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



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

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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 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 'Pragyan' 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.

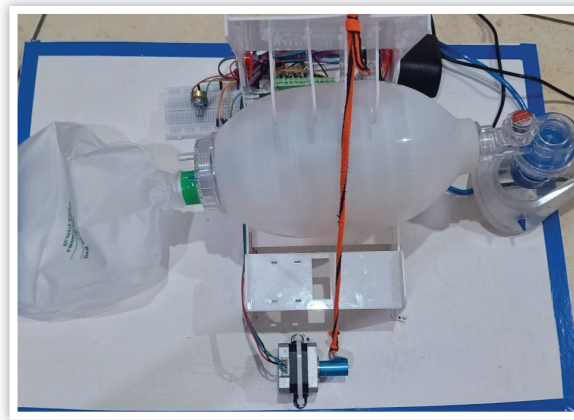
Ventilator is the name of the medical device that is used to treat respiratory failures. Ventilators are used for patients who are unable to breathe, so the term "life support" is also used. If you're unable to breathe on your own, this device will assist you. Another name for it is a "mechanical ventilator." 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  
}
```

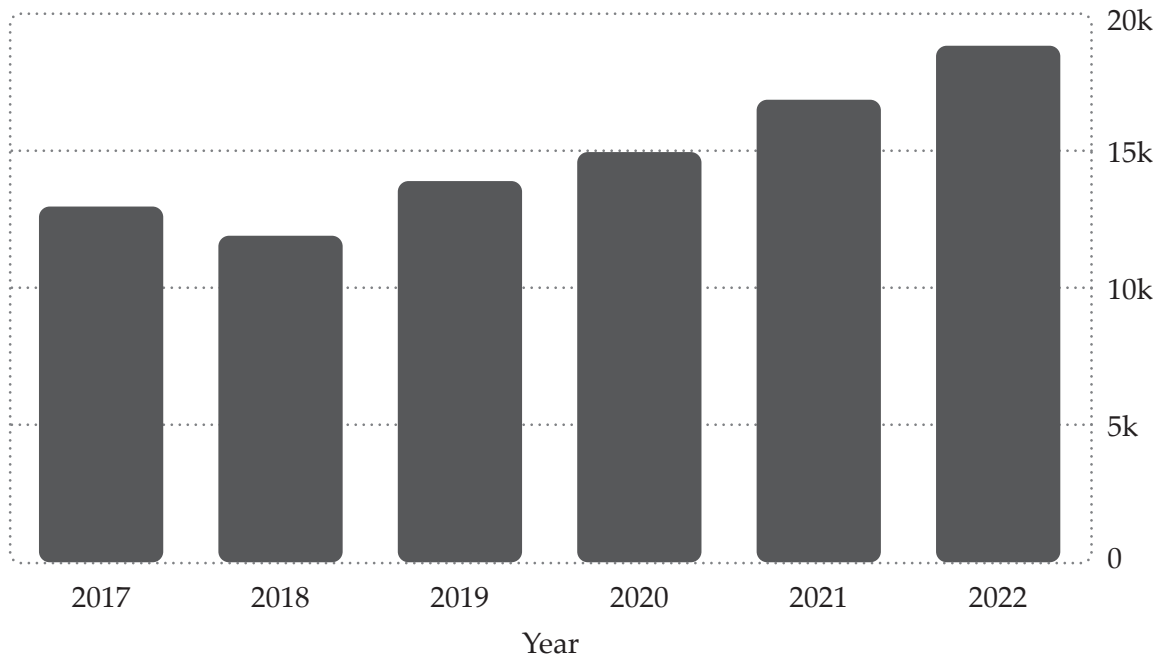
This project highlights the possibility of building a portable, low-cost ventilator that will have all the basic functions of a ventilator. This ventilator can be used in hospitals and in homes for a short span of time until professional help is provided.

11. School Name: Apeejay School, Bhubaneswar**Students:** Rohan Mansingh, Amlan Swastik Behera,
& Samikhya Patra**Project Supervisor:** Ms. Bandana Panda**Project Name:** Sensor Safety to MinersScan 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.

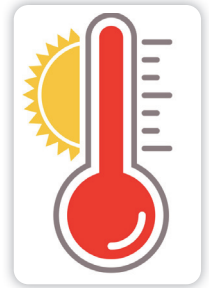


Death of miners

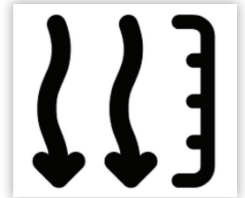
**Mine Exploration Rover (MER):**

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.

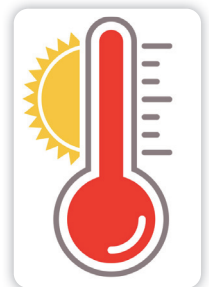


MER's analysis of these parameters allows the identification of low-risk mining points, facilitating the subsequent setup of the Miner Safety Stick (MSS). Additionally, MER includes GPS tracking for precise location identification.

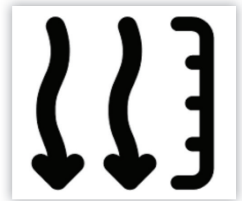
Miner Safety Stick (MSS):

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

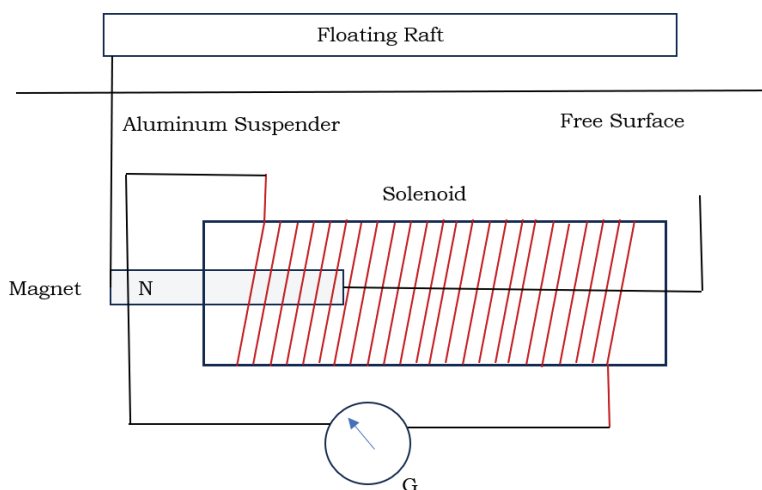


Figure 1.2 – A Model Structure for Toritorongo

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:



Two wild jumbos killed as train hits them in Kamrup

Mukut Das | TNN

Guwahati: Two wild elephants were killed after being hit by a train in Assam's Kamrup (Metro) district while they were crossing the railway tracks in Khetri area on Tuesday night.

According to the railway authorities, the incident took place around 10 pm at Durun Moinajan area, which falls under Khetri police station, on the outskirts of Guwahati city.

Additional principal chief conservator of forests & chief wildlife warden, Assam, Mahendra Kumar Yadav, said: "A herd of elephants was seen roaming in and around the Khetri area for the last few days, probably in search of food. The elephants that were killed in the train accident might have strayed away from the herd. We have initiated an investigation to know from which



NO END TO THEIR MISERY

place the elephants came."

A local resident said, "The wild elephants regularly come to this area from nearby hills by crossing the National Highway 37 in search of food. A herd of elephants came to the area last night, but two elephants died after a speeding passenger train mowed them down while they tried to cross the railway tracks."

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

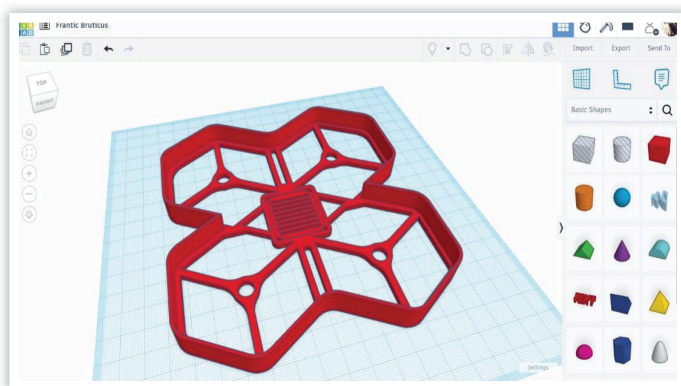
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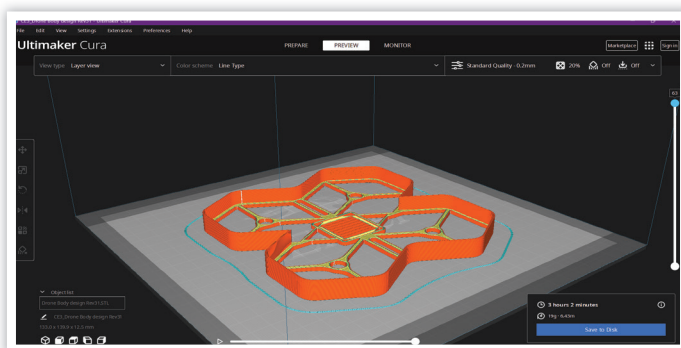
Introduction

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

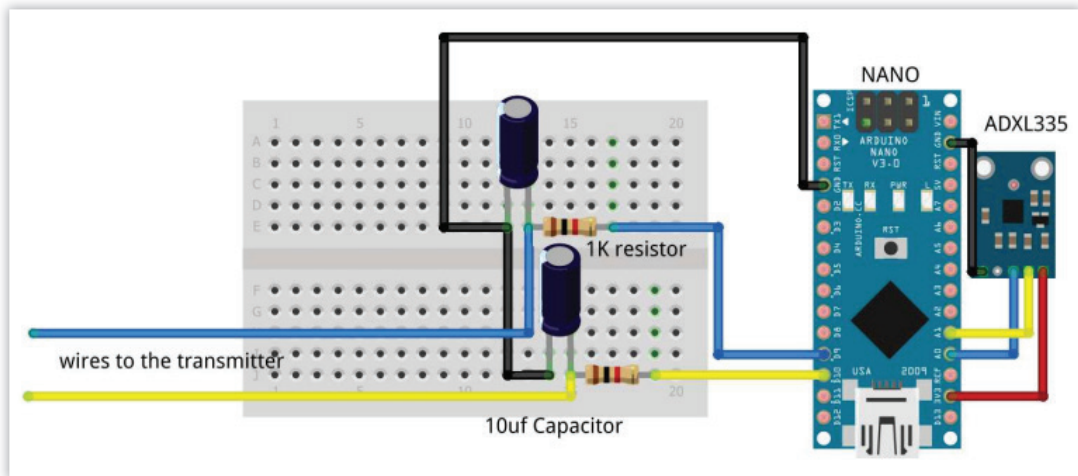


Fig.2.1 Accelerometer configuration in Remote controller

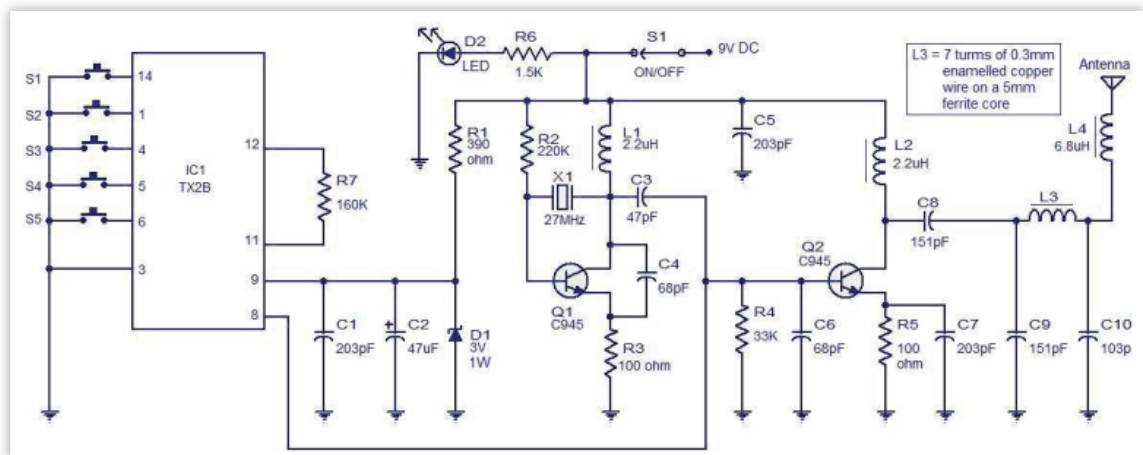
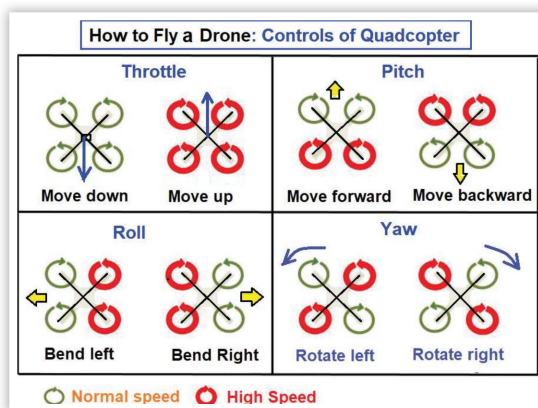


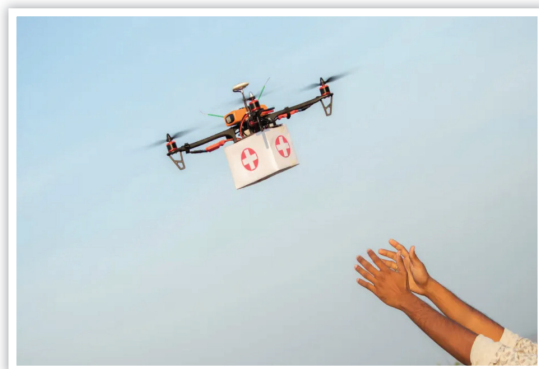
Fig.2.2 Circuitry development for Remote controller

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

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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 doesn't 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”

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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 O2 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

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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 Hiriyyur, Aryaa Sridar,
& Vaibav Sanjay Kanth**Project Supervisor:** Ms. Suchita Kadambi**Project Name:** PUrSE (Pick Ur School Easy)
– An innovative School Search AppScan the code to
watch the video
of the project

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 enhance and improve 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

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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

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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 IoT -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

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of the project



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 brought 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

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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 supplement for fertilizer 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 in water 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 helps to reduce the fertilizer cost and can even enhance 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 to scale 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

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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 person 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 a 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 a parking lot and your car starts charging automatically.

Principle Used:

- Metals are good conductors 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. In spite 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

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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

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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

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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

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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

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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 LITHIUM 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

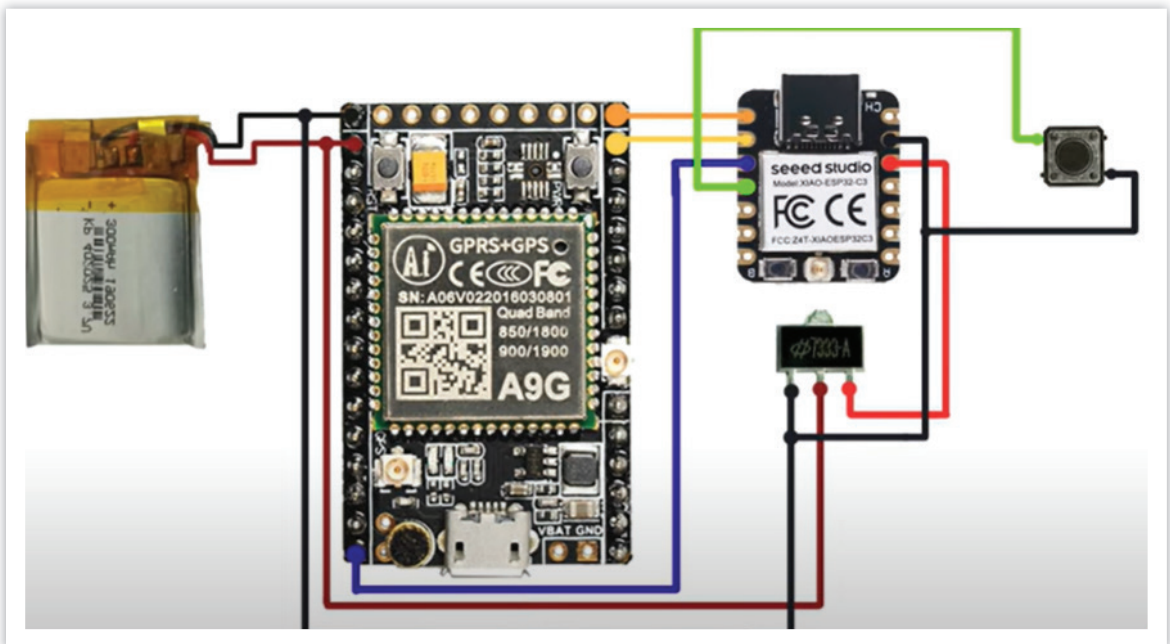
Advantages

1. It is chargeable and it can be 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



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:

- 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:

- 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:

- 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:

- 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

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watch the video
of the project

**Introduction:**

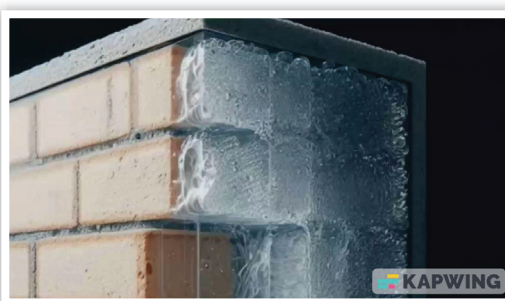
In the pursuit of sustainable living, the construction industry stands at a crossroads. Traditional building materials, contribute significantly to environmental degradation. The conventional manufacturing process involves excavation, leading to soil erosion, air pollution from brick kilns, and the release 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.

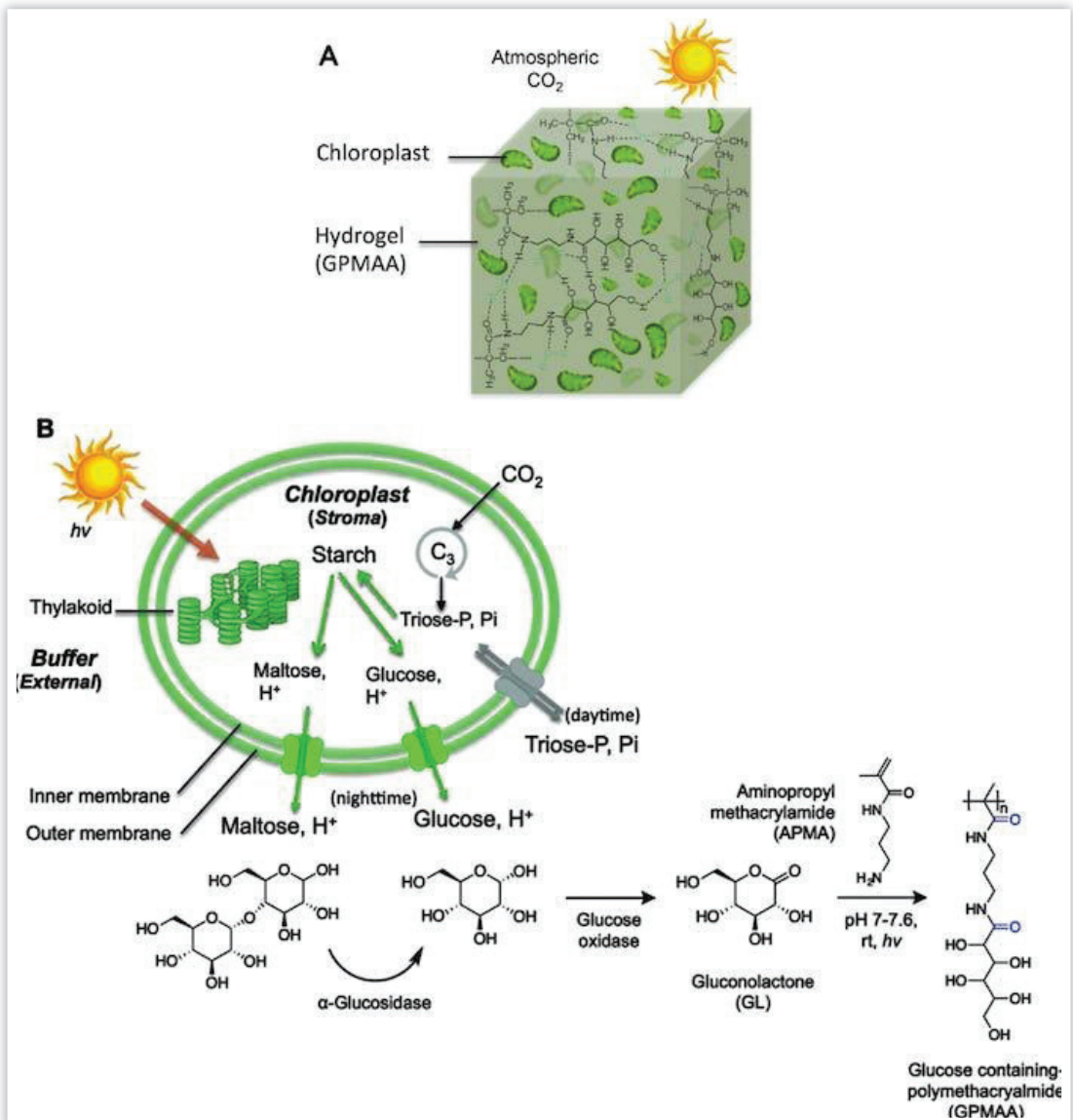
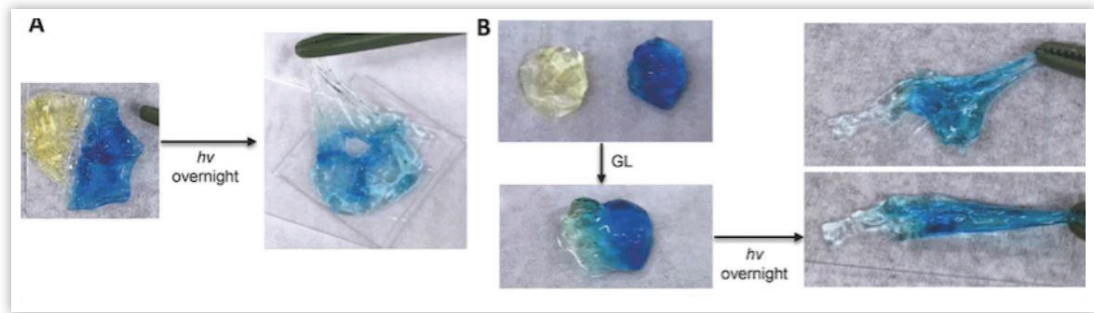
The Problem:

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 CO₂ 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

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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.



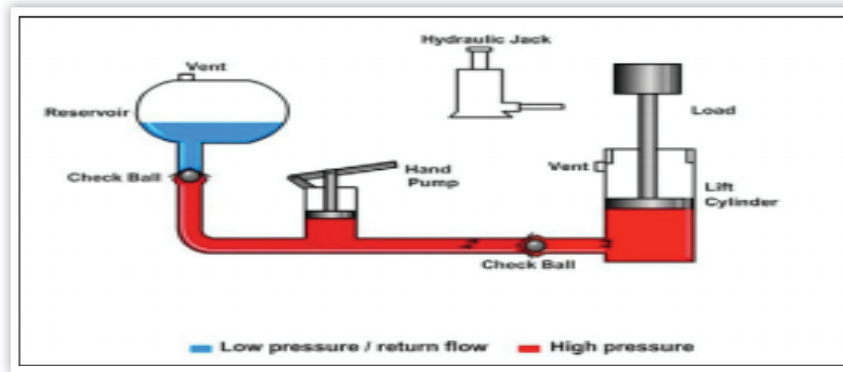
PRINCIPLE

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

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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

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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



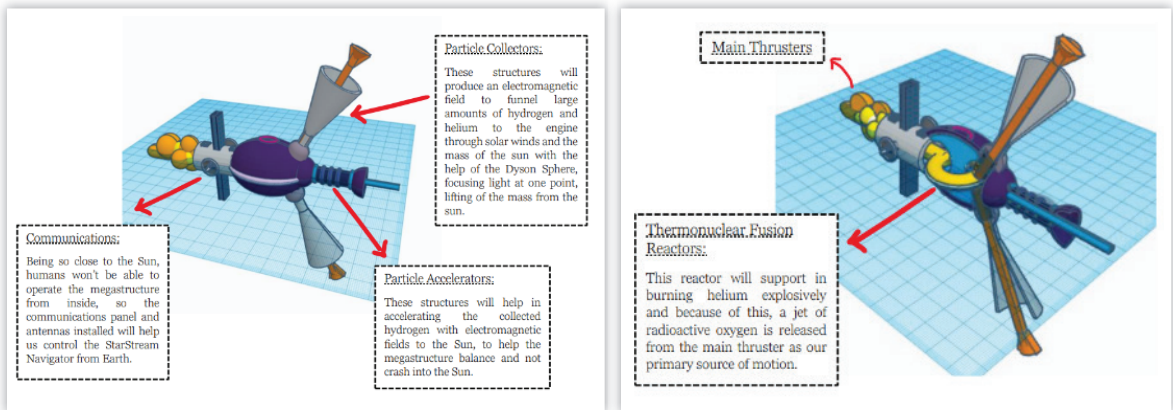
In the realm of hypothetical mega-engineering projects, two concepts stand out as potential game-changers: the Dyson Sphere and the Stellar Engine. While these ideas exist primarily in the realm of theoretical speculation, they offer tantalizing glimpses into the boundless possibilities of humanity's 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?

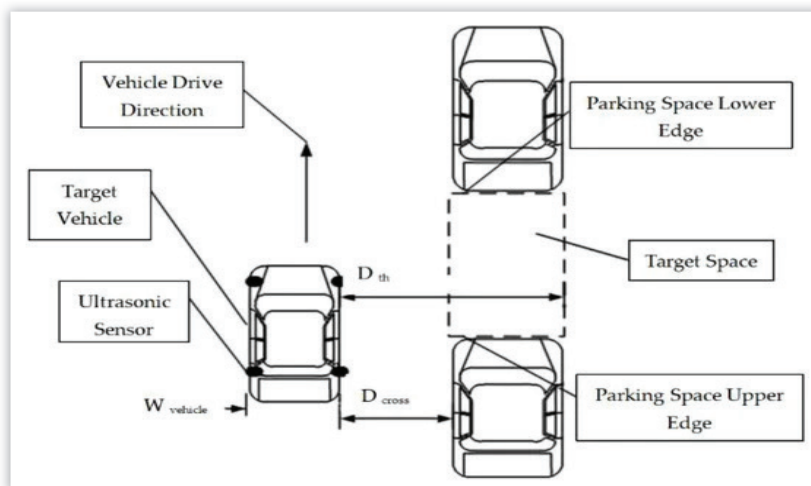
Problem:

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.

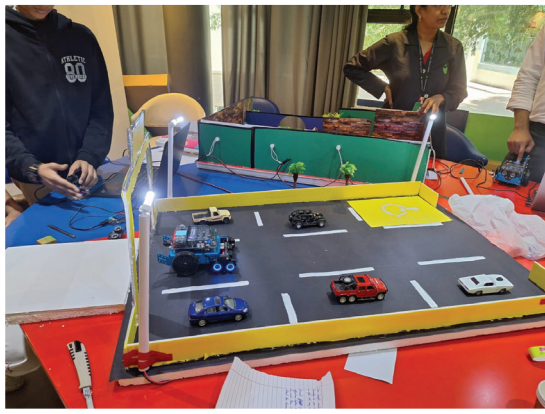
Basic Idea:

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

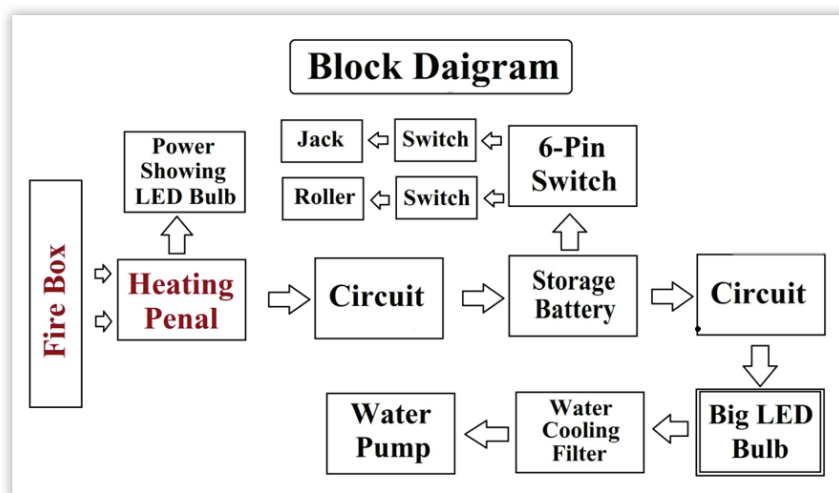
36. School Name: Indian School Nizwa, Nizwa

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

**Aim:**

The project aims to generate electricity from waste material while mitigating carbon emissions through the use of carbon filters.

Materials Used:

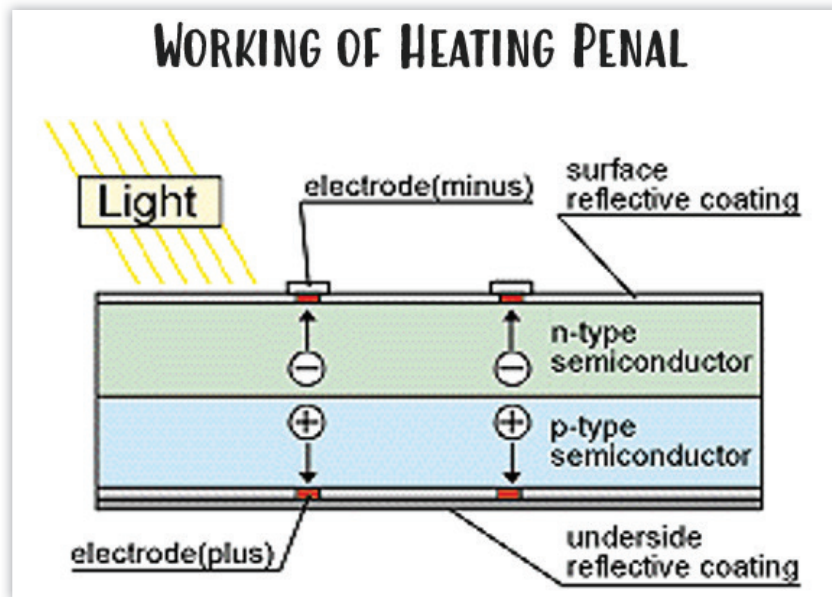
Zaar box, Heating Panel, LED Bulb, Resistor, DC motor 3000 RPM, Battery PCB, Roller System, Mini switch.

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.

Macmillan Budding Scientist, powered by Springer Nature 2022-23

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 wastes 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.

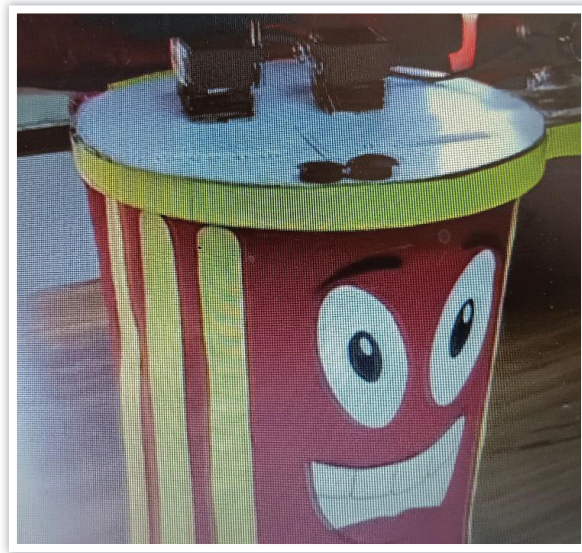
So we have developed the I Bin that can effectively separate the waste into biodegradable and non-biodegradable categories. This will drastically reduce the ill effects caused otherwise. It also saves the time spent on the process and the cost involved with it. The sorting also helps the local authorities 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 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 stinky 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 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 Co₂ and on the other it emits lots of O₂ 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 steps 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.

Participate in Macmillan Budding Scientist 2024-25

ELIGIBILITY

Classes
6 to 8

Team Size
3 students & 1 coordinating teacher

CATEGORIES

NEW
Internet of Things & Artificial Intelligence

Environmental Science

Biological Sciences

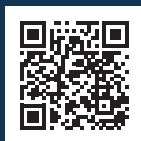
Physical Sciences

Chemical Sciences

NOMINATION

Nomination is going on and closes on October 31, 2024

Scan the QR Code for the nomination form



OR

Enter this URL in your browser

<https://macmillaneducation.in/macmillan-budding-scientists/>

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.

THINGS TO CONSIDER

- The last date for submission of the video is **October 31, 2024**. 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.

REGIONAL



Exciting STEM kits for 1st & 2nd placed teams

AWARDS



GRAND FINALE

1st place: Science grant of ₹25000*
2nd place: Science grant of ₹20000*

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