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RESCUE ROBOT

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Abstract: Robot is a re-programmable, multi functional device which is primarily designed to do work like human such as pick and place, loading and unloading, surveillance, health care, industrial, aerospace application. Robots can perform dangerous and accurate work to increase the productivity as they can work 24 hours without rest. This paper deals with the design and control of automated vehicle type robot which can move in desired direction and captures pictures and videos of required location. An android application has been used and a Bluetooth communication is made with robot which interfaces with microcontroller to control its direction. Aim of this work is to design and control the motion of robot using Bluetooth device of an Android phone.

Keywords: Jumper wires, Arduino Uno, Bluetooth Module, Dual motor driver module.

I. INTRODUCTION

This is an era where robots are used extensively for surveying places where humans cannot be present directly. This project aims at solving such a problem. The Bluetooth controlled robot can be controlled remotely by a person and can be used to survey Remote places with the help of a camera that is onboard the robot and broadcasts it directly to a server that can be accessed by an IP address. The robot also has an onboard fire detector which it can use to detect fire. Hardware components required for this project as follows:

- Arduino UNO
- HC-05 Bluetooth Module
- Dual H-bridge motor drivers L298
- Micro-motors & Grippy wheel
- Jumper wires
- Battery
- LED(generic).

II. SYSTEM PARTS

2.1 HC – 05 Bluetooth Module: HC-05 Bluetooth Module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Its communication is via serial communication which makes an easy way to interface with controller or PC(here an android device). HC-05 Bluetooth module provides switching mode between and slave mode which means it able to use neither receiving nor transmitting data.



Figure 1HC-05 Bluetooth Module

2.2 Arduino Uno: Arduino UNO is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic projects. This board can be interfaced with other Arduino boards, Arduino shields, Raspberry Pi boards and can control relays, LEDs, servos, and motors as an output.

Arduino UNO features AVR microcontroller Atmega328, 6 analogue input pins, and 14 digital I/O pins out of which 6 are used as PWM output.



Figure 2 Arduino Uno

2.3 ESP32 Camera Module: ESP32-CAM is a low-cost ESP32-based development board with onboard camera, small in size. It is an ideal solution for IoT application, prototypes constructions and DIY projects. The board integrates WiFi, traditional Bluetooth and low power BLE , with 2 high- performance 32-bit LX6 CPUs.



Figure 3ESP32 Camera Module

2.4 Dual motor driver module:A Dual motor driver is an electronic circuit that switches the polarity of a voltage applied to a load. These circuits are often used in robotics and other applications to allow DC motors to run forwards or backwards.

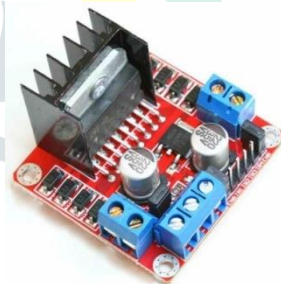


Figure 4 Dual motor driver module

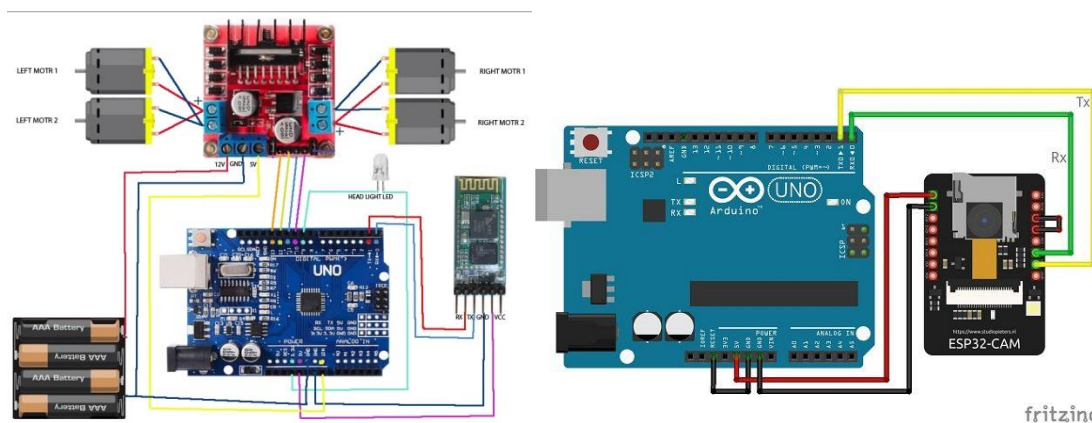


Figure 5 Circuit Diagram

III. CIRCUIT DESIGN OF RESCUE ROBOT USING ARDUINO UNO

The circuit contains of two arduino uno boards. One of them is used to control the ESP32 camera module, while the other is used for controlling the robot. The above Fig 5 shows the connections for the part that controls the movement of the robot.

A Bluetooth module is connected to the uno chip which is used for communicating with the transmitter. A bridge motor driver is also connected to the uno chip as shown above. Four DC motors are also connected to the bridge motor driver. A DC power supply not exceeding 12V is connected to the power pins in the bridge driver as well as the uno chip. The camera module requires a separate arduino chip for its operation, it just requires connecting the camera module and the DC power supply (here we have used 3 9V batteries in parallel as the module requires a lot of current) as shown in the figure above.

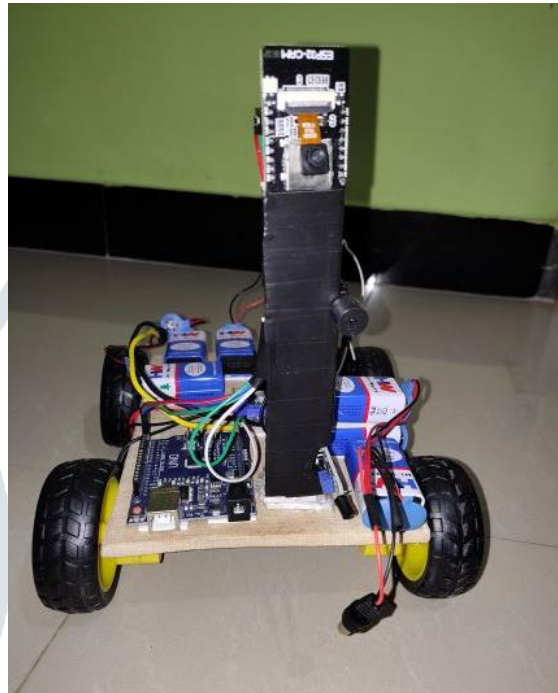


Figure 6 The Robot

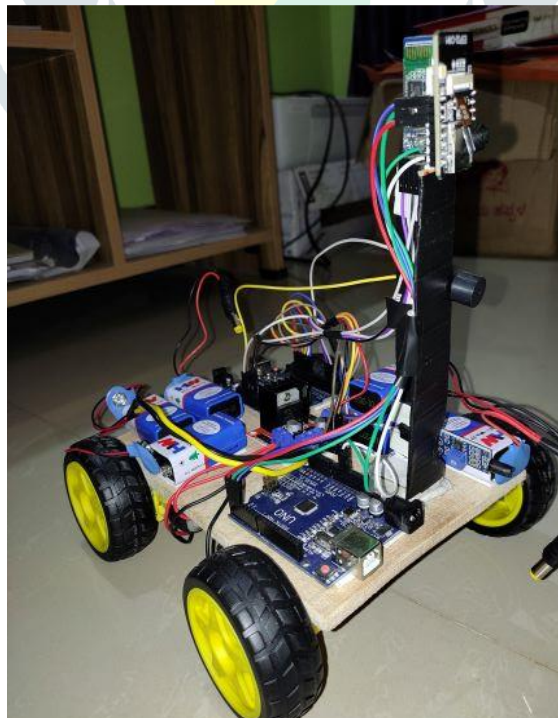


Figure 7 The Robot

IV. PROJECT MOTIVATION AND PURPOSE

Our project is aimed at designing a robot which can be used for surveillance in scenarios where humans cannot be physically present. For example in the scenario of collapse of an apartment building humans entering the building directly might not be a viable option or very safe, so in such a case this robot can be used to find out if there is any Human struck in the debris of the collapsed building. The onboard camera is also capable of running a facial recognition algorithm which can also be used to recognize faces that have been initially fed to it in the form of a still image. This feature can be used to find a person who might be struck in the debris. The robot also has a light sensor (fire sensor) which can be used to detect sudden changes in the light intensity. This can be used to turn on a fire extinguisher which can come in handy to extinguish any fire in such scenarios. So there is room for further improvement. ARDUINO UNO is the main component of the robot which has been programmed using the Arduino software.

V. WORKING OF RESCUE ROBOT USING ARDUINO UNO

The Arduino UNO boards are of course the brains of the robot. The Bluetooth module is used to communicate with the robot. The signals received by the Bluetooth receiver are interpreted by the uno and a suitable output pin is turned to high or low based on the signal received. This is then connected to the bridge motor driver which then turns the wheels, the wheels can also be made to turn in the reverse direction by inverting the polarity, this is actually why the bridge driver is used. The robot can be made to turn left or right by running only the wheels on the right or left side respectively. This can also be achieved by using the bridge driver. The camera module just needs to be refreshed (if necessary) once it is programmed and all the connections are made as shown in figure 4.

VI. SIGNIFICANCE OF THE SYSTEM

The main purpose of the project was to replace humans with robots in performing dangerous tasks. A robot can be more suited to such jobs because of its compact size and its ability to perform multiple operations at the same time. This can be a more effective way of surveying places where humans cannot go directly like inspecting a radioactive leak or the leakage of poisonous gasses.

This project has a lot of room for further development and can be altered in such a way so as to fit the specific needs of the user. A commercial product of a much bigger scale with the same objective has been developed by a company called Boston Dynamics and is called "Spot".

VII. CONCLUSION

This system is designed to develop a wireless Human rescue robot which will help to save life of Humans in any building collapse and at the time of other disaster occurs. This system has been designed in such a way that it can cater to the need of rescue squad, the military, the police and for handling hazardous or radioactive materials.

VIII. REFERENCES

- [1] Wikipedia
- [2] <https://create.arduino.cc/projecthub/ashshaks/bluetooth-control-robotic-car-0d9444>