
# ANNUAL REPORT 2023

## ROBOTICS & EV CLUB


# Technoxian

The Technoxian- World Robotics Championship is a distinguished tournament that annually attracts a myriad of international teams to participate in a plethora of robotics challenges. Ranging from Bots combats to Drone racing, the challenges are both innovative and competitive. Every year, New Delhi serves as the venue for this grand event.

On 23rd August 2022, our team marked its presence in the Robowars 60kg category. This particular segment of the championship saw active participation from over 30 dynamic teams, showcasing their technological prowess and strategic capabilities.

Our team, comprising of Aadil Khatri, Girraj Shah, Urmit Mehta, Vraj Modi, Madhva Patel, Shyam Gohil, Dev Patel, Tirth Borda, Marmik Shah, and Arjun Rabari, delivered a commendable performance. Out of the stiff competition that we faced, we managed to secure the fourth position in the championship, a testament to our hard work, dedication, and synergy.

To conclude, our participation in the Technoxian- World Robotics Championship not only offered an opportunity to showcase our skills on a global platform but also reinforced our commitment to continuous learning and innovation in the field of robotics. The experience was invaluable, and our team returned richer in knowledge and experience.

A remarkable accomplishment was achieved by our esteemed Robotics and EV Club at The Faculty of Technology and Engineering, The Maharaja Sayajirao University of Baroda. Our team, comprised of Naim Rathod, Chaitanya Patil, Meet Chauhan, and Dhruval Varasada, secured the prestigious 1st Runner-up position in the SmackBot robotics competition held at Technex'23 Robowars, a prestigious global level event organized by IIT Varanasi (BHU). They won the competition and earned a prize money of Rs 15,000, showcasing their skills and expertise in the field of robotics and engineering.

Technex Robowars event is organized at the international level where students of several universities showcase their talents by coming up with their robots with unique features. In this event, the eye-catching moment is the war between the robots.

Under the mentorship of Dr. Akash Pandey and Mr. Devasi Chocha, our students represented the university with exemplary dedication and innovation. Notably, their creation, "SmackBot," was conceived and developed entirely by the Robotics and EV Club, exemplifying their unwavering commitment to excellence.

We extend our heartfelt gratitude to all those who contributed to this remarkable achievement, including the dedicated students, the mentors, the Department, and Workshop for their steadfast support, the esteemed Head of Departments, the Dean, and the broader community of supporters who played an integral role in facilitating the team's success.


# Technex'23

# MindBend'23

On April 1, 2023, the Robotics and EV Club of MSU eagerly stepped into MINDBEND, one of Gujarat's most celebrated Techno-Managerial Fests, masterfully orchestrated by the student body of the Sardar Vallabhbhai National Institute of Technology (SVNIT) Gujarat.

Our enthusiastic team, made up of Chaitanya Patil, Naim Rathod, Meet Chauhan, Aditya Mistry, Ayush Biscuitwala, Taher Dahodwala, Sandip Suthar, Vrunda Gurjar, Ishan Mistry, and Venu Vachharajani, plunged into five distinct competitions:

1. Sky High: With unwavering dedication and innovative designs, our team emerged victorious with the First Prize. Tasked with creating a high-performing, remotely operated aerial vehicle, we triumphed over more than 15 formidable opponents.

2. Cat-a-Pult: Engineering met creativity as we demonstrated our prowess by constructing a highly efficient catapult for launching projectiles. Our blended approach of theory and practice earned us the First Prize.

3. Racing: This adrenaline-pumping competition saw our team in the thick of it, crafting agile vehicles. While the top spot eluded us, the learning on vehicle dynamics and control systems was invaluable.

4. Maze Runner: Navigating intricate mazes with autonomous robots, we stood our ground against fierce competition, showcasing our problem-solving acumen and technical sophistication.

5. Line Follower: Our dedication shone through as we developed robots adapt at following precise paths, even as we encountered and overcame challenges.

MINDBEND, more than an event, is a beacon for technological inspiration. It's a confluence of renowned scientific minds, avant-garde technologists, and thought leaders, all assembled on a singular platform to ignite discussions and fuel innovations in the world of science and technology. By spearheading such landmark events, SVNIT Gujarat and its proactive student community make an indelible mark on Gujarat's technological horizon.

For the Robotics and EV Club of MSU, MINDBEND wasn't just an event, but a crucible of learning and triumph. Our dual First Prize victories in Cat-a-Pult and Sky-High competitions speak volumes of our team's relentless drive and inventive spirit. Moreover, we deeply resonate with MINDBEND's overarching mission of uniting the crème de la crème of the tech world. As we look ahead, the prospect of participating in future iterations of this fest energizes us, promising platforms to further hone our skills and foster symbiotic collaborations. MINDBEND is more than a festival; it's a tech odyssey, and we're deeply privileged to chart its course.

A two-day workshop organized by the Robotics and E.V. Club, the student chapter of TRS (The Robotics Society), in collaboration with IIT Varanasi (BHU) and Innovians Technologies. The workshop was generously sponsored by MSU Vision 2020, MSU Alumni Foundation, and The Robotics Society of India. The event aimed to provide hands-on experience in the field of robotics and Arduino to aspiring engineers and enthusiasts.

Day 1: Learning the Basics of Arduino

The workshop commenced with an enthusiastic gathering of 70 students eager to delve into the world of robotics and Arduino. Mr. Ashwin Saini, a corporate trainer from Innovians Technologies, led the workshop as the instructor. His expertise and passion for the subject were evident from the outset.

The first day of the workshop primarily focused on Arduino basics. We learned about the Arduino microcontroller, its components, and how to program it using the Arduino IDE. The instructor provided clear explanations and practical demonstrations, ensuring that everyone could follow along.

After grasping the fundamentals, we were divided into groups for hands-on practice. Each group was provided with an Arduino kit, and we set out to build our first project – a line follower robot. We learned how to interface various sensors and motors with the Arduino board and wrote the necessary code to make the robot follow a predefined path.

Day 2: Exploring Advanced Robotics Concepts

The second day was even more exciting as we delved into advanced robotics concepts. We covered a wide range of topics, including obstacle avoidance, voice control, gesture control, and app-controlled robots.

1. Obstacle Avoider Robot: We built robots equipped with ultrasonic sensors to detect and avoid obstacles. This project taught us how to implement logic to navigate around objects successfully.

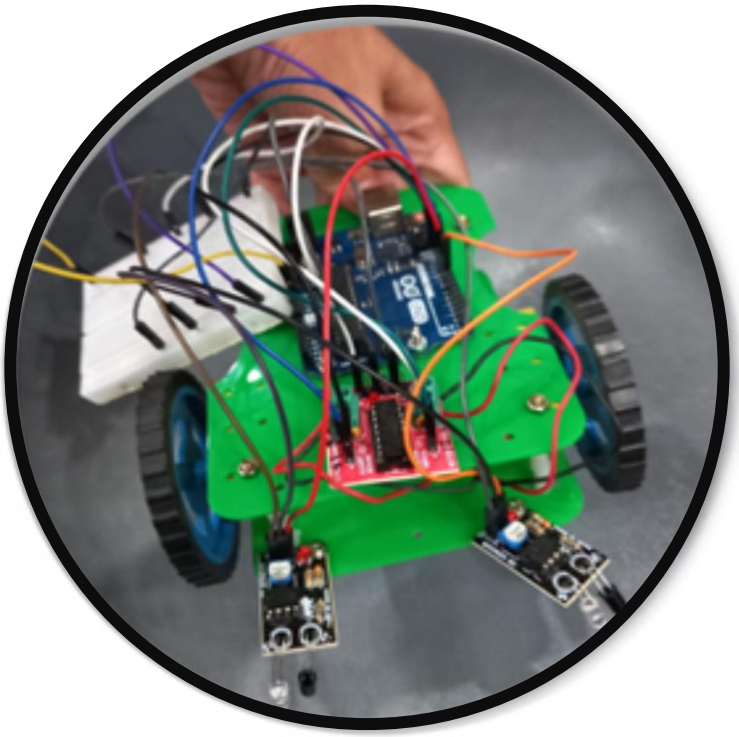
2. Voice-Controlled Robot: We explored the fascinating world of voice recognition technology, programming our robots to respond to voice commands. It was amazing to see our creations respond to our voices.

3. Gesture-Controlled Robot: In this segment, we used motion sensors to control our robots through gestures. This hands-on experience opened up new possibilities in the field of human-machine interaction.

4. Android App-Controlled Robot: The final project involved creating an Android app to control our robots remotely. It was incredible to see our robots respond to commands from our smartphones.

At the end of the two-day workshop, a valedictory ceremony was held to celebrate our achievements. Certificates of participation were distributed to all the attendees, recognizing their dedication and hard work. The instructors and organizers were also acknowledged for their efforts in making the workshop a success.

Participating in this workshop was an enriching and enlightening experience. We gained valuable knowledge and practical skills in the field of robotics and Arduino, thanks to the excellent guidance of Mr. Ashwin Saini and the support of the organizers and sponsors.



# Arduino Workshop

# FootPrints'23

We are thrilled to share a momentous achievement for our Robotics and EV Club at the Faculty of Technology and Engineering, The Maharaja Sayajirao University of Baroda. In this report, we will provide an account of our dedicated team's outstanding performance at the esteemed national-level competition, FootPrints, organized by our university.

Our Robotics and EV Club team showcased exceptional dedication and hard work as we participated in various challenging events at FootPrints 23. These events included SmackBot, TechnoKick, Hydrex, Ballista, Wrestle-O-Mania, and Monochrome. Our relentless commitment paid off as we secured the prestigious 1st position in the Ballista competition. These remarkable victories are a testament to our team's unwavering dedication, creativity, and technical expertise.

At the national-level event, our university was proudly represented by our team, consisting of 50 talented members from the Robotics and EV Club. Our participation demonstrated our exceptional skills, innovative spirit, and competitive determination. This achievement reflects our commitment to excel on a grand stage and highlights our potential at the national level.

FootPrints 23, organized by The Maharaja Sayajirao University of Baroda, is a prestigious national-level event that brings together students from various universities to showcase their skills and innovations through unique robotic creations. The event is renowned for its exhilarating robotic battles and challenges, providing participants with a platform to push the boundaries of creativity and engineering.

Under the expert guidance of Dr. Akash Pandey and Mr. Devasi Chocha, we, the students of the Robotics and EV Club, conceived, designed, and brought to life several innovative robots. These robots not only demonstrated our technical prowess but also showcased our ability to transform ideas into functional and competitive machines. The process demanded relentless hard work, countless hours of dedication, and unwavering support from our esteemed Department and Workshop.

We are delighted to present a report on our involvement in the Kaushalya Drone Hackathon, a vibrant online event by "Kaushalya – The Skill University" which concluded registration on July 25th, 2023. This event celebrated drone technology, uniting participants from varied backgrounds to design 3D drone models addressing real-world issues.

Our team introduced a novel traffic-based drone project designed to alleviate urban traffic congestion. The key features included:

Real-time Traffic Data Collection: Our drones, armed with advanced sensors and cameras, captured real-time traffic dynamics such as vehicle flow and road conditions.

Bottleneck Identification: Leveraging modern algorithms, our drones pinpointed traffic congestion hotspots, providing valuable insights for better traffic management.

Enhancing Urban Mobility: Our core vision was to revolutionize urban transport using the data our drones collected, focusing on increased efficiency and reduced congestion.

Impressively, our project cleared the pre incubation round, and we were provided with prototype development assistance from Drone Mantra Lab.

As we look forward, our roadmap includes:

Testing and Optimization: Ensuring the efficiency of our drone prototypes in real-world contexts.

Expert Collaborations: Partnering with specialists in drone tech and urban mobility to amplify our drones' potential.

Tech Exploration: Incorporating emerging technologies to augment our drones' capabilities.

Outreach and Awareness: Promoting sustainable transport solutions with our drones and engaging with the community and stakeholders.

Implementation: Aiming to deploy traffic-based drones in cities for active traffic management and to champion a sustainable urban transport system.

Our triumphant participation in the Kaushalya Drone Hackathon was a watershed moment, reinforcing our dedication to genuine problems. Winning the top honor and securing prototype support propels our vision of reshaping urban mobility. With our path set, we are committed to a future of efficient and sustainable urban transit steered by our traffic-based drones. The journey progresses, and we eagerly await our role in shaping it.

# Kaushalya Drone


# Internship at Hison Green

In an age marked by alarming pollution levels and a heightened reliance on diminishing fossil fuels, addressing the pressing environmental concerns is more crucial than ever. Against the backdrop of this environmental crisis, the electric vehicle (EV) segment emerges as a beacon of hope, offering a sustainable solution to counteract the detrimental effects of traditional fuel sources. HISON ENERGIES PVT LTD passionately aligns itself with this vision of a greener tomorrow, underscoring its commitment to the cause by optimizing its production capacity to supply batteries for EVs. Recognizing the gravity of the situation and the imperative need for change, we at HISON pledge to go above and beyond in our efforts, empowering the electric vehicle industry and safeguarding the future for generations to come.

During a transformative period for our robotics club, we were granted the incredible opportunity to intern at HISON ENERGIES PVT LTD, a pioneering entity in the realm of green energy and electric vehicles (EVs). This immersive experience was invaluable, broadening our horizons both technically and conceptually. At HISON, we honed our skills in advanced battery technology, which proved pivotal in the evolution of our robot designs, ensuring longer operational durations and efficient energy consumption. The intricate interplay between robotics and EV technologies instilled in us a profound appreciation for the synergies of these domains, inspiring us to innovate at the intersection of both fields. The insights garnered from this internship have not only significantly elevated the calibre of our bots but have also imbued us with a renewed passion to drive change in the world of robotics and EVS.

Our robotics club, consisting of 15 dedicated students, had the privilege to intern at HISON ENERGIES PVT LTD Inferred in the world of electric vehicles and advanced battery tech, we honed collaborative and specialized skills vital to our projects This & invaluable experience at HISON not only augmented our robotic designs but also cemented our team's bond, driving us to push boundaries in both robotics and EV realms.

"WHEN YOU DO A THING FOR THE FIRST TIME, IT'S NOT THE WHOLE BOOK. IT'S JUST THE FIRST PAGE."

On February 16th, 2023, the Robotics and EV Club of Faculty of Technology and Engineering, the Maharaja Sayajirao University of Baroda took its maiden step into the competitive arena, participating in the Soccer Bot and Racing Bot competitions at PU Projections. The event was marked by enthusiasm, creativity, and a shared passion for robotics.

Participants are Chaitanya Patil, Meet Chauhan, Naim Rathod, Vrunda Gurjar, Aditya Mistry, Parikshit Joshi, Dhruval Varasada, Vishwa Desai.

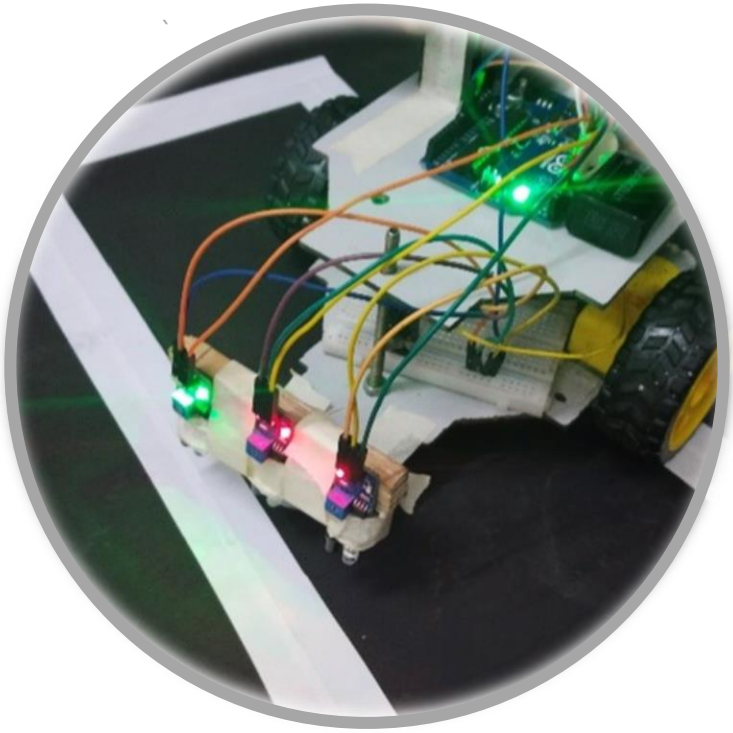
The team displayed exceptional teamwork and technical proficiency in the Soccer Bot competition. Their robot exhibited precision and agility, showcasing their prowess in the field.

In the Racing Bot competition, the team's ingenuity in engineering was evident. The robot, crafted with precision, displayed remarkable speed and control, leaving an indelible mark on the competition.

This event marked the beginning of a journey, the opening chapter in a book of endless possibilities. The experience gained and lessons learned in this inaugural endeavour will serve as a foundation for future triumphs and innovations.

The success achieved in these competitions was a testament to the team's collaborative spirit and unwavering determination. They showcased exemplary sportsmanship, exhibiting grace in both victory and defeat.

# PU Projections



# Line Follower Bot

The Robotics and EV Club of The Faculty of Technology and Engineering of Maharaja Sayajirao University, Baroda, is pleased to introduce our Line Following Robot. This innovative robotic system is designed to autonomously follow a predefined path marked by a contrasting-coloured line, demonstrating our commitment to advancing robotics and electric vehicle technologies.

The robot's hardware is designed for optimal performance. It features a durable and lightweight Fiber chassis, ensuring stability and agility during operation. High-grip rubber wheels provide precise control and traction, allowing the robot to maintain consistent contact with the line. An array of Infrared (IR) sensors is strategically placed on the robot to detect the contrasting line, enabling real-time data collection for accurate line tracking. The heart of the robot is a powerful microcontroller unit (MCU) responsible for processing sensor data and controlling the robot's high-torque DC motors, providing responsive and precise movement. To enhance operational uptime, the robot is equipped with a rechargeable lithium-polymer battery.

In terms of software and control, the robot is programmed using high-level languages like Python or C/C++, enabling efficient data processing. It utilizes advanced control algorithms, including Proportional-Integral-Derivative (PID) control, to ensure precise line tracking and obstacle avoidance. Ultrasonic sensors are integrated into the robot's system, allowing it to detect obstacles and navigate around them while staying on the predefined path.

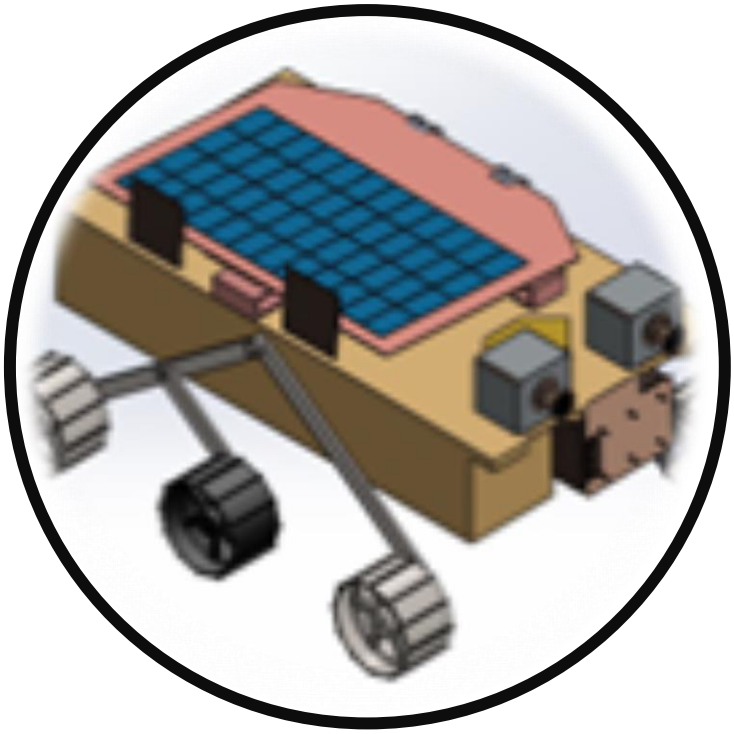
The Line Following Robot developed by the Robotics and EV Club serves as an excellent educational tool and symbolizes our dedication to innovation in robotics and electric vehicle technologies. With its precision line tracking, obstacle avoidance capabilities, user-friendly interface, and advanced sensing and control systems, this robot showcases our commitment to pushing the boundaries of automation and robotics.

Our Robotics & EV Club's remarkable achievement in the Mission Chandra 3DModel Competition, which took place on the 19th of August. Our team's dedication, creativity, and hard work have earned us the prestigious 1st position in this prestigious competition.

The Competition was organized to celebrate the remarkable achievements of the Mission Chandrayan and to encourage young talents in the field of robotics and space exploration. This event attracted a total of 70 competing teams. Participants were tasked with creating an impeccable 3D model of the lunar rover Pragyan. showcasing their technical skills, attention to detail, and passionfor space science and technology. Our team meticulously designed and crafted a highly detailed 3D model of the lunar rover, Pragyan, paying close attention toevery aspect of its structure and components.

Our team, comprised of Chaitanya Patil, Meet Chauhan, Naim Rathod and Venu Vachharajani embarked on this challenging journey with enthusiasm anddetermination. We recognized the importance of this competition not only as an opportunity to demonstrate our technical prowess but also as a chance to promote STEM education and inspire others to explore the field of robotics andEV.

The efforts of our team were rewarded with the 1st position in the MissionChandra 3D Model Competition. This achievement not only showcases our technical excellence but also highlights our club's dedication to fostering aninterest in robotics and EV among our peers and the wider community.



# Mission Chandra

# Orientation

The Robotics and EV Club at MS University, known for its advanced research and mentorship, conducted an orientation session primarily for first-year students, introducing them to the potential of robotics and electric vehicles. This comprehensive event featured a detailed presentation on the nuances of robotics, from basic systems to intricate humanoid designs, and the evolving realm of electric vehicles.

Real-world applications and innovations of robotics and EVs were discussed, underlining their transformative role in modern industries. Moreover, attendees were given a hands-on experience with robotics kits and EV modules, along with opportunities to clarify their queries.

The session's success was evident from the surge in club registrations and the buzz it generated across the campus. Further, senior club members received a flood of mentorship requests, indicating the ignited passion and eagerness among the freshmen. This orientation not only served as an educational platform but also emphasized the significance of early engagement and mentorship in molding future leaders. As the club moved forward, it continued its steadfast commitment to innovation and knowledge dissemination, hinting at a promising future for robotics and electric vehicles at MS University.

The "Sky High" competition is a dynamic event that invites participants to craft and launch rockets, uniquely powered by pressurized water. Made from bottles, these rockets aim for maximum flight distance, emphasizing innovation and engineering aptitude.

For the rocket's design, participants typically utilize plastic soda bottles of 2-liter capacity or larger as the main body. Emphasizing stability and aerodynamics, the rockets are equipped with custom fins to ensure stabilization during flight and a streamlined nose cone to minimize drag.

Propulsion is achieved using pressurized water combined with compressed air. While specific pressure limits are set for safety, the nozzle design is key, influencing the thrust and trajectory of the rocket. Some rockets even feature a payload bay, allowing for onboard experiments.

Ensuring the rocket's safe return to the ground, a recovery mechanism is often integrated. This could be a parachute or streamer. Optionally, some rockets feature a timing mechanism to delay the deployment of this recovery system.

Regarding operational procedures, rockets are introduced to the competition on a launching tube, generally set at a specific angle. The sources of pressure for propulsion can be either compressed air or a specialized launch pad. With safety paramount, a countdown system is used for controlled launches.

The primary metric for success in the competition is the distance a rocket travels. Precision tools measure the exact distance each rocket achieves, with the farthest traveling rocket being declared the winner. Apart from this, awards are also given for design ingenuity, creativity, and achievements related to payloads.

Safety is paramount in the "Sky High" competition. Both participants and spectators are mandated to wear safety goggles. Launch zones are kept clear to ensure no mishaps, and there's a strict adherence to pressure limits when pressurizing rockets.

In essence, the "Sky High" competition stands as a testament to the blend of fun and learning. While participants get a hands-on experience in crafting rockets, they also imbibe crucial lessons in engineering and aerodynamics. The guidelines mentioned in this report are pivotal in ensuring that the competition remains a safe, fair, and enriching experience for everyone involved.

# Sky High

Hydrex is an innovative model of a hydraulic crane designed to scoop and place objects with precision and efficiency. This report provides an overview of Hydrex, its key features, operational capabilities, benefits, and potential applications.

The model combines cutting-edge hydraulic technology with advanced controls to revolutionize the material handling industry.
Hydraulic Power System: Hydrex is equipped with a high-performance hydraulic power system that provides the necessary force and precision for its operations.

Telescopic Boom: The crane features a telescopic boom that extends and retracts, allowing it to reach objects at various heights and distances.

Scooping Mechanism: Hydrex is designed with a specialized scooping mechanism, featuring a scoop or bucket attachment that can securely hold and transport objects.

Hydrex excels in its operational capabilities, which include:
Scooping and Transport: The crane can scoop up materials, such as soil, gravel, or debris, and transport them to a desired location with precision.

Object Placement: Hydrex can delicately place objects in tight spaces, making it suitable for tasks like arranging construction materials or placing components in manufacturing processes.

Height and Reach: With its telescopic boom, Hydrex can access objects at different heights and distances, increasing its versatility.

Load Capacity: The model is designed to handle a wide range of loads, from lightweight objects to heavy machinery.

Hydrex is a ground-breaking model of a hydraulic crane that excels in scooping and object placement. With its advanced features, versatility, and safety measures, it has the potential to revolutionize industries that rely on material handling and precise object placement. As technology continues to advance, Hydrex represents a significant step forward in hydraulic crane technology, offering enhanced efficiency and productivity.

# Hydrex

Soccer bots, also known as football robots, are specialized machines designed for autonomous or remote-controlled play of soccer. They find applications in research, education, and entertainment to showcase developments in robotics and AI.

Key Features:

Mobility: Soccer bots are equipped with wheels or legs for field movement, with advanced ones using omnidirectional wheels or specialized locomotion mechanisms.

Vision Systems: Cameras and computer vision systems help soccer bots detect the ball, goalposts, and other players for strategic decision-making.

Control Algorithms: These robots rely on complex algorithms for field navigation, ball handling, and goal attempts, often making real-time decisions based on sensor data.

Communication: In team-based competitions, soccer bots need communication systems to collaborate with teammates.

Strategy: Soccer bots can be programmed with diverse strategies for offense, defense, and goalkeeping, adaptable to different game scenarios.

Competition: Soccer bot competitions like RoboCup attract teams from worldwide institutions, showcasing robot capabilities.

Education: These robots are valuable tools in STEM education, teaching robotics, programming, and AI in a hands-on manner.

Soccer bots represent a captivating fusion of technology and sports, continuously advancing to potentially compete with human players, driving progress in robotics and AI.

# Soccer Bot


# Maze Runner Bot

The Maze Runner Bot, either autonomous or remotely controlled, is specifically tailored to navigate intricate mazes with exceptional accuracy and efficiency. Infused with cutting-edge sensors, sophisticated artificial intelligence algorithms, and optimal mobility mechanisms, it stands as a testament to the rapid advancements in robotics and AI.

Key Features:

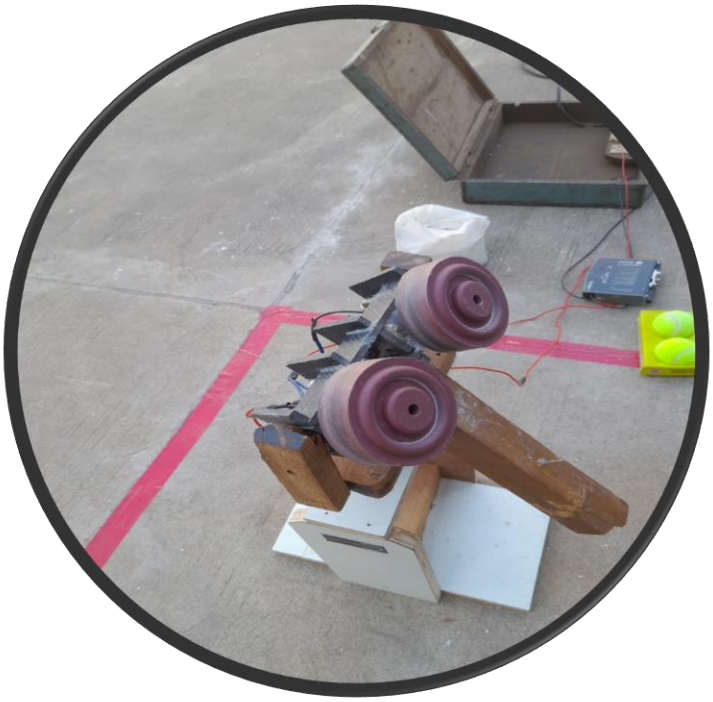
1. Mapping and Navigation: By employing state-of-the-art mapping and navigation algorithms, the bot not only constructs a real-time map of the maze but also strategizes the most optimal route to its end goal.
2. Decision-Making: When faced with diverging paths or unexpected barriers, the robot utilizes decision-making algorithms, mirroring the decision-making process a human would employ within a maze.
3. Mobility: With a design that prioritizes movement, it is commonly fashioned with wheels or tracks, ensuring smooth navigation across varied terrains within the maze.
4. Goal Achievement: The fundamental aim of the Maze Runner Bot is singular: to reach a designated point or exit within the maze, emulating the objectives characters in mazes often face.
5. Learning and Adaptation: Notably, certain variants of these bots harness machine learning. This enables them to not only adapt but also enhance their maze-navigating capabilities by drawing from past experiences.

In essence, the Maze Runner Bot is a confluence of technology and functionality, with potential applications that span education, research, and entertainment.

Our team recently participated in the Cat-a-Pult event, where we introduced a bot epitomizing both innovation and engineering acumen. This bot was equipped with a sophisticated electric mechanism tailored to throw a ball with precision, using motors.

The main feature of our bot was its compactness and specificity in ball-throwing tasks. It was built around a wooden chassis and was anchored by an elaborate motor system. The core functionality was driven by the electric motors, which played a pivotal role in ball launching. We incorporated high-torque precision motors that were carefully calibrated to dictate the angle and velocity of the ball's trajectory. This meticulous setup allowed us to achieve unparalleled accuracy in the ball throws.

The Cat-a-Pult event served as an ideal stage to unveil our bot's capabilities and its conceivable applications in diverse domains. Given the positive reception and the bot's performance, our team is enthusiastic about further honing this technology. We envision pushing the boundaries in the robotics realm and believe that our innovation has the potential to make a marked difference in the industry.



# Cat-a-Pult

# Ballista

The manually operated ballista, a revered ancient siege weapon, has been employed for centuries in warfare. In the modern age, an adaptation of this instrument incorporates an elastic mechanism to target and strike varying distances and heights. This unique integration of the traditional ballista's characteristics with current engineering techniques results in an agile and precise projectile launcher.

At the core of this ballista is its construction. The frame and base, typically crafted from durable materials like wood, form the primary structure. The base ensures the weapon remains stable, while the frame supports and houses the essential components.

Central to the modern ballista's functionality is the elastic mechanism, pivotal for the propulsion of projectiles. This mechanism encompasses two limbs or arms, which are either constructed from flexible materials such as fiberglass or use high-tensile strength rubber bands. One end of these limbs is anchored to the frame, while the opposite end connects to a winch or torsion apparatus.

In conclusion, this elastic mechanism ballista presents a captivating blend of age-old warfare technology and present-day engineering knowledge. Its proficiency in aiming at objects over diverse distances and altitudes renders it indispensable to history aficionados and those keen on delving into projectile launcher mechanics. Anticipated advancements in design and materials promise the development of even more sophisticated and accurate ballistae in upcoming years.

The SmackBot robot, with a weight category of 40-60kg, was developed by students from the Robotics and EV Club at the Faculty of Technology and Engineering, The Maharaja Sayajirao University of Baroda. This machine is notable for its unique weaponry and mechanical designs, tailored for combat scenarios.

Constructed with a high-strength aluminium alloy chassis, SmackBot is designed to resist significant impacts.

**Propulsion System

- Four high-torque DC motors drive the robot, ensuring precision and agility in movements.

- Omnidirectional wheels provide exceptional mobility, permitting intricate maneuvers in combat scenarios.

**Weaponry and Actuators

- SmackBot's primary offensive tool is a pneumatic hammer mechanism, capable of delivering swift and substantial blows to adversaries.

- A double-acting pneumatic cylinder powers the hammer's operation, and high-torque servo motors control weapon dynamics.

**Control and Electronics

- The robot's operations hinge on an Arduino Mega microcontroller.

- For navigation, obstacle detection, and weapon actuator feedback, it incorporates the Inertial Measurement Unit (IMU), proximity sensors, and Hall Effect sensors, respectively.

- A wireless communication module ensures seamless remote control operation.

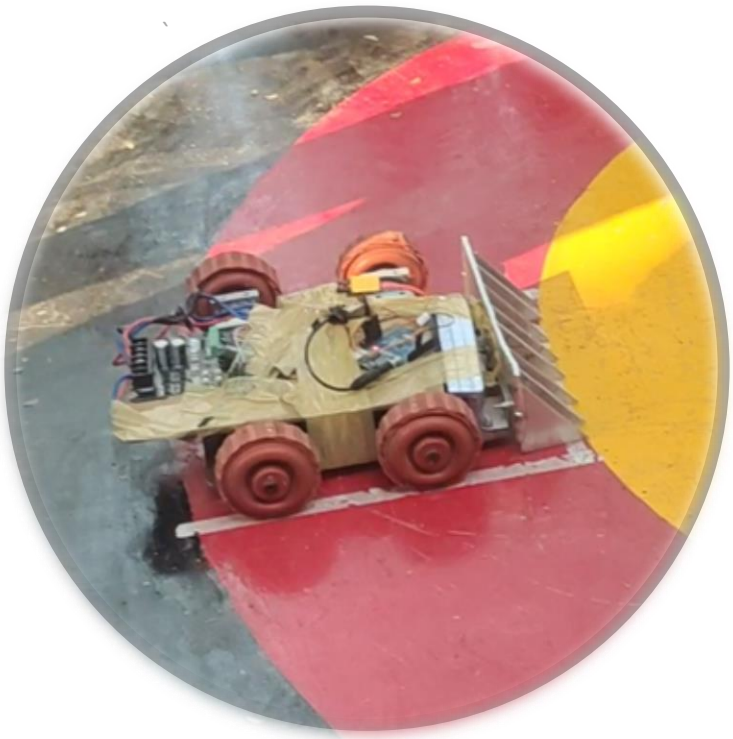
**Power Supply

- Energy is sourced from two 12V lithium-polymer (LiPo) batteries, offering prolonged operational durations.

- Voltage regulation mechanisms ensure stable power distribution to all components.

In summary, SmackBot epitomizes the fusion of advanced technology and innovation, reflecting the prowess of students from The Maharaja Sayajirao University of Baroda.

# Smack Bot



# Sumo Bot

Sumo bots, inspired by traditional sumo wrestling, are specialized machines tailored for the autonomous or remote-controlled combat arena. These robots are primarily designed to emphasize fighting capability, durability, and the application of strategic manoeuvres to push their opponent out of the ring. They're crucial in advancing research in robotics and AI, showcasing significant developments in both fields.

Key Features:

- Mobility: Sumo bots are typically equipped with wheels to manoeuvre swiftly in the combat arena. Advanced versions might incorporate omnidirectional wheels or specialized locomotion mechanisms to gain an edge in battles.

- Control Algorithms: Sumo bots utilize complex algorithms for ring navigation and opponent engagement. They make real-time decisions, adjusting their tactics based on immediate sensor feedback.

- Sensors: Apart from cameras, other sensors, such as ultrasonic or infrared, play pivotal roles in detecting opponents and preventing self-elimination by avoiding the ring's edge.

- Strategy: Sumo bots are programmed with diverse fighting strategies, adaptable to different opponents and combat situations. These strategies can vary from aggressive pushes to defensive holds, based on the bot's design and opponent's actions.

- Competition: Sumo bot competitions are gaining traction globally, drawing robotics enthusiasts and institutions to showcase their engineering capabilities and strategies.

- Education: Sumo bots serve as excellent educational tools, providing hands-on experience in teaching robotics, programming, and AI principles.

In essence, sumo bots represent the intriguing intersection of technology and combat sports. They are continually evolving, with advancements aiming to make them more formidable fighters, thus driving progress in the realm of robotics and AI.