Robot for Transportation with an SMS Alert

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Abstract. Most of the imports in India are done by people. Robotic systems have an advantage over other distribution systems because of the large transport environment that can transport jumbo products in long lengths. Automation, like driverless cars, is the result of technological development. The proposed model describes a controlled robot that moves from point A to point B with load on it. It is a robotic vehicle which is an electrical machine controlled by batteries and smartphone application. Bluetooth is connected to the controller via UART. It uses ATmega32 microcontroller for transmitter and receiver. In the receiver, the microcontroller receives the radio frequency signal and controls the robot according to the instructions. The robot's motion is controlled by two DC motors connected to each wheel. The main objective is to deliver the goods within hospital premises or physically aided people can make use of it without directly being involved in transporting.

Keywords: Automation · bluetooth · ATmega32Microcontroller

1 Introduction

Smart phones are getting more sophisticated today thanks to upgraded computers, larger storage capabilities, and more communication options. Nowadays, Bluetooth is frequently utilized to distribute data and give smartphones additional capabilities. The integration of Bluetooth technology with mobile phones, developed in 1994 by Telecom supplier Ericsson, reveals its advantages [2]. Old school wired digital gadgets have been converted to wireless ones as a result of changes in how people use them at home and at work. Up to seven Bluetooth modules can talk to a host Bluetooth system simultaneously over a single connection. In the 1960s, the first industrial robot was made available in the United States. Since then, their program has made great strides, greatly advancing robotics. Robots are now more common in variety of industries, including construction and healthcare. Robots are known as intelligent machines that may be created and employed [3]. These robots carry out heavy, dangerous, and precise labors because they can work continuously for 24 h without rest and can perform human tasks more effectively and quickly [4]. Introducing robots for

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physically aided people allows them to walk less and rest at a place. Controlling a robot with supplies by being at one place can make things more easier and reduces some amount of work. The goal of this research is to employ robots to reach their destination and later alert the user about the result.

2 Literature Survey

A track-following robot created by Roman Osorio C. in 2006 [5] uses magnetic sensors to guide its movement. They have chosen infrared sensors because it is not easy to detect this sensor. Comparator circuitry was utilised to increase the system's sensitivity. A line-following robot with the ability to avoid collision if an object crosses its path of motion has been the subject of various design studies. Dr. Bindu A. Thomas and colleagues (2013) [6] created an industrial based robotic arm that can lift loads and identify obstacles. If there are any hurdles in between the path it would wait for a while and make buzzer sound or any other sound by which it can alert the user so that the hurdle can be cleared or the path is made safe for transporting, later on the robotic arm continues its work. Al-Taharwa et al. (2008) [7] described how a robot that follows a predetermined path functions. His work is completely based on using genetic algorithms to find an optimal path or a easy way to travel for a robot from the initial point to its desired destination, because there may be may paths in which a robot can be moved but it will be more optimal to find a path which takes lesser time then required and also which is obstacle free. He used genetic algorithm method because it has successfully been able to solve the old traditional problems and find new methods. To get to any store location, the robot navigates queues. The work of Abrar M. Alajlan and others [8,15] have given collision avoidance algorithm for robotic system. There study has helped further works to achieve a system which tackles any objects in their path and provide a clear way.

2.1 Types of Robots

In recent years, a wide variety of robots with various jobs have arisen in numerous industries. These various robot types are developing steadily and providing many occupations that assist people in various facets of their lives [6]. According to their intended uses, robots can be categorised into the following types:

– Industrial robots: They use articulated arms designed for a variety of industrial operations, including painting, welding etc.
– Domestic or home robots: These are employed in the houses for variety of jobs, including robotic pool cleaners, vacuum cleaners and sweepers.
– Medical robots: These devices are utilised in hospitals and the medical field. Surgery, automated guided vehicles, and possibly lifting aids are just a few of the various duties that a medical robot can carry out in this profession.
– Service robots: These can perform a variety of tasks, including data collection, technology demonstration, research, and others.

3 Motivation

The inspiration behind our work comes from a number of sources:

- Growing Need for Automation: Traditional manual ways of transporting goods may not be sufficient given the growing need for faster and more dependable transportation.
- Labour Shortages and Increasing Labour Costs: The use of robots in the delivery of goods can serve to lighten the load on the workforce and decrease the need for costly physical labour.
- Increased Productivity and Efficiency: An autonomous robot can work continuously without getting tired, taking breaks, or needing to rest, which dramatically boosts productivity and efficiency in the movement of goods [9].
- Increased Safety and Risk Mitigation: By giving complicated activities to robots, we can reduce the possibility of mishaps and occupational injuries, making the workplace safer.

4 Problem Statement

Our goal is to create an autonomous robot that can move objects with efficiency in enclosed spaces like warehouses, hospitals, or distribution centres. It can reduce work load and increase the efficieny of work.

5 System Architecture

5.1 A Robot

As described in Fig. 1 In general, robots have three roles: line monitor, collision detection, and heavy load loading and unloading. From the figure shown below the arrows indicate signal transmission between different components. The main component and central unit of the system is Arduino Uno. It is powered by a DC motor, a motor driver and a rechargeable battery.

5.2 Servo Motor Controlled Function

The destination Selector used to choose a favourite destination is shown in the below block diagram Fig. 2. Used to load bulk onto the robot is the loading unit. Unloading device used to remove mass from robot. The path is changed to follow the intended path by a servo motor. The system is fed with power supply.

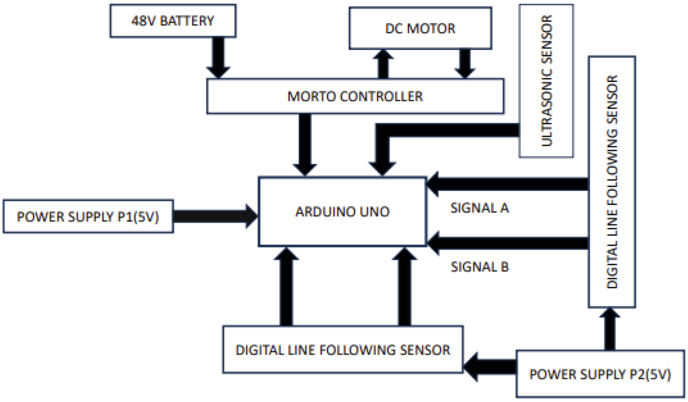

Fig. 1. Robot Block Diagram

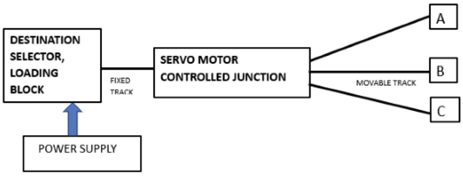

Fig. 2. Servo Motor Controlled Function

5.3 Controller

Central Controller is shown in the Fig. 3, where Bluetooth technology is used to connect the robot unit to the central unit. Through a channel, the track unit communicates with the central unit. The robot and track's entire movement is controlled by a central unit.

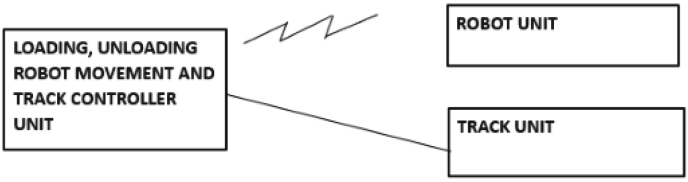

Fig. 3. Central Controller

5.4 Components

In the beginning, we have to connect all the components accordingly. Second, we require a phone, we should download a mobile app from the playstore called as serial bluetooth terminal, and we need to modify settings accordingly in the application to connect to the robot and we can operate according to the way we need for performing activity.

1. Arduino Uno: Arduino Uno which is displayed in Fig. 1, is a microcontroller which is used for the purpose of doing main calculation it can be easily used by connecting the device with a USB cable to support the microcontroller. Arduino stands out among microcontroller platforms due to its unique combination of open-source accessibility, user-friendliness, and a vast, supportive community. Its open-source nature fosters collaboration and innovation, allowing anyone to freely access and modify its hardware and software designs. The platform's cross-platform compatibility, cost-effectiveness, and integration capabilities make it a versatile choice for everything from educational endeavors to advanced IoT projects (Fig. 4).

Fig. 4. Arduino UNO

2. Motor Controller: It is called a stepper motor as shown in Fig. 2. it divides the full rotation into several equal steps. Stepper motor can easily be operated with Arduino Microcontroller. Can control Arduino Uno [6] using a USB cable. Power is given to the Ardunio using an A/D converter or any other external power source. Plug in 1mm positive plug into the power jack on the connection board to which adapter is attached. You must plug the battery lead into the ground pin and Vin pin (Fig. 5).

Fig. 5. Servo Motor

3. Bluetooth HC-06: The HC-06, which is depicted in Fig. 3, defines a serial port from which data can be sent and received. REsearchers utilised Teraterm as the serial terminal. Before uploading the code to the Arduino, the HC-06 module must be unplugged. Once the code has been successfully submitted, it is linked once more (Fig. 6).

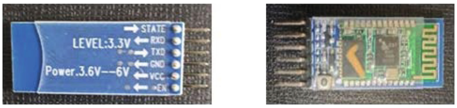

Fig. 6. Bluetooth Module

4. Motor Driver Board: The motor driver acts as the interface between the Arduino and controllers. The motor is responsible for propelling or controlling the robot's movements. Whether it's DC motors for wheels, stepper motors for precise control, or servo motors for specific applications, the motor driver is compatible with the motor type, voltage, and current requirements. It Ensures that the chosen motor driver can handle these parameters and is compatible with Arduino model, allowing seamless integration and precise control for the robot's mobility (Fig. 7).

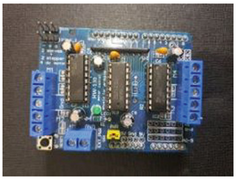

Fig. 7. Motor Driver Board

5. GSM Module: Compact electronic devices known as GSM (Global System for Mobile Communications) modules allow for communication between devices and mobile networks. These modules are essential for enabling wireless communication for a variety of applications, including robots, embedded systems, mobile phones, and the Internet of Things (IoT). A microprocessor, a GSM modem, and other parts including SIM card readers and antenna connectors are the standard components of a GSM module. It works with a SIM (Subscriber Identity Module) card, which enables voice and data services and authenticates the device with the mobile network [7].

5.5 Circuit Diagram

Connections to all the components is shown below using Tinkercad software which gives clear view on the connections to each components. The components are arranged on a support. The suitable code has be dumped into Arduino for its better working and functionality. Which makes the motor work and GSM module function. Vehicle starts moving to the required directions and directed and stops when reaches (Fig. 8).

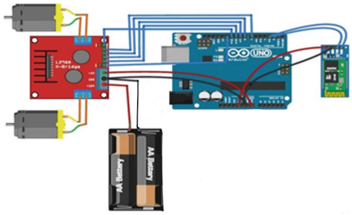

Fig. 8. Connection diagram

6 Results

6.1 Prototype

The figure shown below is of the output model (Fig. 9).

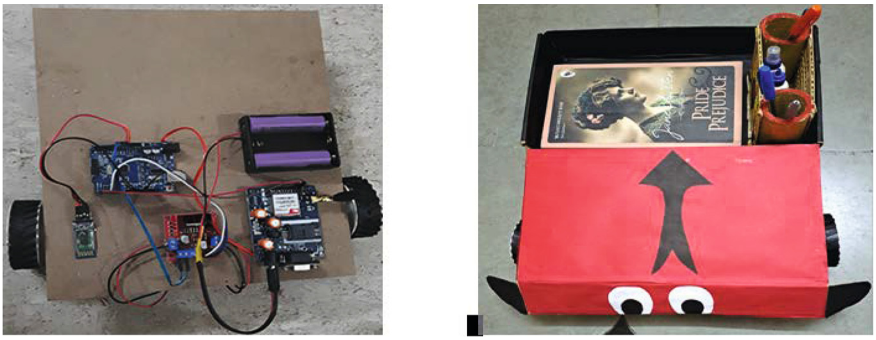

Fig. 9. Output model

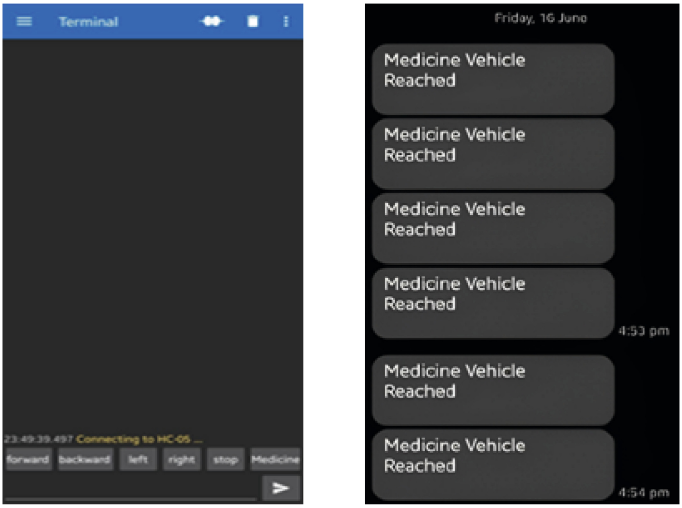

Fig. 10. App Interface and SMS alert

The application which we are using called "Serial Bluetooth Terminal" in the beginning looks like as shown in Fig. 10. After initializing the setup the terminal gets activated and it starts taking and giving responses accordingly.

Efficiency of model: A person who is enable to walk or is physically disabled and has to transport some items to other place in home then that person has to take some support to reach destiny or some other person has to come to take those things. But if the disabled person has access to this robot he can call it whenever required and supply items to its destiny.

7 Applications

1. Autonomous Vehicles: Self-driving cars and trucks are a significant area of development in transportation. These robots use sensors, cameras, and advanced AI algorithms to navigate roads and transport passengers or goods without human intervention [13].
2. Delivery Robots: Smaller robots designed for last-mile delivery can transport packages and goods from a distribution center or store directly to a customer's doorstep. These robots can navigate sidewalks and pedestrian pathways safely. [12]
3. Warehouse Robots: Automated guided vehicles (AGVs) or autonomous mobile robots (AMRs) are used in warehouses to transport goods, pallets, and containers between storage locations and picking stations. They optimize order fulfillment and reduce manual labor [9].
4. Public Transportation: Robots can be used in public transportation systems to assist passengers, provide information, and maintain cleanliness in stations and vehicles [15].

8 Conclusions

8.1 Conclusion

The main goal has been is to create an autonomous robot that can be utilised to move loads more quickly. When compared to the time needed for humans to complete the jobs, less time is needed in case of robots. As a result, efficiency is higher because it requires less time. The safe transportation in limited time is the primary goal. Additionally, the robot successfully avoids running into any roadblocks and is effective at moving objects quickly to alleviate human pain.

8.2 Limitations

1. This robot is being run on Batteries, and long lasting batteries is quite pricey.
2. Since The mobile application is connected through Bluetooth so, the connectivity is upto limited range. These two things can be considered for better performance of the current running model.

8.3 Future Scope

1. Autonomous Delivery Robots: Delivery robots have the potential to revolutionize last-mile logistics. These robots can navigate sidewalks and streets to deliver packages, groceries, or food orders autonomously. They can reduce delivery costs, increase efficiency, and minimize the need for human drivers.
2. Warehouse Automation: Robots can be employed in warehouses for tasks such as picking, sorting, and organizing inventory [9].
3. Agriculture: Autonomous tractors are set to revolutionize farming. These driverless tractors allow farmers to control them via an app on their phone or computer, freeing them from long hours of driving [10,11].
4. Autonomous Robots in Construction and Mining: They can handle repetitive tasks, hazardous environments and heavy lifting without risking human lives [12].

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