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LANDMINE DETECTOR AND SURVEILLANCE ROBOT

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Abstract - Landmines and different explosives are set in war fields and other populated places which causes wounds and once in a while death to people as well as property misfortune. There are different kinds of landmines, for example, Anti-tank landmines and people killing landmines. Antitank landmines and some of the people killing landmines are in metal casing so these landmines can be identified by utilizing metal finders. These landmines must be moved for dispersion utilizing mechanical arms. For recognizing the landmine, without human obstruction, the automated remote controlled ground vehicle with appended mechanical arm design model is proposed in this paper. This model consists of a spy-cam and an ESP sensor as well as a sound buzzer along with a microprocessor that detects the landmine and also spy on enemy territory.

Key Words: ESP, SPY-CAM, Automated remote control, Sound buzzer, Metal finder, Microprocessor

1. INTRODUCTION

As of late, the world has gone over many bomb shoot fatalities in papers, media. These fatalities have expanded substantially more nowadays and they are tracked down in domains as well as in jam-packed regions. Thus, observation fundamentally close to the outskirts in the tactical situation to safeguard warriors, occupants of that area from adversaries are required. There are a number of gadgets that can distinguish the bomb with the assistance of philanthropic guide. In this condition, there is a risk of the human losing his life. Many individuals are losing their lives without their inclusion due to the landmines that are covered inside. By utilizing this automated gadget recognition and the migration of the bomb with the inbuilt mechanical arm without human intercession is conceivable. Consequently, the human presence in this location is diminished. Robots are being planned productively involving microcontrollers for quick working and to lessen human misfortune in distinguishing and diffusing the hidden landmines [1].

Landmines are broadly organized into two sorts: individuals killing and threatening to vehicle mines. Both have caused a phenomenal encountering in the past numerous years. To deal with one of the deep-rooted issues making phenomenal agony and mishap people of a couple of countries affected through landmines, around 150 countries have molded a settlement to lessen the number of misfortunes and extension in the amount of mine free countries. There are generally around 110 million landmines in 70 countries. Out of them only 40 million are destroyed up until this point. Mine fields which are left after the contentions or planted by fear mongers ensure more than 80,000 passings reliably. 80% of the setbacks are of individuals killing mines, in which most of them are kids. The vitally 5 countries which have commonly number of landmines are: Iraq: 9 million, Afghanistan: 11 million, Angola: 13 million, Iran: 16 million, Egypt: 23 million [2].

2. LITERATURE REVIEW

There are various projects done on landmine detector robots, using Arduino, using microcontroller. In this review, the studies the various authors related to this topic is examined and discussed. So, let us see their project model and ideas.

Land Mine Detection Using Unmanned Ground Vehicle
P. Greeshma Shivani, Somani Harshit, Ch. Vamsi Varma, R. Mahalakshmi

This paper describes about the losses of soldier's lives caused by stepping on the landmines. This paper also proposed a counter measure to prevent any danger to the life. In this paper, they have used an Arduino board and made a rover for it.

Landmine Detection and Reporting using Light Weight Zumo Bot
Rajesh Kannan Megalingam, Vamsi Gontu, Ruthvik Chanda, Prasant Kumar Yadav, Allada Phanindra Kumar

This paper shows the stats of the total number of deaths of soldiers caused by stepping on landmines. In this paper, a model of zumo-bot is shown.

ARDUNIO CONTROLLED LANDMINE DETECTION ROBOT
V. Abilash and J. Paul Chandra Kumar

In this paper, a new advanced technology is used which consists of a GPS sensor. They have used Arduino sensor along with GPS tracking.

Land Mine Detecting Robot Capable of Path Planning
Muhammad Zubair, Mohammad Ahmad Choudhry

In this paper, a robot path mapping is used along with graphical user interface and PIC microcontroller. This robot is capable of path planning and pinpoints the exact locations of the landmines.

Sensor Controlled Defense Purpose Robot for Land Mine Detection
A. Kunaraj, M. Mathushan, J. Joy Mathavan, G.M. Kamalesan

This paper describes the advantage of using a robot to detect a landmine instead of a soldier. The main component used is Arduino UNO microcontroller.

3. METHODOLOGY

A landmine detection robot is required to detect the buried landmines. Since we also installed a surveillance camera which will help the robot to spy on enemy territory. For safety of the user, the robot is controlled with the help of microcontroller ESP-32 as well as a cam module which has a ESP. The robot has a noise buzzer installed that gets activated when a landmine is detected. The robot is powered by a DC motor and also a SERVO motor.

4. WORKING PRINCIPLE

In this experiment we have used ESP cam module to establish communication between the user and our surveillance vehicle which also includes ESP-32 microprocessor. Cam module is placed on SG-90 servo motor for surveillance. This vehicle makes movement using DC motors which operate using microcontroller ESP-32. This vehicle also includes a metal detector which detects the landmine placed under the ground.
Power for the system is routed from Lithium-Ion batteries which has a supply voltage of 3.7 volts each. This power is routed to motor driver(L298) that is used to operate DC motors which are used to perform the movements of the vehicle. 5-volt DC supply is provided to the ESP-32 microprocessor and ESP Camera module. Metal Detector Sensor is connected to microprocessor ESP-32 for landmine detection. The rover has been designed for all terrain 4WD which is friendly in every type of landmark whether the platform is rocky or in desert areas.

5. COMPONENTS

I. ESP-32 MICROCONTROLLER

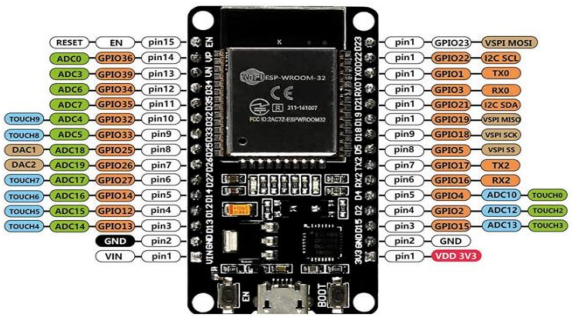


Fig-1

ESP32 is a chip that provides Wi-Fi and (in some models) Bluetooth connectivity for embedded devices– in other words, for IoT devices. Although ESP32 is only the chip, the manufacturer also frequently refers to the development boards and modules that contain this chip as "ESP32."

II. ESP-32 CAM MODULE

Fig-2

Based on ESP32, the ESP32-CAM is a compact, low-power camera module. It includes an inbuilt TF card slot and an OV2640 camera. Intelligent Internet of Things applications like Wi-Fi picture uploading, QR identification, wireless video monitoring, and more can make extensive use of the ESP32-CAM.

III. DC MOTORS

Fig-3

With a working voltage range of 3 to 12 volts, it's ideal for small to medium-sized robot construction. available at RPMs of 60 and 150. DIY enthusiasts will find the 300 RPM BO Motor-Straight suitable. For usage in a mobile robot automobile, this motor set is perfect because it is tiny, affordable, and simple to install.

IV. L-298 MOTOR DRIVER

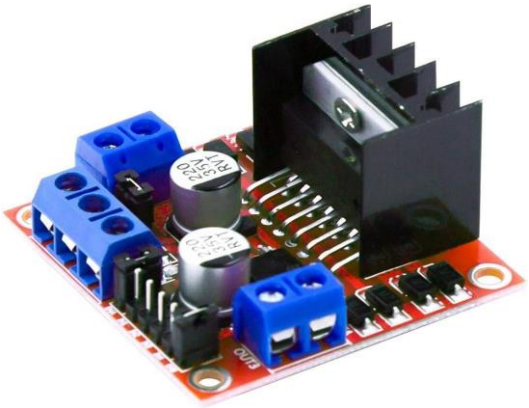


Fig-4

The L298N is a dual H-Bridge motor driver which allows speed and direction control of two DC motors at the same time.

V. LITHIUM ION BATTERY-18650

Fig-5

An 18650 battery or 1865 cell is a cylindrical lithium-ion battery common in electronic devices.

VI. SG-90 SERVO MOTOR

Fig-6

Popular micro servo motor SG90 is frequently utilized in do-it-yourself and enthusiast applications. This little, inexpensive servo motor has a maximum torque of 1.8 kg-cm and can spin 180 degrees.

VII. ON/OFF SWITCH

Fig-7

A control switch is defined as an on-off switch when its function is to open or close an electrical circuit in a stable manner.

6. SNAPSHOTS

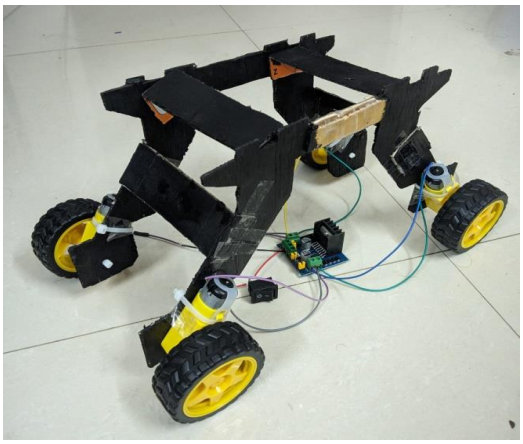
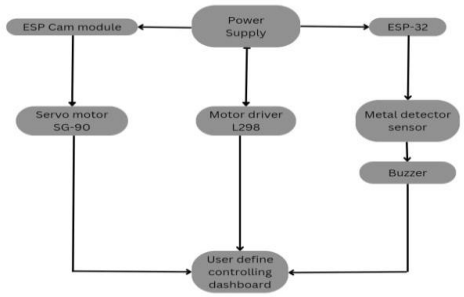


Fig-8

7. BLOCK DIAGRAM



7. FUTURE SCOPE

We have implemented a surveillance and defense robot under the category of ***UNMANNED GROUND VEHICLE [UGV].*** We have used ***ESP-32 MICROCONTROLLER*** as well as ***ESP-32 CAM*** as a central processing unit to establish better life-server connection between user and machine. With the use of this microcontroller, we can also form a connection with the detector for landmine detection.

8. CONCLUSION

By using our vehicle, we will be able to reduce the death casualties of soldiers and improve the security of the nation. We have also installed a surveillance camera which will help us to monitor the battlefield and also, we can spy on enemy territory. We can record and capture real-time videos and images of enemies. We can study the patterns of the buried landmines.

9. REFERENCES

[1]P.Greeshma Shivani, Somani Harshit, Ch.Vamsi Varma, R.Mahalakshmi,‘‘Land Mine Detection Using Unmanned Ground Vehicle’’, Proceedings of the Fourth International Conference on Trends in Electronics and Informatics (ICOEI 2020)

[2] Rajesh Kannan Megalingam, Vamsi Gontu, Ruthvik Chanda, Prasant Kumar Yadav, Allada Phanindra Kumar,‘‘Landmine Detection and Reporting using Light Weight Zumo Bot’’, Proceedings of the International Conference on Inventive Computing and Informatics (ICICI 2017)

[3] V. Abilash and J. Paul Chandra Kumar,‘‘ARDUNIO CONTROLLED LANDMINE DETECTION ROBOT’’, 2017 Third International Conference On Science Technology Engineering and Management (ICONSTEM)

[4] Muhammad Zubair, Mohammad Ahmad Choudhry,‘‘Land Mine Detecting Robot Capable of Path Planning’’, 2010 Second WRI World Congress on Software Engineering

[5]A. Kunaraj, M. Mathushan, J.Joy Mathavan, G.M. Kamalesan,‘‘Sensor Controlled Defense Purpose Robot for Land Mine Detection’’, Proceedings of the International Conference on Smart Electronics and Communication (ICOSEC 2020)

[6] Ahmed Ismail, Mohammed Elmogy and Hazem ElBakry, "Landmines Detection Using Autonomous Robots: A Survey", International Journal of Emerging Trends & Technology in Computer Science (IJETTCS)2014.