LOBOT -LOW COST, SELF CONTAINED LOCALIZATION OF SMALL SIZED GRIUND ROBOTIC VEHICLE

[1] **Dr. G.Sirisha, Associate Professor,** Dept. of ECE, Teegala Krishna Reddy Engineering College, Hyderabad, India.

[2]**Govindu Sravanthi**, **UG scholar,** Dept of ECE, Teegala Krishna Reddy Engineering College, Hyderabad, India, Email: govindusravanthi2147@gmail.com.

[3] **Somavarapu Sowmya, UG scholar,** Dept of ECE, Teegala Krishna Reddy Engineering College, Hyderabad, India, Email: sowmyasomavarapu13@gmail.com.

[4]**vanga Anjesh, UG scholar,** Dept of ECE, Teegala Krishna Reddy Engineering College, Hyderabad, India, Email: vangaanjesh@gmail.com.

[5]**a.Sravan Kumar, UG scholar,** Dept of ECE, Teegala Krishna Reddy Engineering College, Hyderabad, India, Email: sravan2452000@gmail.com.

ABSTRACT

In this project, The objective of this paper is to implement and propose LOBOT, a low-cost, self-contained localization system for small-sized ground robotic vehicle. LOBOT does not require external reference facilities, expensive hardware, careful tuning or calibration and is capable of operating under various indoor and outdoor environments. It identifies the local relative movement through various inexpensive sensors and a correct location by GPS technology. The controlling becomes easy with wireless technology like Wifi. By graphical user interface is easy to find out various parameter and graph of some parameter. LOBOT keeps the positioning error well under an accepted threshold we will deliberate how to control robot controlled car using IOT technology through an android mobile phone. A new version of wireless controlled vehicle is proposed for spying purposes. This robot supposes a movable spy robot with wireless system. The LOBOT is made up of DC motors, 12v lead acid batteries, and 3 movable wheels. In this vehicle, the signals transmitted from the user's smart phone are used for vehicle motion. Metal detector is used for detection land mines or bombs and a gas sensor is used for harmful gas detection, DHT11 for temperature and humidity detection and notification alerts will be sent to the blynk app.

Keyword: blynk app iot, android mobile application.

1. INTRODUCTION

Small-sized ground robotic vehicles have great potential to be deployed in situations that are either uncomfortable for humans or simply too tedious. For example, a robot may become part of industrial operations, or become part of a senior citizen's life, or become a tour guide for an exhibition center. The robot is kept as small as possible to allow access through narrow passageways such as a tunnel. To fulfill these missions, the robotic vehicle often has to obtain its accurate localization in real time. Considering the difficulty or impossibility in frequent calibration or the management of external facilities, it is desirable to have a self- contained positioning system for the robot: ideally, the localization system should be completely integrated onto the robot instead of requiring external facilities to obtain the position; the system should work indoors and outdoors without any human involvement such as manual calibration or management. Meanwhile, the cost is expected to be as low as possible. There exist various localization schemes for ground robotic vehicles. These techniques normally utilize GPS, inertial sensors, radio signals, or visual processing. GPS often becomes inoperable in certain environments such as indoors or in wild forests. Additionally, the GPS operations consume power quickly. As an alternative, a localization system may use various waves including electromagnetic waves of various frequency (e.g., common WiFi radio, Ultra-wideband, RFID radio, Infrared , laser beam and ultrasound. The radio based positioning is among the most popular techniques.

1.1 Objective

The main Objective of this project is to implement and propose LOBOT, a low cost, self-contained Localization system for small sized ground robotic vehicle. To detect the bombs using IOT technology and notify this information to the authorities. Robots are used extensively in manufacturing and, more glamorously, in space exploration, where minimum maintenance requirements are emphasized Robot is defined as, "A reprogrammable, multifunctional manipulator designed to move material, parts, tools or specialized devices through various programmed motions for the performance of a variety of tasks." Small sized ground robotic vehicles have great potential to be deployed in situations that are either uncomfortable for humans or simply too tedious. For example, ROBOT. Become part of industrial operations, or become part of a senior citizen's life, or become a tour guide for an exhibition centre. The robot is kept as small as possible to allow access through narrow passageways such as a tunnel . To fulfil these missions, the robotic vehicle often has to obtain its accurate localization in real time. Considering the difficulty or impossibility in frequent calibration or the management of external facilities, it is desirable to have a self- contained positioning system for the robot: ideally, the localization system should be completely integrated onto the robot instead of requiring external facilities to obtain the position; the system should work indoors and outdoors without any human involvement such as manual calibration or management.

2. Block diagram

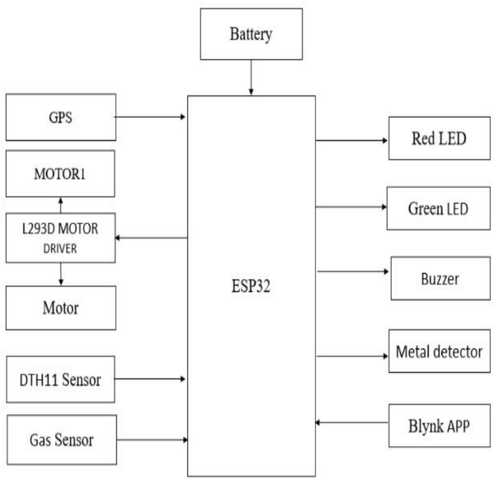

Fig 2.1: Block Diagram.

2.1 ESP32 Modules

There are many ESP32 modules available for experimenters. Just about any of them can be used for the experiments here. Many of these boards have an integrated micro-USB connector that will simplify programming. Some boards don't have this feature and require an external FTDI adapter for programming. Most of these boards are based upon the ESP32-WROOM chip. The ESP32 DEV KIT and ESP32 NODEMCU boards are quite popular and available at Amazon and eBay. Ad fruit makes the HUZZAH32 board. Spark fun has the ESP32- Thing board and the popular ESP32-Cam board integrates a small video camera and a micro SD card socket along with an ESP32 (this board will require an FTDI adapter for programming). Please note that these boards share many features but they don't have the same pinouts. In our experiments, I'll be referring to the pin function (i.e. GPIO 4) instead of an actual pin number. This will allow you to use a different board than the one I am using. Programming the ESP32 The ESP32 can be programmed using many different development environments. Code can be written in C++ (like the Arduino) or in Micro Python. To make use of all of the ESP32 features Espressif provided the Espressif IoT Development Framework, or ESP-IDF.

For beginners, an easy way to get started is by using the familiar Arduino IDE. While this is not necessarily the best environment for working with the ESP32, it has the advantage of being a familiar application, so the learning curve is flattened.

Fig.2.2 esp32 module.

2.2 Metal Detector

Inductive Proximity Sensor ("prox" "sensor" or "prox sensor" for short) is an electronic oscillator consisting of an inductive coil made of numerous turns of very fine copper wire, a capacitor for storing electrical charge, and an energy source to provide electrical excitation. The size of the inductive coil and the capacitor are matched to produce a self-sustaining sine wave oscillation at a fixed frequency. The coil and the capacitor act like two electrical springs with a weight hung between them, constantly pushing electrons back and forth between each other. Electrical energy is fed into the circuit to initiate and sustain the oscillation. Without sustaining energy, the oscillation would collapse due to the small power losses from the electrical resistance of the thin copper wire in the coil and other parasitic losses.

Fig. 2.3 Metal Detector.

2.3 L293D Motor Driver

The L293D motor driver is available for providing User with ease and user friendly interfacing for embedded application. L293D motor driver is mounted on a good quality, single sided non-PTH PCB. The pins of L293D motor driver IC are connected to connectors for easy access to the driver IC's pin functions. The L293D is a Dual Full Bridge driver that can drive-up to 1Amp per bridge with supply voltage up to 24V. It can drive two DC motors, relays, solenoids, etc. The device is TTL compatible. Two H bridges of L293D can be connected in parallel to increase its current capacity to 2 Amp.

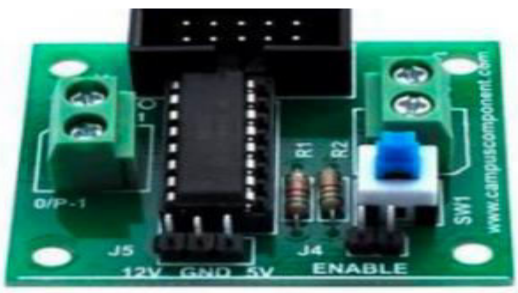

Fig 2.4: L293D Motor driver

2.4 Buzzer

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarms, timers and confirmation of user input such as a mouse click or keystroke. A piezoelectric element may be driven by an oscillating electronic circuit or other audio signal source, driven with a piezoelectric audio amplifier. Sounds commonly used to indicate that a button has been pressed are a click, a ring or a beep.

Fig 2.5 A Buzzer.

2.6 (GPS)

The Global Positioning System (GPS) is a U.S. space-based global navigation satellite system. It provides reliable positioning, navigation, and timing services to worldwide users on a continuous basis in all weather, day and night, anywhere on or near the Earth. GPS is made up of three parts: between 24 and 32 satellites orbiting the Earth, four control and monitoring stations on Earth, and the GPS receivers owned by users. GPS satellites broadcast signals from space that are used by GPS receivers to provide three- dimensional location (latitude, longitude, and altitude) plus the time.

Fig 2.7 Global positioning system.

2.7 MQ2 SENSOR

MQ2 Gas Sensor Module MQ2 gas sensor can be used to detect the presence of LPG, Propane and Hydrogen, also could be used to detect Methane and other combustible steam, it is low cost and suitable for different application. Sensor is sensitive to flammable gas and smoke. Smoke sensor is given 5 volt to power it. Smoke sensor indicate smoke by the voltage that it outputs . More smoke more output. A potentiometer is provided to adjust the sensitivity. Sn02 is the sensor used which is of low conductivity when the air is clean. But when smoke exist sensor provides an analog resistive output based on concentration of smoke. The circuit has a heater. Power is given to heater by VCC and GND from power supply. The circuit has a variable resistor. The resistance across the pin depends on the smoke in air in the sensor. The resistance will be lowered if the content is more. And voltage is increased between the sensor and load resistor.

Fig 2.8 MQ2 Sensor.

2.8 DHT11 SENSOR

Humidity and Temperature sensors DHT11, shown in Figure 4, is a temperature and humidity sensor has four pins- VCC, GND, Data Pin and a not connected pin. A pull-up resistor of 5k to 10k ohms is probed for communication between sensor and micro-controller. DHT11 sensor consists of a capacitive humidity sensing element and a thermistor for sensing temperature. The humidity sensing capacitor has two electrodes with a moisture holding substrate as a dielectric between them. Change in the capacitance value occurs with the change in humidity levels. The IC measure, process this changed resistance values and change them into digital form [15,16,17]. For measuring temperature this sensor uses a Negative Temperature coefficient thermistor, which causes a decrease in its resistance value with increase in temperature.

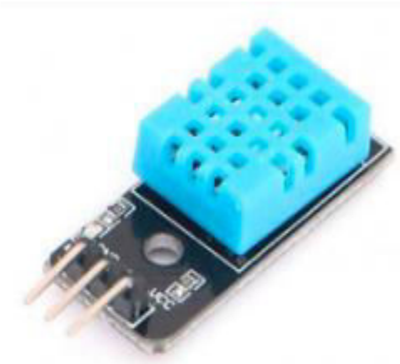

FIG. 2.9 DHT 11.

3. Schematic Diagram

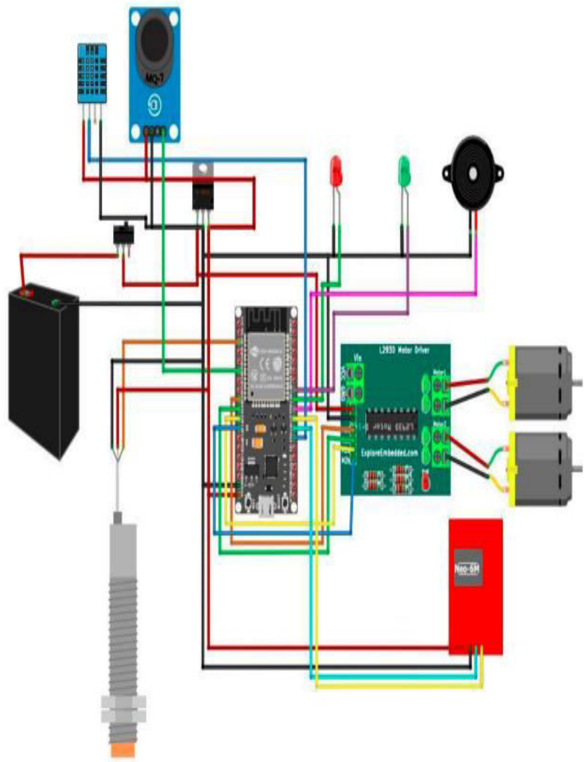

Fig 3.1 : Schematic Diagram.

4. Flow chart diagram

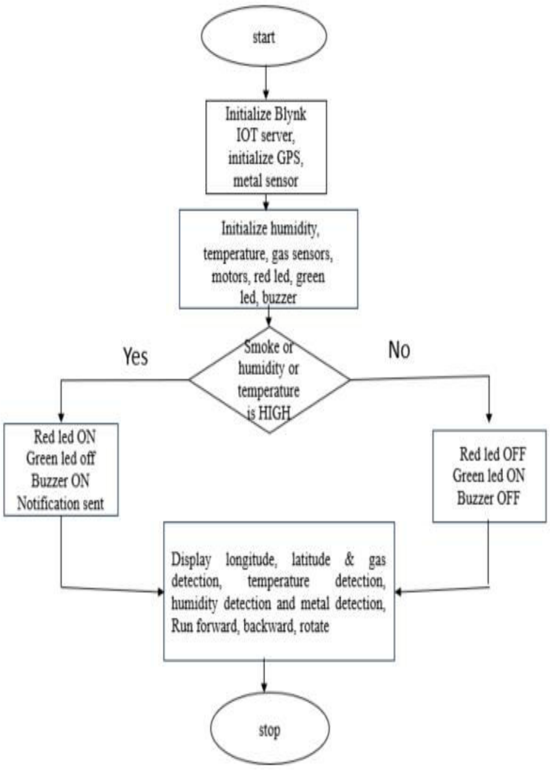

Fig 4.1 : Flow Chart.

5. RESULT AND DISCUSSION

Experimental Result

This project is well prepared and acting accordingly (including all the hardware and software) as per the initial specifications and requirements of our project. Because of the creative nature and design the idea of applying this project is very new, the opportunities for this project are immense. The practical representation of an experimental board is shown below.

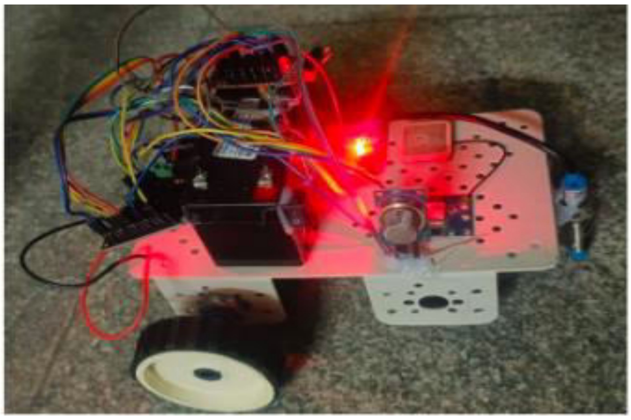

Fig 5.1: Practical Representation of Experiment.

5.2 Conclusion based output.

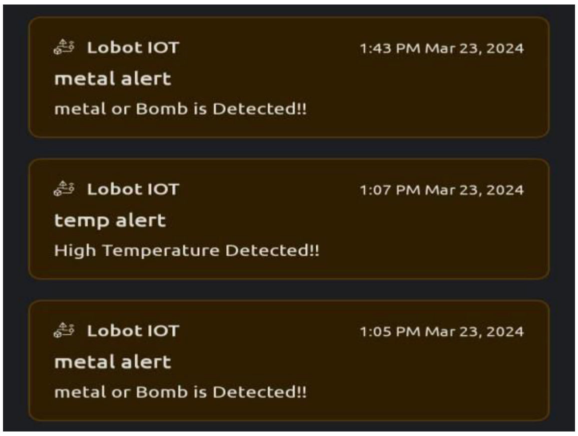

Fig 5.2.1: Output Notifications.

Fig 5.2.2: Total layout of BLYNK App.

5.3 Numerical representation of input corresponding outputs.

ELEMENTS	INPUT	OUTPUT
Metal Detector	Metal<3000	Metal or Bomb is Detected
DTH11 Sensor	Room Temperature >33'C Room Humidity>75'C Temperature & Humidity	High Temperature is detected
MQ2 Sensor	MQ2>2000	Smoke or Toxic gases Detected

6. CONCLUSION

The hardware device LOBOT uses are easily available at low cost. We developed a prototype of LOBOT and conclude extensive field experiments. The empirical experiments of various temporal and spatial scales with LOBOT verified its accuracy. In contrast to the acceleration-based approach, LOBOT succeeds in maintaining low cumulative error. Thus the human intervention is reduced in automated parking system by LOBOT. This robot was built by keeping military applications in mind. So, it comes with basic video surveillance and human detection so that it can detect underground persons etc. Further extensions are can be made in the same projects such as home automation, telemedicine system. The robot can be equipped with interactive voice feedback. It is possible to install ME(medical emergency) band in the robot to look after the health of an elderly person in the house.

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