Technoarete Transactions on Applications of
Information and communication Technology (ICT) in Education
Vol-2, Issue-3, July 2023
e-ISSN: 2583-1127

Robot Tracking via Centrally Monitored System for Logistics

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Abstract

Today, robots are beneficial in many different fields and products. In certain companies, employees lift weights while working, as opposed to using robots. Robots that can lift weights are used in many different industries, but they are managed by people. We are inspired to build a self-contained robot as a result. It detects and follows the route of the moving object in accordance with the programmer's instructions. In order to regulate the motor, we employ IR (Infrared Radiation) sensors. The sensor output is sent to the controller, which makes a determination and gives the appropriate command to the motor driver. A robot that is travelling will seek out a path that is clear of obstacles and change its direction if it encounters any along the way. The suggested device can lift up to 5 kg of weight, and by adding a high torque-providing motor, more weights can be lifted up.

Keywords

IR Sensor, L298 Motor Driver, HX711

INTRODUCTION

A mobile robot called an automated guided vehicle (AGV) uses vision to follow wires or other markers, lasers, or wiring in the floor. They are typically used in industrial settings to move goods inside of a plant or warehouse. A self-driving robot called a "line follower" either a white line in a black region or a black line in a white area. A robot must be able to recognise and adhere to a specific line. Under rare circumstances, such as crossovers, where it may have more than one choice to pick from, the robot must follow a predetermined path. A basic line follower robot can be constructed from a base with wheels mounted at each of its two ends. A rectangular-shaped stiff plastic sheet can be used as the basis. You can add more rigid bodies, such as cylinders, linked to several body forms connected by joints, each of which has a predefined motion in one direction. The line follower robot may have wheels and a fixed base, legs and many rigid bodies joined together by joints, or both. A warehouse or industrial facility can be automated by automated guided vehicles, which boost output and cuts expenses. The AGV has the ability to independently attach to trailers and tow big loads behind them.[1]

LITERATURE REVIEW

Design of Pick and Place Robot: The common perception of a robot is one that functions and appears to be a human. To boost efficiency and provide consistent quality, the sector is transitioning from its current state of automation to robotics. They may not seem the least bit human, despite all the research being done to give industrial robots even more humanistic, humanlike features, and superhuman abilities. A form of robot often used in industry is a robotic manipulator, also referred to as a robotic arm. In an open or closed kinematic chain, it is composed of rigid links connected by moving joints. Links can be viewed as symbolising the human waist, upper arm, and forearm, with joints at the shoulder and elbow in some arrangements. An end result, such as a tool and its fixture, a gripper, or any other working equipment, is connected to the arm at the wrist joint. [2].Pick and Place Robotic Arm Using Atmega 328p: Industry and daily tasks have been discovered to be more attractive to and implemented through automation via robots in recent years. The pick and place robot is a manufacturing equipment designed to eliminate human error and interference, resulting in more precise results in pick and place operations [3][4]. There are numerous areas where human interaction is challenging, but because the process in question needs to be run and controlled, robots find applicability in these areas. According to the literature, pick and place robots are created and employed in a variety of industries, including those that fill bottles, pack goods, and use surveillance to find and detonate bombs. The goal of the project is to create a pick-and-place robot that uses the Robo-Atmega 328p for all pick-and-place operations. The pick and place robot that has been constructed uses an RF signal for control. Four Omni wheels support the chassis so that the robotic arm can be moved. There are two degrees of freedom in the robotic arm that was used. This robot can be customized with additional features like line following, wall hugging, obstacle avoidance, and metal detection for various applications. [5][6]. People are trained to look for comfort. They are constantly looking for alternatives to regular tasks and jobs that they can complete on their own. The idea of an object pick-and-place robot that will work along a specific line may assist a business reduce labour costs or serve as a labour replacement. The automation concept is being adopted by industries on a daily basis, and robots are the finest options for this. A robotic manipulator, often known as a mechanical arm, is one form of robot that is most frequently utilised in industry. It consists of rigid links joined by moveable joints in an open or closed kinematic chain. By keeping to a specified line, our line-following robot and mechanical arm can pick up an object from one place and carry it to another [7][8].Line follower Cargo-bot For Warehouse Automation: In order to improve the movement of vital materials inside warehouses used for logistics, this paper describes the line following algorithm. There would be no human intervention during any of the warehouse's operations. The proposed system uses nodes and black paths to temporarily advance on the ground, reducing labor and aiming for secure, prompt, and effective cargo delivery. By adjusting control settings, this work intends to develop controlled robot movement and improve performance. These kinds of robots are typically utilised in manufacturing facilities with pick and place equipment. This robot travels a predetermined path while transporting components from one place to another. Many studies have recently been conducted to strengthen industry automation. This robot is designed to provide the necessities [9]. This study presents a line-following robot using an Atmega 328p nano microcontroller, three infrared sensors, DC motors, wheels, and a PCB frame, detecting black lines on white surfaces. The infrared signal is reflected when it strikes a white surface but not when it strikes a black surface. This system uses four straightforward DC motors that are connected to four wheels to move the robot in four directions left, right, forward, and backward. The L2953D driver circuit uses the Atmega 328p nano as a controller to regulate the speed of DC motors [10][11]. A line follower robot is a mobile device that can recognize and follow a predetermined line drawn on a floor, either visible or invisible like a magnetic field, using infrared sensors. TABAR, a line-following robot, underwent testing for the Tabrizi competition. Despite facing technical and mechanical challenges, the robot successfully followed the path, demonstrating the importance of thorough design, implementation, and testing processes [12][13]. Warehouses are utilizing advanced technology to enhance transportation, reducing human intervention and ensuring safe, efficient movement of materials. This technology detects black paths and moves nodes on the ground, enhancing efficiency. Studies show that robots travel a predetermined path while transporting components in manufacturing facilities. These robots, designed to deliver necessities, have been studied to enhance industry automation and improve performance [14][15].

METHODOLOGY

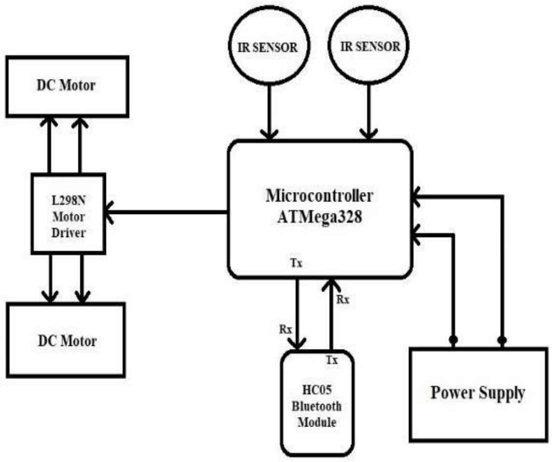

Figure 1. Block Diagram part-1

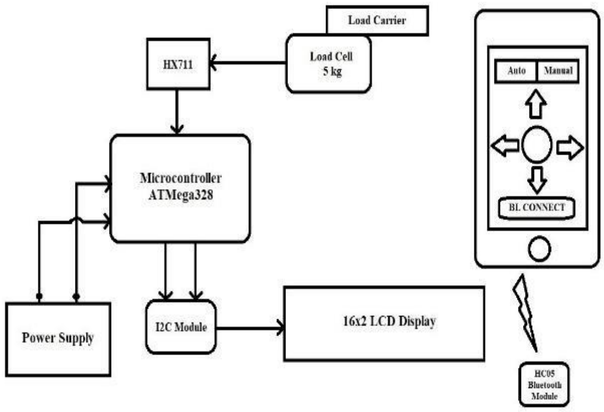

Figure 2. Block Diagram Part-2

SYSTEM DEVELOPMENT

Sensor Section

In automatic mode, black line detection is performed via IR sensors. The mobile application is connected to the microcontroller via the HC05 Bluetooth model. The connections of the 16x2 display are made simpler by the use of an I2C module. We utilised a load cell to calculate the weight, but before the entire circuit could function, the load cell needed to be calibrated using a HX711 and an Atmega 328p. We must start with 100g of weight when the LCD displays display 100g of weight in order to calibrate the load cell with the HX711 and Atmega 328p. Calibration is completed once a 100 g weight is maintained over the load cell. The load cell, powered by the HX711, converts analogue voltage into weight values, which are then displayed on a 16X2 LCD.

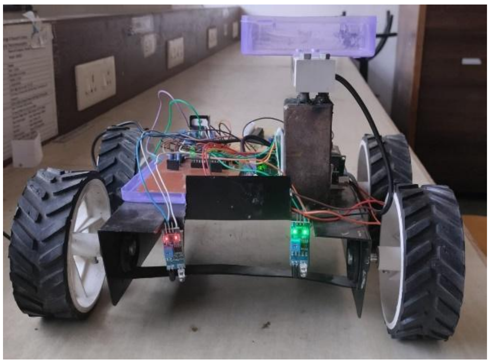

Figure 3. Front view of the suggested model

Driver Section:

The driver section consists of a motor driver and two DC motors. Motor drivers are used to run the motors because the Atmega 328p cannot supply adequate voltage and current to the motor. Hence, a motor driver circuit is added in order to provide the motor with enough voltage and current. This motor driver controls the motors after receiving instructions from the Atmega 328p.

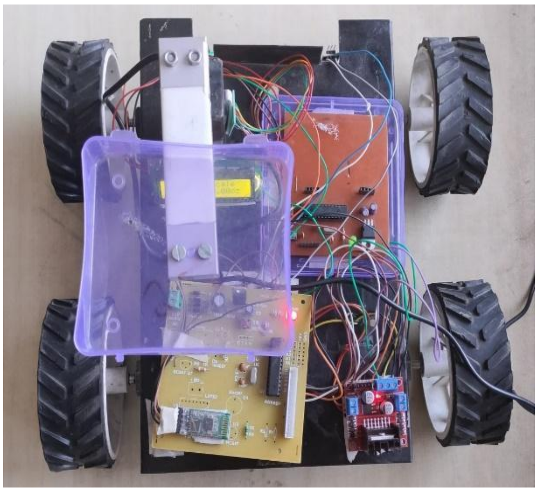

Figure 4. Top view of the suggested model

Figure 5. Backside view of the suggested model

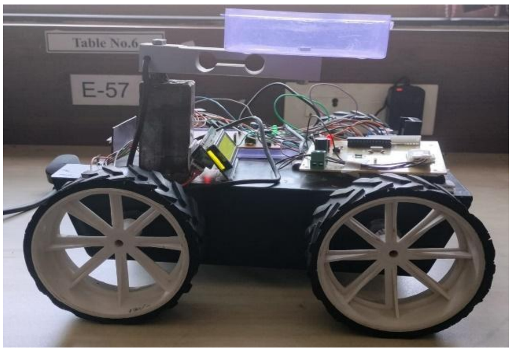

Figure 6. Side view of the suggested model

Circuit Diagram:

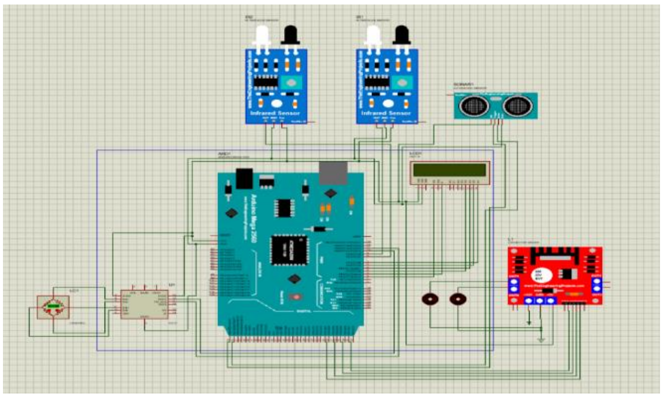

Figure 7. Circuit Diagram

SYSTEM ALGORITHM

Flow Chart

Here, we developed the model using two microcontrollers. When we begin providing the model with electricity, both microcontrollers begin to function. One microcontroller is in charge of the load carrier section and LCD, and the other microcontroller is in charge of the motor driver, remote, and IR sensors.

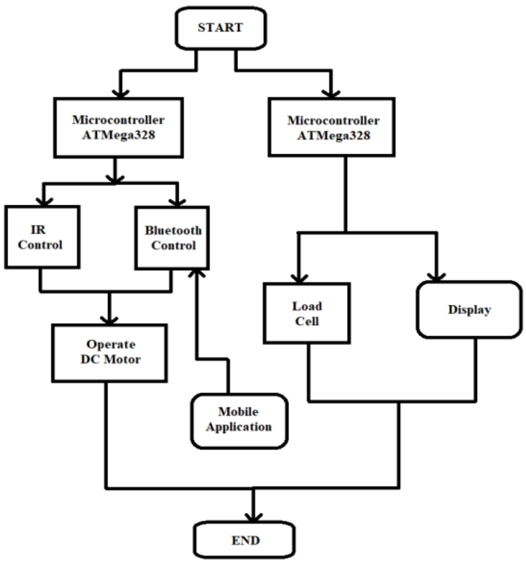

Figure 8. Flow Chart

Two microcontrollers are employed for the robot's long-lasting performance because when the power is first supplied, a single microcontroller takes on all the load and begins to heat up, making it unable to be used for an extended period of time. Here, a Bluetooth device is utilised to link a remote-control application, and a DC motor rotates the robot's wheels. The LCD panel displays the data collected by the load cell.

3D Modelling

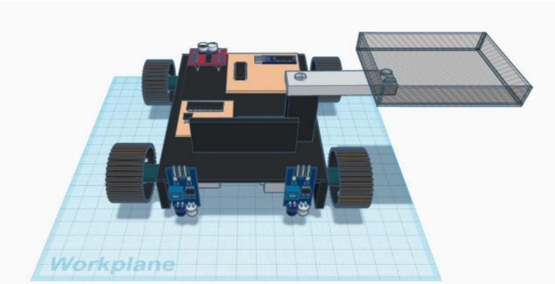

Figure 9. Front view of 3D model

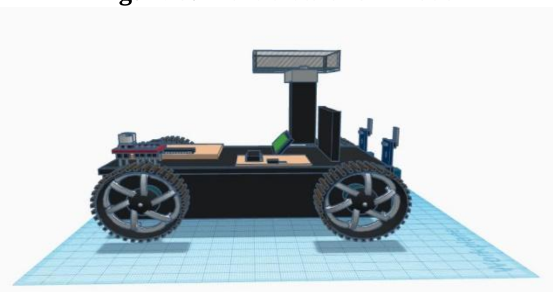

Figure 10. Side view of 3D model

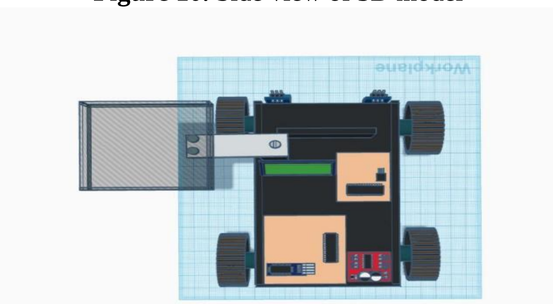

Figure 11. Top view of 3D model

RESULT

Table1. Results

Load (in Kg)	Distance (in M)	Time (in Min)
5	100	3.1
2	100	2.4
0	100	2.0

From above table1, we come to know that as the load increases the speed becomes slightly less so it takes time to reach the destination.

CONCLUSION

Robot tracking through a centrally monitored system was devised in its entirety. Design is based on the AT Mega 328P microcontroller. The suggested device can lift up to 5 kg of weight, and by adding a high torque-providing motor, more weights can be lifted up. Robot can be manually operated using a mobile application and automatically follows the black line.

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