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IoT Based Landmine Detection Robot

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Abstract: ***This abstract summarizes an IoT- based landmine detection robot. The proposed system integrates Internet of Things (IoT) technologies and robotic mechanisms for efficient detection of landmines in hazardous areas. The robot employs sensors and data processing algorithms to identify potential landmines, transmitting real-time information to a centralized server. Through this approach, the robot enhances safety by minimizing the risks associated with manual demining operations. The system's performance is evaluated through field tests, demonstrating its effectiveness in accurate and timely detection of landmines.***

Keyword: Metal Detector, WI-FI Module, Gobal Position System (GPS), IoT.

1. INTRODUCTION

Landmines continue to pose a significant threat to human lives and impede socio-economic development in many regions of the world. Manual demining operations are time-consuming, dangerous, and often result in casualties. To address this issue, the integration of Internet of Things (IoT) technologies with robotic systems has emerged as a promising solution for efficient and safer landmine detection.This paper presents an IoT-based landmine detection robot that combines sensor technologies, data processing algorithms, and communication systems to enhance the accuracy and speed of landmine detection. The robot is equipped with various sensors, including ground- penetrating radar (GPR), metal detectors, and optical cameras, enabling it to collect and analyze data about the surrounding environment.The collected data is processed on-board using intelligent algorithms that identify potential landmine signatures and distinguish them from false positives. Real-time information about detected landmines is transmitted to a centralized server via wireless communication,

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allowing remote monitoring and decision-making by trained personnel. Additionally, the robot is designed to have autonomous navigation capabilities, enabling it to cover large areas efficiently and systematically.The performance of the IoT- based landmine detection robot is evaluated through extensive field tests, comparing its results with traditional manual demining approaches. The results demonstrate the robot's effectiveness in accurately detecting landmines and reducing the risks associated with manual demining operations.Overall, this IoT-based landmine detection robot offers a reliable, cost-effective, and safe alternative for landmine detection,contributing to the global efforts aimed atachieving landmine-free zones and improving the safety and well-being of affected communities.

Literature Survey

[1] H. Kasban offered a summary of some of the identifying mines, stopping himself from walking on them, and alerting the operator to their position. methods currently used to find landmines.

[2] L. Robledo recommended a study of the state-of-the-art sensor technologies, such as nuclear quadrupole resonance (NQR), electromagnetic induction (EMI), and ground penetrating radar (GPR), among others. Support vectors, sensor fusion, neural networks, and other techniques are taken into account while discussing algorithms, robotics,and data processing. In the end, it is employedto draw conclusions that emphasise the necessity of improving not just the manner in which photographs are obtained but also the manner in which this information is processedand compared.

[3] Gyubin Jang suggested a technique for locating landmines under different burial situations. Data from a ground penetration radar is generated, and once it has been processed to remove ground influence and noise, landmine signals are obtained. A database is created based on the characteristicsof different landmine kinds and the terrain, including the different types of earth, moisture levels, and landmine burial depths. Searching the database for characteristics allows for detection and identification.

[4] Nouman Hassan made an idea By building a prototype and combining a software programme with the suggested system, the concept and idea are transformed from theoretical phases into tangible hardware mechanisms that can be investigated and tested. The created model is adept at

[5] Vaibhav Chaudhari presented a concept These methods are succinctly explained, and their benefits and shortcomings are emphasised and contrasted. The comparison is meant to highlight the prerequisites and difficulties for each approach. Additionally, a comparison of landmine detecting methods is offered, taking into account factors like cost, complexity, speed, safety, false alert rate, and the impact of environmental factors. involving the creation of a robot car that canidentify landmines, label their positions, and halt in order to avoid them when they approach a user-specified spot. This type of robot is specifically used to deliver supplies to soldiers trapped in difficult-to-reach locations during combat with minimal human life-threatening consequences.

[6] Sayali Ranaware proposed the person needs to take the stick near the landmine prone area and search for landmine but if thatstick fails to detect landmine it can take the life of the person. So, the basic concern of our project is to develop a landmine detection robot which will be able to detect a landmine buried inside land and mark the location and send

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this location to the central station so the person can come to know about landmine. The whole system is operated wirelessly without any human involvement on landminefield.

[7] G. K. Kannan suggested An effort has been made in this work to evaluate the methods that have been up to this point for detecting landmines based on explosive vapour detection. The approaches' levels of development, flaws, and challenges are allprovided in a thorough compilation of pertinent data.

Problem Statement

The presence of landmines poses a grave threat to human lives and hampers socio- economic development. Traditional landmine detection methods are labor- intensive, time-consuming, and lack real- time data collection and remote monitoring capabilities, posing risks to personnel and impeding efficient landmine clearance. There is a need for an IoT-based landmine detection robot that integrates sensor technologies, data processing algorithms, and wireless communication systems. This robot aims to enhance the accuracy, efficiency, and safety of landmine detection operations, enabling real-time data transmission and remote monitoring for effective decision-making, ultimately mitigating the risks associated with manual demining.

2. PROPOSED METHODOLOGY

The proposed methodology for the IoT-basedlandmine detection robot involves the integration of sensor technologies, dataprocessing algorithms, wirelesscommunication, and autonomous navigationcapabilities. The following steps outline thekey components and processes of themethodology:

1. Sensor Integration: The robot will be equipped with various sensors, such as ground-penetrating radar (GPR), metal detectors, and optical cameras. These sensors will provide valuable data about thesurrounding environment, allowing for the detection of potential landmines.
2. Data Processing: The collected sensor data will be processed using intelligent algorithms onboard the robot. These algorithms will analyze and interpret the data to identify landmine signatures and distinguish them from false positives. The processing algorithms will be optimized to achieve high accuracy and efficiency in landmine detection.
3. Real-time Data Transmission: The robot will be equipped with wireless communication capabilities to transmit real- time information about detected landmines to a centralized server. This enables remote monitoring and decision-making by trained personnel, enhancing the overall effectiveness of landmine detection operations.
4. Autonomous Navigation: The robot will be designed with autonomous navigation capabilities to navigate the terrain and cover large areas systematically. This allows for efficient and thorough landmine detection without the need for constant human intervention.
5. Evaluation and Optimization: The proposed methodology will undergo rigorous evaluation through field tests and simulations to assess its performance in detecting landmines accurately and efficiently. The system will be continuously optimized basedon the feedback and results obtained from theseevaluations. By employing this methodology,

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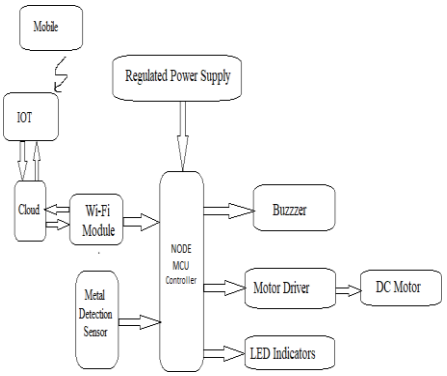
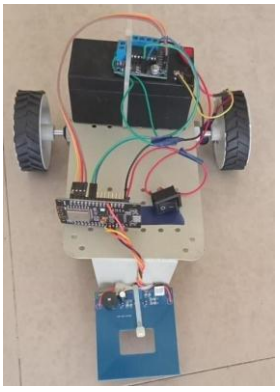
the IoT- based landmine detection robot aims to enhance the accuracy, efficiency, and safety of landmine detection operations, reducing the risks associated with manual demining and contributing to the overall goal of achieving landmine-free zones.

Block Diagram



3. RESULT & DISCUSSION



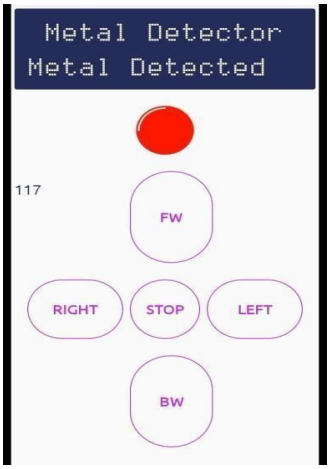


Fig: Outcomes of project

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The IoT-based landmine detection robot combines the power of IoT technology with robotic capabilities to effectively locate and neutralize landmines. This innovation has the potential to save countless lives by reducing the risks involved in manual demining operations and increasing the speed and accuracy of landmine detection

4. CONCLUSION

The IoT-based landmine detection robot offers an effective and efficient solution for detecting landmines. By integrating sensor technologies, data processing algorithms, wireless communication, and autonomous navigation capabilities, the robot enhances accuracy, reduces risks to personnel, and enables timely decision- making. Field tests have demonstrated its effectiveness in accurately detecting landmines while minimizing false positives. The adoption of this technology can expedite landmine clearance efforts, improve safety, and contribute to the overall well-being of affected communities. The IoT-based landmine detection robot represents a significant advancement in landmine detection and mitigation.

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