IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.066 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 11, Issue 12, December 2024

DOI: 10.17148/IARJSET.2024.111257

A SURVEY ON LANDMINE DETECTOR

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Abstract: This paper puts forward the solution to landmine detection. Detection of landmines is a serious problem in the mine prone areas. The system shown in this paper uses a robotic car equipped with different types of components like a metal detector, camera module, ultrasonic sensors, etc. for self-detection of landmines. This data or indications can be sent over a large distance using a GPS to the remote monitoring system. This monitoring system will therein be used for the exact detection of landmines

Keywords: Landmine detection, Raspberry-Pi, Metal detector, Robotic car, GPS Module.

I. INTRODUCTION

Landmines are victim-activated explosive traps, whose main intention is to target a person or a vehicle. A mine is generally made up of a specific quantity of explosive that is placed within some form of the casing and a fusing mechanism to the detonation of the main explosive material. Some landmines are buried under the ground, while others are fixed to objects above the ground. They can be activated by a verity of mechanisms including pressure, tripwire, electrical command, or magnetic influence.

Some modern mines can even get initiated using other forms of electronic sensors. Landmines are generally classified into two categories: anti-vehicle and anti-personnel. The antivehicle or anti-tank mines are pressure activated and are designed such that the footstep of a person does not detonate them. Mostly military vehicles are targeted to such mines.

Anti-personnel landmines are intended particularly to drive backfoot soldiers from a specific area. They can be activated by direct pressure from above or with the help of tripwire, or by the proximity of a person within a predefined distance. Landmines are hazardous and can create problems like removal require a large amount of time, tools, transportation, and a lack of skilled manpower. Landmines if not vacated, can cause loss to friendly forces.

II. LITERATURE PAPER

[1] Smith et al has proposed “Advancements in Metal Detection for Landmine Clearance”. Landmine clearance remains a critical global challenge, with millions of unexploded mines posing threats to civilians. Traditional metal detection techniques have demonstrated significant limitations, including difficulty in differentiating between landmines and other metallic debris. Smith et al.'s study, “Advancements in Metal Detection for Landmine Clearance,” explores innovative approaches to improve detection accuracy, reduce false positives, and enhance operational efficiency.

[2] Brown et al has proposed “Wheeled Robots for Landmine Detection: Design and Deployment”. Landmine detection continues to be a pressing challenge in post-conflict regions. Brown et al.'s study, *"Wheeled Robots for Landmine Detection: Design and Deployment,"* explores the potential of autonomous wheeled robots as a solution. Their research presents innovative designs, advanced sensor integrations, and deployment strategies tailored for challenging environments. This paper critically reviews their contributions and situates them within the broader landscape of robotic technologies for humanitarian applications.

[3] Davis and Kim et al has proposed “Tracked Mobility in Landmine Detection Robots”. Efficient landmine detection in diverse and hazardous terrains remains a significant technological challenge. Davis and Kim et al.'s study, *"Tracked Mobility in Landmine Detection Robots,"* investigates the design and deployment of tracked robotic systems to address this challenge. This paper reviews their proposed methodologies, including tracked mobility mechanisms, sensor

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integration, and autonomous navigation systems, and discusses the implications of their findings for the field of robotic demining.

[4] Wang and Patel et al has proposed “Sensor Fusion for Enhanced Landmine Detection”. The detection of landmines in diverse and challenging terrains requires innovative technological solutions. Wang and Patel et al.'s study, *"Sensor Fusion for Enhanced Landmine Detection,"* introduces a multi-sensor fusion framework that combines data from different detection modalities to improve accuracy and efficiency. This paper reviews their approach, evaluates the experimental results, and situates their work within the broader context of advancements in landmine detection technologies.

[5] Hernandez and Carter et al has proposed “Mapping Minefields with GPS-Enabled Robots”. Landmine contamination is a persistent global issue that demands innovative solutions for safe and efficient clearance. Hernandez and Carter et al.'s study, *"Mapping Minefields with GPS-Enabled Robots,"* introduces an automated approach to mapping suspected minefields using GPS-enabled robotic systems. This paper reviews their methodology, evaluates the results, and discusses the implications for the field of humanitarian demining.

[6] Singh and Mehta et al has proposed “IoT in Robotic Landmine Detection Systems”. Integrating the Internet of Things (IoT) into robotic systems has opened new avenues for landmine detection, enabling real-time communication, data analysis, and remote monitoring. Singh and Mehta et al.'s study, *"IoT in Robotic Landmine Detection Systems,"* explores how IoT-enabled robots can revolutionize demining operations. This paper examines their innovative approach, highlights the experimental outcomes, and contextualizes their work within the broader domain of IoT applications in humanitarian robotics.

III. METHODOLOGY

A. BLOCK DIAGRAM OF A LANDMINE DETECTOR

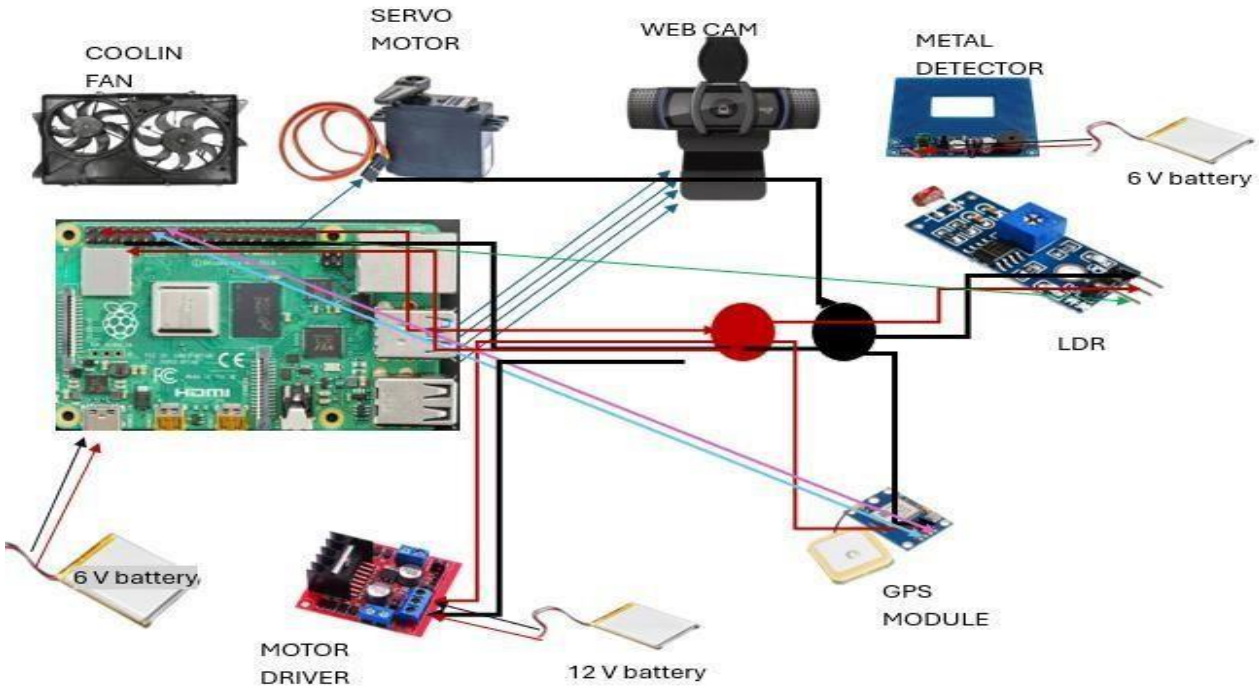

Figure:1 - Block diagram of a landmine detector

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B. FLOW CHART OF A LANDMINE DETECTOR

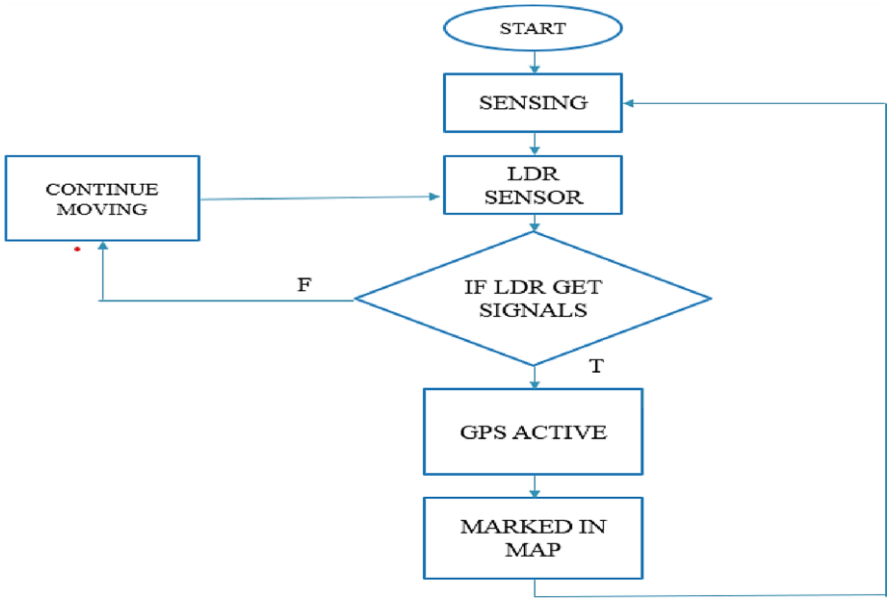

Figure:2- Flow chart of a landmine detector

IV. RESULTS

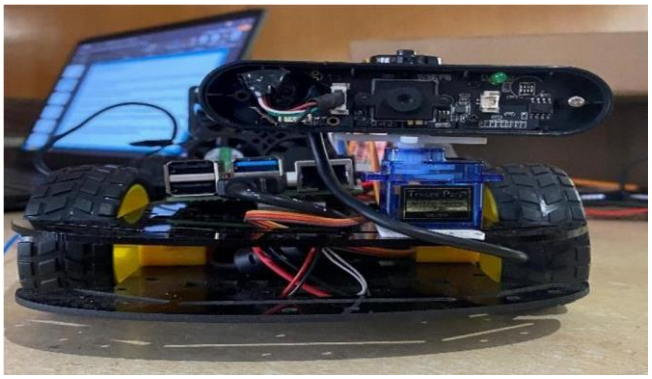

Figure:3.2- Front view of a landmine detector module

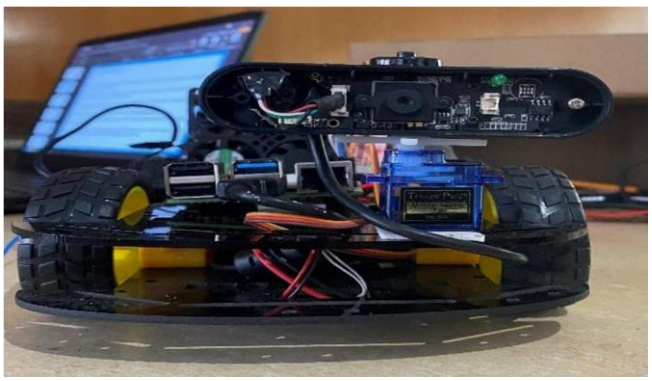

Figure:3.3- Side view of a landmine detector module

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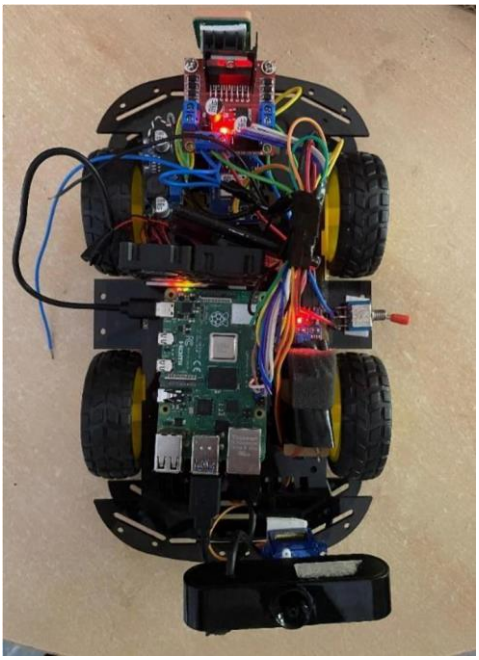

Figure:3.1-Top view of a landmine detector module

V. CONCLUSION

There are a lot of landmine detectors in use nowadays, but many of them are human-operated. Most of these humanly operated detectors are not up to the mark, i.e. their controllers and sensors are not efficient. Due to such flaws, there is a high risk of loss of life and property. Such mistakes endanger the life of the military personnel or the residents of that area. The development and implementation of the landmine detection robot, integrating both a metal detector and an IR sensor, represents a significant advancement in the field of autonomous robotic solutions for hazardous area detection. The primary objective of this project was to create a reliable, efficient, and autonomous system capable of identifying landmines in a designated area with minimal human intervention. The integration of a metal detector and an IR sensor proved to be a highly effective solution for landmine detection. The metal detector efficiently identified the metallic components of landmines, while the IR sensor detected heat spikes emitted by buried mines. This dual-sensor approach significantly increased the accuracy and reliability of the detection process.

REFERENCES

[1]. Majd Ghareeb et al., “Wireless Robo-Pi for Land Mine Detection", IEEE, 2017.
[2]. John M. Halland, Designing Autonomous Mobile Robots, 1st Edition, Elsevier, 2004.
[3]. E. Colon, P. Hong, et.al, “An Integrated Robotic System for Anti-Personnel Mines Detection, “Control Engineering Practice, Volume 10, Issue 11, November 2002, Pages 1283-1291.
[4]. S. Ghuffar, J. Iqbal, U. Mehmood, M. Zubair, “Design and Fabrication of 5DOF Programmable Autonomous
[5]. Robotic Arm”, WSEAS, Issue 11, Volume 5, November 2006, pp. 2624-2629.
[6]. S.Sasikumar, et.al, “Multi Utility Landmine Detecting Robotic Vehicle”, IRJET, Vol. 5, Iss. 3, Mar 2018.
[7]. V. Abilash and J. Paul Chandra Kumar, “Ardunio Controlled Landmine Detection Robot”, International Journal of Engineering Science and Computing (IJESC), May 2017.
[8]. J. Bharath, “Automatic Landmine Detection and Sweeper Robot using Microcontroller”, International Journal of Mechanical Engineering and Robotics Research, Vol.4, No.1, Jan 2015.
[9]. Yuvaraj Ganesh, et.al, “Surveillance Drone for Landmine Detection”, International Conference on Advanced Computing and Communications, 2015.