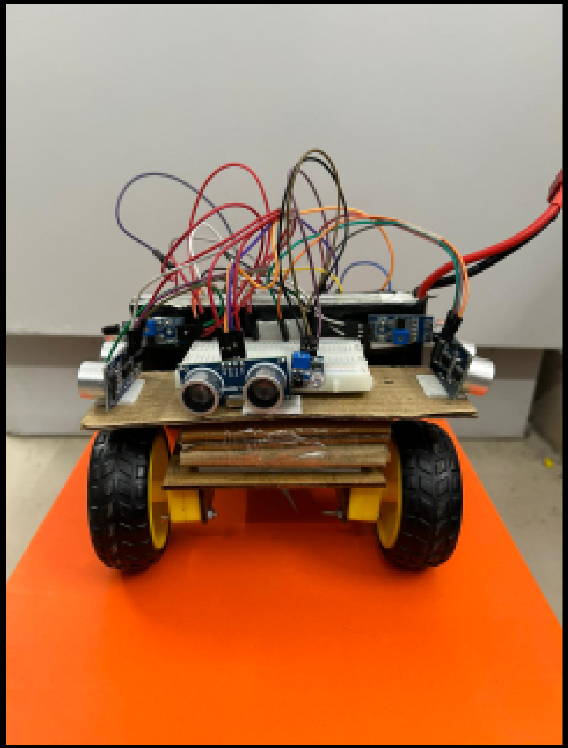
PROJECT GROUP:24

PROJECT TITLE :

MAZE SOLVING CAR



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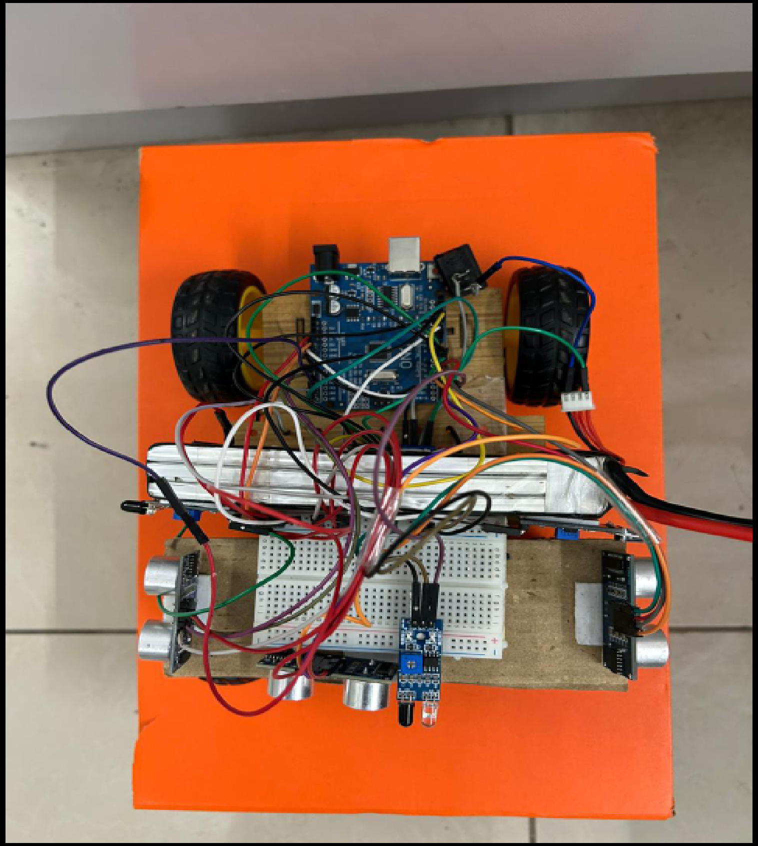
OBJECTIVES AND MATERIAL USED

We tinkered a device called Maze solving Car using ARDUINO. This project aimed to combine robotics, programming, and engineering skills. Through this project, we aimed to enhance our skills in ARDUINO programming , sensor integration leading to deeper understanding of emerging technologies.

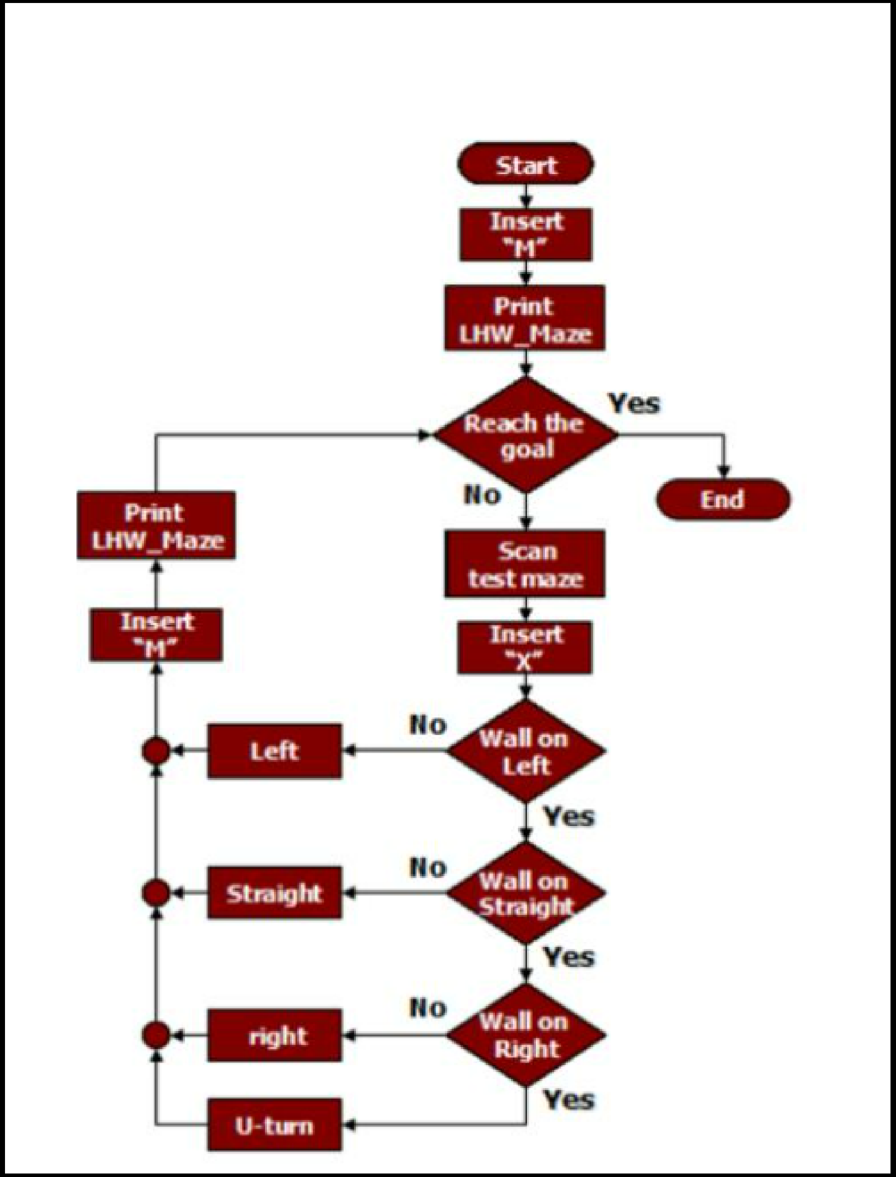
For tinkering Maze solving car , we used the following components:-

- ONE BREAD BOARD
- ONE USB-A TO B CABLE
- ONE RECHARGEABLE BATTERY
- ONE DOUBLE SIDED TAPE
- CAR-KIT(AS PER PHOTO)
- ONE L298N MOTOR DRIVER
- JUMPER WIRES
- SCREWDRIVER
- CARDBOARDS TO MAKE MAZE
- ONE ARDUINO UNO
- THREE ULTRASONIC SENSORS
- SWITCH
- SCISSORS, BLADE
- THREE IR SENSORS

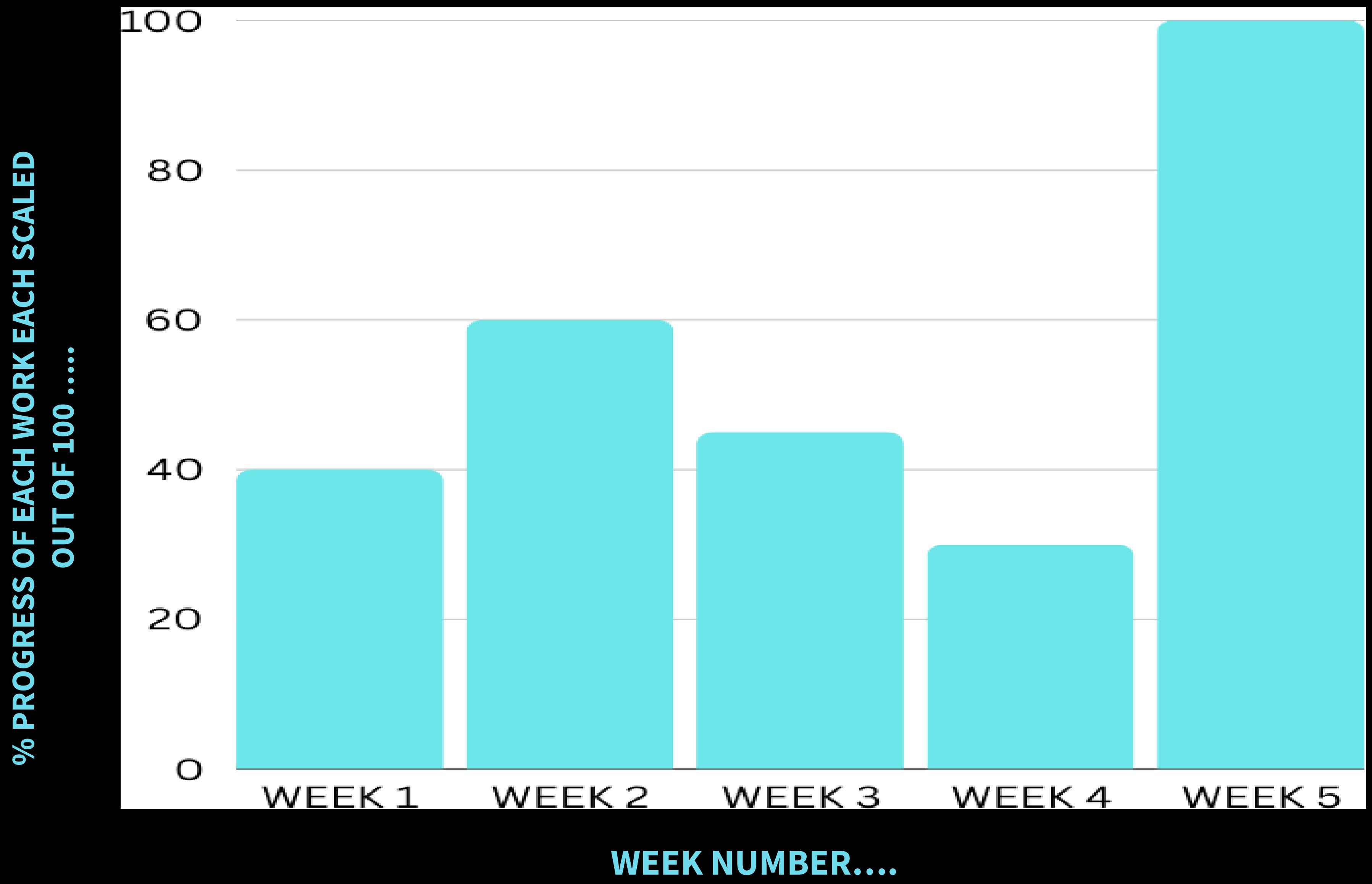


BLOCK DIAGRAM AND WORKING…..

In our project, we used the algorithm called “left hand” in which the car checks the wall firstly with left ultrasonic sensor , then front one and then the right one.
If the car detects no wall at left, then it will turn to left.
If the car detects wall at left, then it will check the front wall . If it detects no wall in the front, it will keep on moving straight.
If the car detects both left and front wall, then it will check the right one. If no wall is there at right, then it will turn right, else it will turn back 180 degrees and backtracks its path and recursively applies the same procedure.
If the car gets too close with the wall, with the use of IR sensors, the car can maintain its

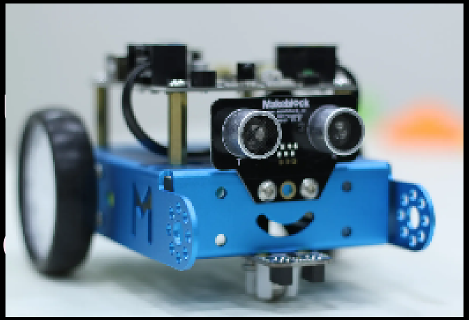


WEEKLY PROGRESS BAR GRAPH.....



SIMILAR PRODUCTS....

There are many products based on maze-solving and also many softwares are launched also for visualizing:-



- **mBot by Makeblock :**mBot is an educational robot kit that can be for maze-solving tasks. It comes with various sensors and is programmable using a graphical programming language or Arduin IDE.

- **LEGO Mindstorms :** LEGO Mindstorms offers a programmable rob platform that can be used for maze-solving applications. It comes w LEGO bricks, motors, sensors, and a programmable brick that can be programmed using the LEGO Mindstorms software.

- **Thymio by Mobsya:** Thymio is a small robot designed for educati purposes. It comes with various sensors and can be programmed using graphical programming environments, making suitable for maze-solving projects.

- **Raspberry Pi Robot Kits:** Similar to Arduino kits, Raspberry Pi robot kits offer a more powerful computing platform. These kits often include sensors, motors, and other components suitable for maze-solving applications.

- **Robotis Bioloid :** Robotis Bioloid is a modular robot kit that allows users to build and program robots for various tasks, including maze solving. It is suitable for educational and hobbyist purposes.

- **Pololu 3pi Robot :** The Pololu 3pi is a small programmable robot designed for line-following and maze-solving com… es with sensors and can be programmed using the Arduino IDE.

CASE AND SCOPES .....

- **Search and Rescue Operations:**

Case: Maze-solving algorithms can be adapted for search and rescue robots, enhancing their capabilities to navigate through complex and hazardous environments.

Scope: These robots can autonomously traverse through challenging terrains, such as rubble or confined spaces, to locate and assist individuals in emergency situations. This technology minimizes the risk to human rescuers by providing an automated and efficient means of exploration and intervention.

- **Educational Projects:**

Case: Maze-solving cars serve as valuable educational tools in schools, colleges, and robotics workshops, fostering hands-on learning experiences.

Scope: Students engage in practical applications of robotics, programming, and sensor integration through the construction and programming of maze-solving cars.

- **Entertainment and Gaming:**

Case: Maze-solving robots find applications in entertainment, participating in engaging activities like robot races or interactive exhibits.

Scope: These applications bring an element of enjoyment and interaction, demonstrating the exciting capabilities of robotics technology within entertaining contexts.

- **Research and Development:**

Case: Maze-solving cars provide essential platforms for the testing and development of algorithms related to path planning, obstacle avoidance, and localization.

Scope: Researchers leverage maze-solving cars as experimental tools to refine navigation algorithms, contributing to advancements in autonomous robotics and artificial intelligence research.

POSSIBLE CHALLENGES:-

While tinkering maze-solving car, the challenges we faced are :-

- **Power management:-** While we were doing test drives, we had to change batteries many times. To get rid of this, we replaced it with rechargeable battery.

- **Addition of switch:-** We added a switch in the car to easily switch it on or off otherwise it was difficult to hold batteries with hands when car was running.

- **Algorithm optimization:-** We did many test drives and we have to debug and optimize our code so as to get optimal path for the car out of the maze and it was really challenging. We had to fix the delays when we were replacing batteries before using a rechargeable one. Also, the maze can contain diverse obstacles, requiring adaptable algorithms.

- **Fixing of car chassis:-** We had to fix the chassis for about 2-3 times. Also, we had to solder the car for two times too.

- **Addition of IR sensors:-** We noticed that when the car gets too close with the wall then ultrasonic sensor was not able to detect it. So we used IR sensors to detect walls at very close range and it helped the car to maintain its minimum distance with the

Some more possible challenges that can occur:-

1. **Real-Time Processing:** Processing sensor data and decision-making in real-time can be challenging.
2. **Sensor Accuracy and Calibration:** Sensors may have inaccuracies or variations affecting the car's perception.
3. **Environmental Conditions:** Changes in lighting and surface conditions can affect sensor performance.
4. **Cost Constraints:** Building more advanced maze-solving cars can be cost-prohibitive

LIMITATIONS.....

- **Limited Adaptability:** Maze-solving cars may not adapt well to changes in maze complexity or new obstacles. Also, there might be chances that there is dying of battery.
- **Single-Solution Approach:** Some maze-solving algorithms are designed to find a single solution to the maze. If there are multiple paths to the goal, these algorithms may not explore alternative routes.
- **Sensitivity to Maze Structure:** Algorithms may struggle with unconventional maze layouts or structures.
- **Dependency on Sensor Accuracy :** The accuracy of sensors, such as infrared or ultrasonic sensors, is crucial for effective maze navigation. Sensor inaccuracies or limitations can impact the car's ability to perceive its environment accurately.
- **Vulnerability to Maze Changes :** Maze-solving cars may struggle to adapt to changes in the maze layout during operation. Sudden alterations to the maze structure may lead to navigation errors.

CONCLUSION.....

With the dedication of all the group members, we are poised to bring this project to fruition. Our project aims to bridge the gap between theoretical knowledge and practical implementation.

The maze-solving car project not only demonstrates cutting-edge advancements in robotics and AI but also underscores the importance of precision in control systems.

As technology progresses, the project serves as a stepping stone for more intricate applications, ensuring that intelligent autonomous systems evolve beyond simplistic scenarios, contributing to the future of robotics. The principles and techniques developed in this project can be applied to more complex and dynamic environments, paving the way for the future of autonomous vehicles and robotics.