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Design and Development of Multifunctional Robot

Shruti More[1], Rutuja Nirgude[2], Gauri Shnide[3], Mr R. G. Dabhade[4]

[1]BE Students, Dept. of ENTC, MCOERC, Nashik, Maharashtra, India
[2]BE Students, Dept. of ENTC, MCOERC, Nashik, Maharashtra, India
[3]BE Students, Dept. of ENTC, MCOERC, Nashik, Maharashtra, India
[4]Project guide, Dept. of ENTC, MCOERC, Nashik Maharashtra India

ABSTRACT :

The project aims to develop an autonomous delivery robot with effective obstacle avoidance, revolutionizing last-mile logistics. Objectives include autonomous navigation, obstacle detection, collision avoidance, and efficient object delivery. Successful implementation promises enhanced logistics efficiency, cost reduction, improved safety, and technological advancement in autonomous robotics. A key focus is on designing a reliable delivery mechanism, ensuring secure transportation and deposit of objects during missions. These delivery robots find applications in various sectors, from food and retail to healthcare and warehouse operations, offering sustainable and efficient solutions for the evolving demands of modern logistics.

Keyword: Object Delivery, Obstacle Avoidance

1. INTRODUCTION :

In the realm of modern industrial operations, the "Multifunctional Robot" project offers an efficient and precise solution for material handling and logistics. Integrating cutting-edge robotics and intelligent navigation, this innovation optimizes operational efficiency in factories. Engineered for diverse tasks like material deliveries and inventory management, it adapts to specific industrial needs, minimizing manual labour and errors. With a user-friendly interface and pre-defined path-following system, it ensures ease of operation, supporting both autonomous functions and responsive user interaction. This project is a revolutionary companion for enhancing productivity in the fast-paced world of industrial and factory operations.

2. ACKNOWLEDGEMENT :

We thanks to all those who supported and contributed to the successful completion of this project. Special appreciation goes to our project guide for providing valuable guidance and improving the quality of work. We are also grateful for the timely guidance, inspiration, and administrative support from the Principal and Head of the Department, without which this project would not have been possible.

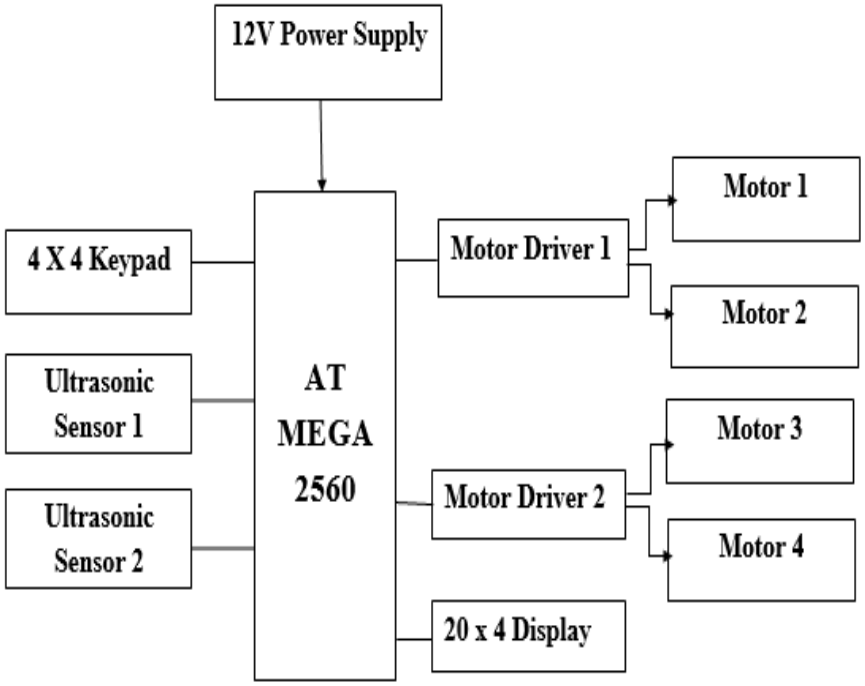
3. PROBLEM STATEMENT

Efficient and secure material transport within modern industrial settings is hampered by manual handling, leading to productivity bottlenecks, safety concerns, and errors. The lack of automation and precision in material handling creates a critical challenge, requiring an innovative solution to optimize internal logistics, reduce physical strain, minimize errors, and enhance time management.

3. OBJECTIVE

Our multifunctional robot project focuses on creating a smart and versatile robot capable of delivering objects between locations while intelligently avoiding obstacles. The main objectives include ensuring efficient and accurate object delivery, enhancing workplace safety by reducing physical strain on human workers, and designing a user-friendly interface for easy customization and remote operation. By achieving these goals, our project aims to contribute to cost reduction and overall operational efficiency, providing a practical solution for diverse industrial applications.

4. BLOCK DIAGRAM



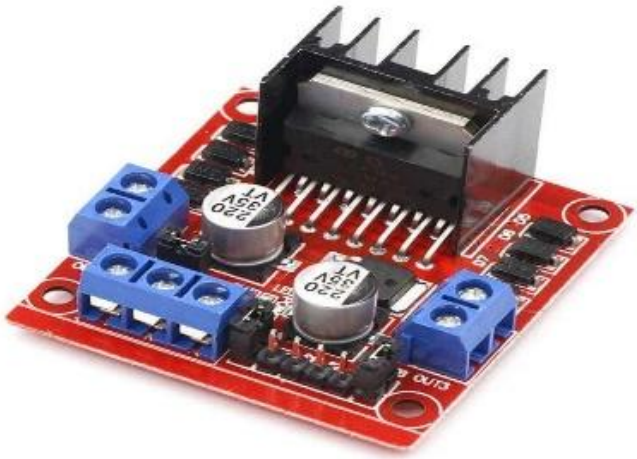
The diagram shows the system's schematic, which integrates a matrix keypad and ultrasonic sensors as input devices for the ATmega 2560 controller.

Matrix Keypad: The matrix keypad use as a manual input interface for users to select specific paths. Users can give their desired path or make selections through the keypad, enabling them to control the robot's movements and operations.

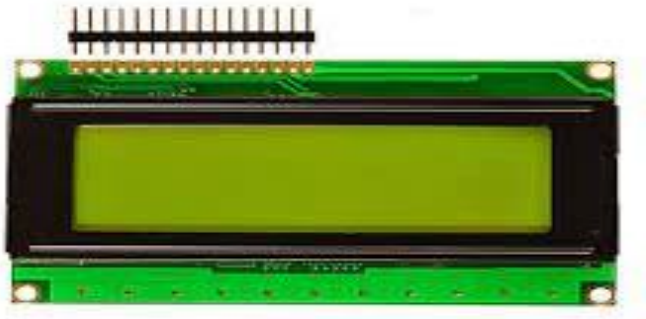
Ultrasonic Sensors: Ultrasonic sensors are used to detect obstacles along the robot's path. These sensors emits ultrasonic waves and measure the time it takes for the waves to bounce back. If the sensors find an obstacle, they transfer the information to the controller, and the robot changes its path to avoid it.

ATmega 2560 Controller: The ATmega 2560 microcontroller processes the inputs received from both the matrix keypad and ultrasonic sensors. The controller regulates and controls the DC 100 RPM motor, responsible for the robot's mobility. It adjusts the motor's speed and direction based on user input and environmental feedback.

Motor Driver: The motor driver block is responsible for controlling the motors, including the DC 100 RPM motor, which drives its movement. It executes the commands issued by the ATmega 2560 controller.



LCD Display: The 20*4 LCD display is user interface that display relevant information to the user and status updates related to the robot's operation. It provides information about the robot's actions and interactions with its surroundings.



4. WORKING :

The "Multi-Functional Robot" transforms material transport with user-friendly control, advanced sensors, and autonomous features like SLAM technology. Ensuring precise navigation, secure storage, and obstacle detection, it prioritizes safety. Robust data security measures protect sensitive information, while remote monitoring and emergency stop enhance real-time safety. Integrated hardware, software, and sensors make it a seamless, efficient, and user-controlled material transport solution.

5. RESULT

The "Multi-Functional Robot" revolutionizes material transport in diverse workplaces. With user-friendly interfaces, autonomous navigation, and real-time monitoring, it enhances efficiency. Prioritizing user control, it ensures seamless interaction, enabling task initiation. Features like obstacle detection and secure storage guarantee safe transportation, minimizing accidents. Incorporating power management and data security, it safeguards items and sensitive information. This system's adaptability to various environments marks a significant advancement in workplace automation, offering widespread applicability and versatility.

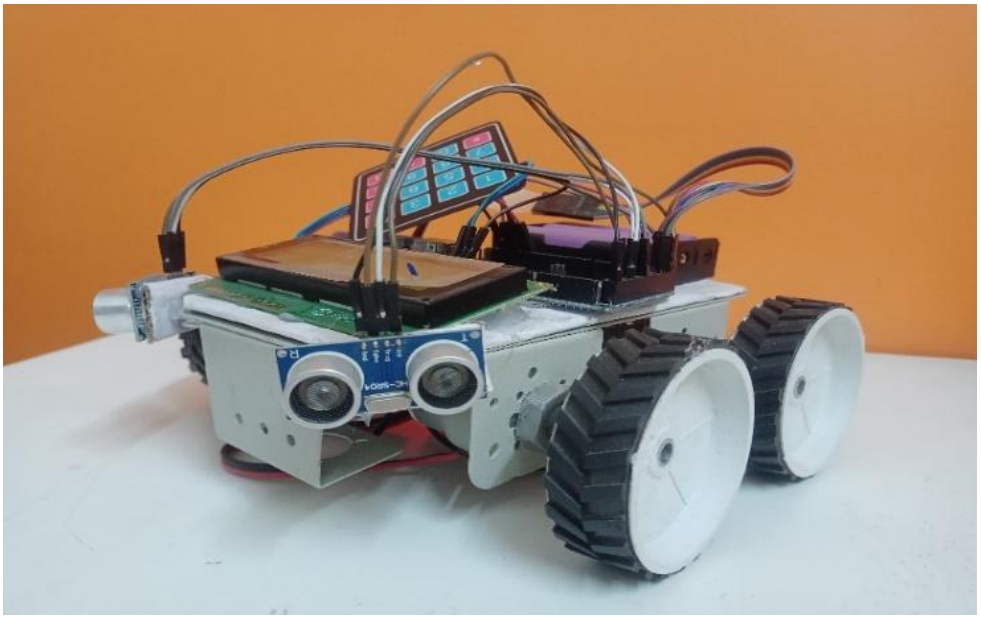


Fig.1 Robot structure

6. CONCLUSION :

The "Multi-Functional Robot" system revolutionizes material transport in workplaces through cutting-edge technology, user-friendly interfaces, and autonomous navigation. It empowers users to control paths and tasks, ensuring safe and efficient transportation with obstacle detection. The system includes secure object storage, power management, and data security measures. Its adaptability and real-time monitoring highlight its widespread potential. The "Multi-Functional Robot" symbolizes innovation in automation and robotics, offering an enhanced, automated future for material transport.

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