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DELIVERY PURPOSE ROBOT USING DIFFERENT TYPES OF METHODS

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ABSTRACT

The autonomous medicine delivering robot is a solution to decreasing the contact between infected patients and hospital staff. It will also need less medical staff to work at one shift. The system will consist of several different things combined to achieve the goal that we have set. Some of the things such as sensors will be used to detect the line so that the robot has a sense of direction. The system will be able to make decisions and go to the room that it's told to go to. This system will use different boards and sensors to make sure it delivers the supplies to the right room at the right time.

Keywords: Ultrasonic Sensor, Arduino Uno R3, L293D Motor, Line Following, Obstacle Avoiding, Voice Control, IR remote Control, Light Following, Human Following.

I. INTRODUCTION

The project is design to Delivery robot build a line following, obstacle avoidance, IR remote control, voice control, light following, human following, using some different type of sensors for its movement. Arduino uno and different ICs used to achieve the desired operation. A robot is a machine that can perform task automatically or with guidance. The project proposes robot that has an intelligence built in it such that it directs itself whenever an obstacle comes in its path. This robot is built, using Arduino. An ultrasonic sensor is used to detect any obstacle ahead of it and sends a command to the Arduino. Depending on the input signal received, the Arduino redirects the robot to move in an alternate direction by actuating the motors which are interfaced to it through a motor driver. At the same time, we can control steering gear to realize the obstacle avoidance function. That is one function on robot similar as different type of function also perform. The robot uses front axle steering, rear wheel drive arrangement. Four drive tires are driven by Four DC motors with gear reduction mechanisms.

II. LITERATURE REVIEW

The goal is to overcome the problem of manually delivering good from a place to place. It saves time and makes a workplace more efficient. The objective is to setup an autonomous robot to stop at certain points and for the robot to understand when mobility is needed. So, an ultrasonic sensor is connected to the delivery robot to make the car respond only when it detects certain material in the bin.

These robots determine the black or white line using Infrared rays. And makes its path following that line. As the robot works fully autonomously engineers have tried to bump up its abilities to make it more reliable for practical usage in various sectors. Making it capable of avoiding obstacles.

Path planning is the most crucial part of the line follower robot. As it is autonomous, it has to make the decision based on the path. Most robots can follow a straight or round-shaped path. However, vital part is to let it take its decision when there is more than one path to go and they are of different shapes obviously. It Purposed the design of a robot that can be controlled using an application running on an android phone. It sends control order by means of Bluetooth which has certain highlights like controlling the speed of the engine, detecting and offering the data to mobile about the course and separation of the robot from the closest obstruction.

III. COMPONENTS AND DESCRIPTION

3.1 Arduino uno R3

Arduino Uno R3 is one kind of ATmega328P based microcontroller board. It includes the whole thing required to hold up the microcontroller; just attach it to a PC with the help of a USB cable, and give the supply using AC-

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DC adapter or a battery to get started. The term Uno means "one" in the language of "Italian" and was selected for marking the release of Arduino's IDE 1.0 software. The R3 Arduino Uno is the 3rd as well as most recent modification of the Arduino Uno. Arduino board and IDE software are the reference versions of Arduino and currently progressed to new releases. The Uno-boards the primary in a sequence of USB-Arduino boards, and the reference model designed for the Arduino platform.

3.2 IR sensor

IR sensor is an electronic device, that emits the light in order to sense some object of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. Usually, in the infrared spectrum, all the objects radiate some form of thermal radiation. These types of radiations are invisible to our eyes, but infrared sensor can detect these radiations. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode.

3.3 L298N Motor Driver

It is essential to drive the motor accurately and it runs the required supply voltage and current to motors to drive it in clockwise and anticlockwise direction. L298N is used for this purpose and it works on H-bridge principle. The motor driver works on 12v.

3.4 DC motor

DC Motor is a device that converts any form of energy into mechanical energy or imparts motion. In constructing a robot, motor usually plays an important role by giving movement to the robot. Here 4 DC motor are used to drive the robot.

3.5 Ultrasonic sensor

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. The working principle of this module is simple, it sends an ultrasonic pulse out at 40kHz which travels through the air and if there is an obstacle or object, it will bounce back to the sensor. By calculating the travel time and the speed of sound, the distance can be calculated.

3.6 Servo motors

Here, servo motor is used which can rotate or push object at some specific angle or distance. Here we used servo motors for purposes to rotate Ultrasonic sensor in left and right direction to cover an entire area wide range of 0-180 degree for precise surveillance.

3.7 Jumper Wire

Without soldering the parts for the electricity power has been terminal to different adjoining parts used for working the jumping wires and can be soldered easily. Soldering is not required and the wire is connected to the pins at each end and the points connected to be allowed. In order to change the connection between the circuit and the bread board, prototyping tools the wires are needed to change the circuit

3.8 LM358P PDIP-8 High Gain Operational Amplifier

These devices consist of two independent, high-gain, frequency-compensated operational amplifiers designed to operate from a single supply over a wide range of voltages. Operation from split supplies also is possible if the difference between the two supplies is 3 V to 32 V, and VCC is at least 1.5 V more positive than the input common-mode voltage. The low supply-current drain is independent of the magnitude of the supply voltage.

3.9 LDR

This LDR 5mm changes resistance with the change in the ambient light exposure on the surface of the sensor. LDR (Light Dependent Resistor) is a type of photocell which finds excellent use in light sensing device application, whether it is automatic outdoor light ON/OFF switch or Indoor automatic light switch.

The LDR 5mm sensor works best in both Light and dark regions. Light-dependent resistors or photoresistors are a staple of electronics. If you need a way to sense the level of ambient light then there is no easier way to do it. As the light on the sensor increases then the resistance across the two leads decreases.

Two Cadmium Sulphide (CDs) Photoconductive Cells with spectral responses similar to that of the human eye. Cell resistance falls with increasing light intensity. Applications of this product include smoke detection, Automatic lighting control, batch counting, and burglar alarm systems.

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3.10 HC-5 Bluetooth module

The HC-05 is a class 2 Bluetooth module designed for transparent wireless serial communication. It is pre-configured as a slave Bluetooth device. Once it is paired to a master Bluetooth device such as PC, smart phones and tablet, its operation becomes transparent to the user. All data received through the serial input is immediately transmitted over the air. When the module receives wireless data, it is sent out through the serial interface exactly at it is received. No user code specific to the Bluetooth module is needed at all in the user microcontroller program.

The HC-05 can be re-configured by the user to work as a master Bluetooth device using a set of AT commands. Once configured as master, it can automatically pair with a HC-05 in its default slave configuration or a HC-06 module, allowing an point to point serial communications.

The HC-05 will work with supply voltage of 3.6VDC to 6VDC, however, the logic level of RXD pin is 3.3V and is not 5V tolerant. A Logic Level Converter is recommended to protect the sensor if connect it to a 5V device (e.g. Arduino Uno and Mega). The power to the HC-05 will cut off if the "EN" pin is pulled to logic 0.

3.11 Infrared IR Wireless Remote-Control Module

The Infrared IR Wireless Remote Control Module Kit for Arduino consists of ultra-thin infrared remote control and 38KHz infrared receiver module. This mini slim infrared remote control with 20 function keys. Its transmit distances up to 8 meters. Ideal for handling a variety of equipment indoors.

IR receiver module can receive a standard 38KHz modulation remote control signal. You can decode the remote-control signal through Arduino programming. You can design a variety of remote-control robots and interactive works.

3.12 TIP32C Transistor

TIP32 is a three-layer PNP device within the working range, the collector current IC is a function of the base current IB, a change in the base current giving a corresponding amplified change in the collector current for a given collector emitter voltage VCE.

3.13 Servo Motor

A servo motor is a type of motor that can rotate with great precision. Normally this type of motor consists of a control circuit that provides feedback on the current position of the motor shaft, this feedback allows the servo motors to rotate with great precision. If you want to rotate an object at some specific angles or distance, then you use a servo motor. It is just made up of a simple motor which runs through a servo mechanism**.** If motor is powered by a DC power supply then it is called DC servo motor, and if it is AC-powered motor then it is called AC servo motor.

IV. WORKING

4.1 Line Following

The concept of the line follower robot is related to the transmitting and receiving of light. The white colour reflects all the light that falls on it whereas the black colour absorbs all the light.

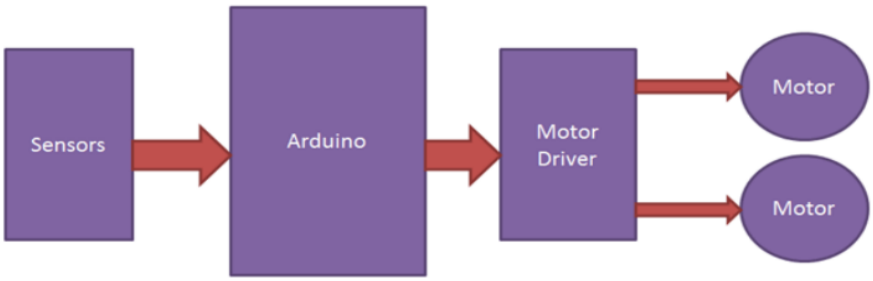

Fig -1: Block Diagram of line following

In this line follower robot, we have used IR transmitters and receivers (also known as photodiodes). When IR light falls on a white surface, it gets reflected back towards the IR receiver, generating some voltage changes that are analyzed by the Arduino. When IR light falls on a black surface, it gets absorbed by the black surface, and no rays are reflected back thus, the IR receiver doesn't receive any rays.

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In this project, when the IR sensor senses a white surface, an Arduino gets HIGH as input, and when it senses a black line, an Arduino gets LOW as input. Based on these inputs, an Arduino Uno provides the proper output to control the line follower.

4.2 Obstacle Avoiding

The obstacle avoidance robot uses ultrasonic sensors for its movements. A arduino Uno R3 is used to achieve the desired operation. The motors are connected through the motor driver L298 motor driver. The ultrasonic sensor is attached in front of the robot.

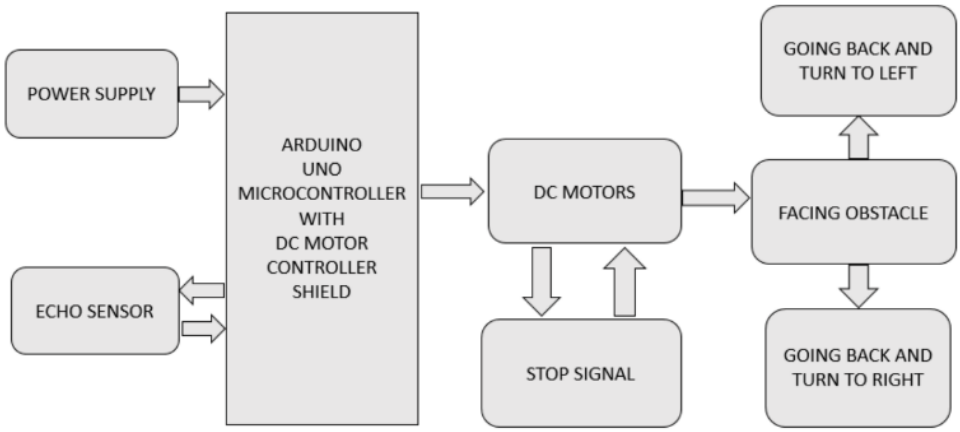

Fig -2: Block Diagram of Obstacle Avoiding

Whenever the robot is going on the desired path the ultrasonic sensor transmits the ultrasonic waves continuously from its sensor head. Whenever an obstacle comes ahead of it the ultrasonic waves are reflected from an object and that information is passed to the microcontroller. The microcontroller controls the motors left, right, back, front, based on ultrasonic signals. To control the speed of each motor pulse width modulation is used (PWM).

4.3 Voice Control

The block diagram of the simple voice controlled robotic vehicle is given it consists of the smartphone that recognizes the voice commands and are being wirelessly transferred to the Bluetooth module HC05. The module at that point changes over the order to content and the series of characters are sent to the Arduino for additional handling. The Arduino microcontroller decodes the string got and correspondingly performs further capacities. The signals are sent to the motor that hence powers and drives the motors connected to it. On the Transmitter area, commands are given to the Mobile Application through the mic. This portable handset is associated with the moving vehicle by means of Bluetooth module. The portable application utilized, is modified so that the voice orders given to the handset are received by the mic and these simple voice orders are changed over to advanced word successions (A to D transformation). These stored sequences are than transmitted to the robotic vehicle via Bluetooth transceiver module and are sent to the transceiver controller. Android application transceiver is used to decode the received signal with the Bluetooth module. The controller contrasts these signals and the put away program orders in it and convert them into voice strings. The voice strings are then used to run the servo engines for the ideal interval of time.

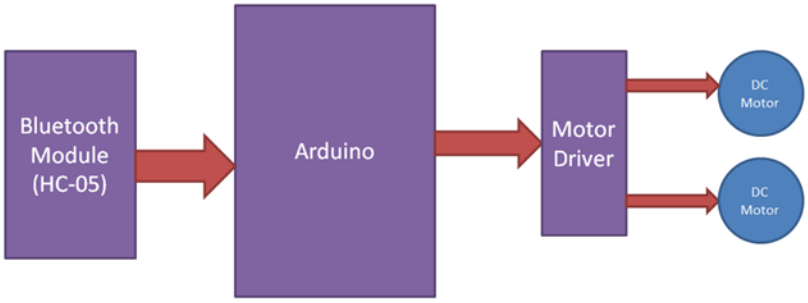

Fig -3: Block Diagram of Voice Control

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The microcontroller, sends directions, which when executed, helps in working of the engine driver. The yield of the Arduino goes to the engine driver IC and it controls the specific engine. A DC power supply is required to run the system. The DC power supply feeds the Microcontroller and the Bluetooth module.

4.4 IR Remote Control

We use TSOP Sensor Module for receiving the IR signals which we give through pressing buttons of a remote. Our robot can move in forward, backward, right, and left directions according to the given signals. We have to press the buttons of the remote to move the Robot in a particular direction. We use four LEDs of different colors which will go on as the robot moves in different directions. it works as a Bluetooth control robot. If the Robot will move forward the LED on pin 3 will glow, the same for the backward LED on pin 4 will glow, the LED on pin 5 will glow if the robot moves in the right, and the LED on pin 6 will glow if the robot moves in left. The Robot keeps moving until we press the stop button on the remote. All the LEDs reset to off. In this way, the Robot moves.

4.5 Light Following

The robot uses a special electronic circuit to control the speed of two motors through the use of two light sensors. The motors are connected to the robot's wheels, which allow it to drive around. Figure 3 shows a simplified diagram of this process (continue reading for a more detailed description of the circuit). If both light sensors detect the same amount of light, the wheels spin at the same speed, so the robot goes straight. If one light sensor detects more light than the other, one wheel will spin faster, which will make the robot turn.

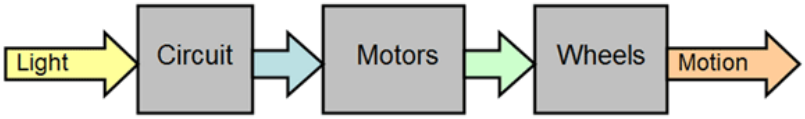

Fig -4: Block Diagram of light following

A simplified diagram of how the robot works. The robot's circuit detects bright light (for example, from a flashlight). The circuit then sends electrical signals to the robot's motors to turn them on. The motors drive the robot's wheels, which make the robot move and steer.

4.6 Human Following

when you come near to the robot starts to follow you. there are 4 wheels in the robot. and 4 motors attached to the chassis. now there are three sensors on the robot one is an ultrasonic sensor and two IR sensor which arranges like two sensors left and right to the ultrasonic sensor. and when you put your hand near to the ultrasonic sensor the robot will start forward.

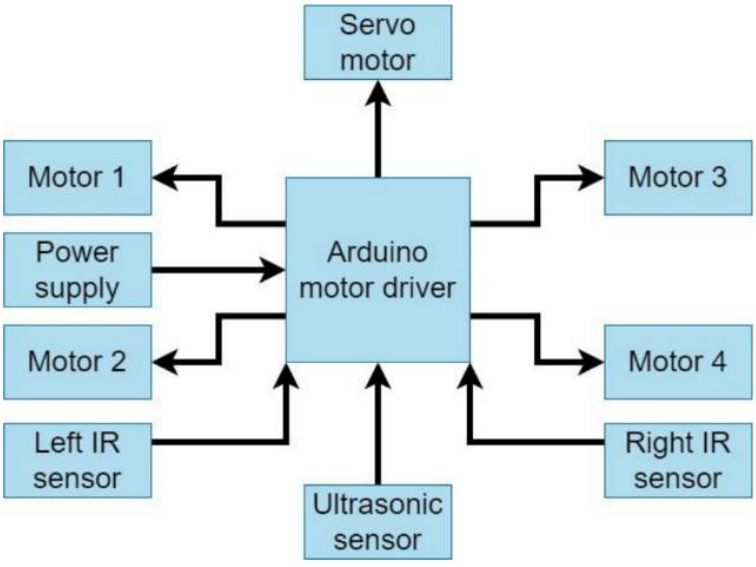

Fig -5: Block Diagram of Human following

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If you turn your hand to the left side the Arduino robot moves on the left side, and if you put your hand in the right the robot will move in the right direction. so, how the whole system works we will talk about this.

when you put your hand in from of the ultrasonic sensor then the sensor detects you and sends this information to the Arduino. there is some distance prefix in the Arduino so if your hand is away from the sensor, it will not read that. and if your hand is near to the sensor, it will read it.

Now Arduino knows that there is something in front of the sensor and Arduino send some instruction to the motor driver and motor driver trigger the motors. and the Arduino robot starts to move forward we need to run all motor forward.

Now, what about the sensors. IR sensor works on infrared light which can also detect the object near to it. so there is two IR sensor one is at the left side of ultrasonic sensor and other is at the right side of the ultrasonic sensor. when anything comes near to the left sensor Arduino got the information that there is something is near to the left sensors and according to the code, the robot will turn to the left. and the same process for the right sensor.

V. TOOLS IDENTIFIED

5.1 Hardware

- Arduino Uno R3
- L298 Motor Driver
- DC motor
- HC-05 Bluetooth Module
- Infrared IR Wireless
- Remote Control Module
- IR Sensor
- Ultrasonic Sensor Holder
- Servo Motor
- Ultrasonic Sensor hc-sr0
- Jumper Wires
- LED
- LM358 Dual Operational Amplifier
- 10k Variable Resistor
- BD139 NPN Transistor
- 4148 Diode
- LDR Sensor
- Resistor
- Capacitor
- TIP32C Transistor
- 18650 3.7V 1200mAh Lithium-Ion Rechargeable Cell
- On/Off switch

5.2 Software Tools

- Proteus 8™ software
- Arduino IDE
- Easy EDA

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VI. SIMULATION

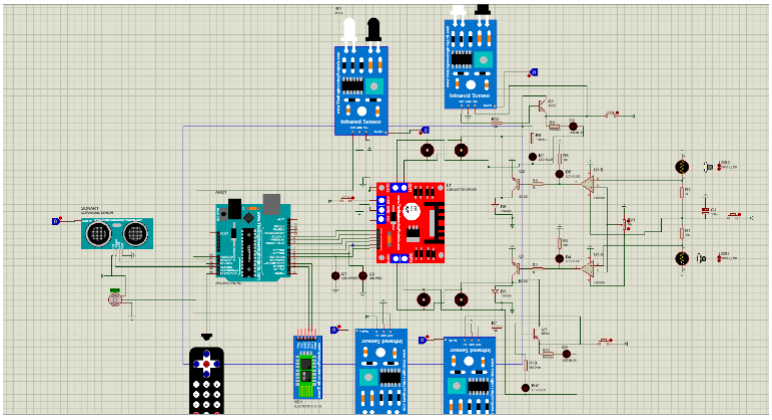

Fig -6: Simulation of Delivery Robot

VII. RESULT AND DISCUSSION

- The Robot will be able to moves in all four directions: i.e. Right, Left, Front, Back
- The robot is working perfectly as per design and functionality. The robot was tested on a path for line following testing which resulted in sensing of white line over a black surface. Further different obstacles were placed in its way so as to test its obstacle detection which also resulted perfectly fine and the robot took turn on the detection of an obstacle. Different color strips were placed in its way so as to check its speed control capability and that too worked fine. As a result, the robot is built-up successfully and it's working perfectly as per its functionality.

Fig -7: Final Model

- Robot is controlled through voice commands given by the user who is operating the project. These voice command needs to be given through an android app which is installed on the user's android mobile. Speech recognition is done within the android app and then a respective command is sent to the voice-controlled robot vehicle. Microcontroller fitted on the vehicle decodes these commands and gives an appropriate command to the motors connected to the vehicle.
- Different experiments were conducted and the performance of the human following robot was tested. Test was performed on the ultrasonic and infrared sensor. It was noted that the sensor was working accurately within a range of 4 meters. Then we performed the test to check whether the robot maintains a specific distance with the target object. Then we checked the serial communication between Arduino, motor shield and various motors. On the basis of results obtained from these tests and experiments, we made the necessary changes in the processing and control algorithm. After the completion, we observed that the results produced were very satisfying the robot was perfectly following the person wherever it goes. Hence the objective of implementing a good Human-Robot interaction was achieved.

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VIII. CONCLUSION

Our goal was to build a delivery robot capable of transporting material to our desired destination. We chose Bluetooth or IR receiver connected to the Arduino uno r3 on the delivery robot for handling the task. The IR receiver has an ultrasonic sensor (HC-SR04) and a Bluetooth module (HC-05) attached to it, and it will read data off the sensors, process it, and send to the Arduino uno r3. The ultrasonic sensor is placed on the container and is used to detect the presence of a letter in the container. The delivery robot needs to detect if it is at the origin or not. To do that, we used a Bluetooth beacon, simply because they are of short-range and easily available. The HC-05 which is wired to the configured to automatically connect to Bluetooth beacon placed at the destination if it is in the range. This information is sent to the Arduino uno r3, which can then finally detect whether or not it is at the origin. By training and building a model based on Keras supervised learning technique often referred to as behavioral cloning, we have achieved the outcome that lets our robot to drive on its own based on our driving style and to deliver the object as and when required to our desired location.

IX. FUTURE SCOPE

This work is all about Delivery Robot using Arduino which will follow a specific line or route and avoid the obstacles and edge it encounters. By attaching the Bluetooth module and a camera, this project can be expanded in the future, so that the user can see the obstacle identified on his screen by sitting at just one spot. Line follow and obstacles with the robot industrial manufacturing processes for edge detection and medical emergency supply in India will play a vital role in the industry. This line following and obstacle and edge detection robot can be used as carrying the load to transport the goods smoothly and without damage from one position to another. When some kind of mishandling of products happens then that device will interrupt its routine operation and call the device administrator to check the issue that occurred to fix. A Wi-Fi system, GPS device, and Camera could be used for this purpose to track the production process and the supply chain in real-time. Every industry or medical authority's practical job can be more effective for supply chain management, so that India's manufacturing sectors take place in foreign markets.

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