



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

# IJRSET

International Journal of Innovative Research in  
**SCIENCE | ENGINEERING | TECHNOLOGY**



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 13, Issue 5, May 2024

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

Impact Factor: 8.423

 9940 572 462

 6381 907 438

 [ijirset@gmail.com](mailto:ijirset@gmail.com)

 [www.ijirset.com](http://www.ijirset.com)

# IOT Based Landmine Detecting Robot

A N Shiva Prasad<sup>[1]</sup>, B Kishore Babu<sup>[2]</sup>, BhudeshNaik K<sup>[3]</sup>, E Vaishnavi<sup>[4]</sup>, Mr. Santhosha B M<sup>[5]</sup>,

U.G. Student, Department of Electrical and Electronics Engineering, Ballari Institute of Technology and Management,  
Ballari, Karnataka, India<sup>[1],[2],[3],[4]</sup>

Assistant Professor, Department of Electrical and Electronics Engineering, Ballari Institute of Technology and  
Management, Ballari, Karnataka, India<sup>[5]</sup>

**ABSTRACT:** “The mechanism of our project is to detect the Metal using IOT Technology. Our project demonstrates real life robotic vehicles that detect land mines or other metal based objects on its path. The vehicle is fitted with a metal detecting system that can sense metals and update sensor response in web application. The system works in conjunction with an ESP32 Microcontroller to achieve this operation. The buttons are used to send commands to move the vehicle forward, backward, left and right. Two motors at receiving end operate the vehicle as per the commands received. As soon as command is send it send the signal to the web application. At receiving end, a ESP32 reads the command and starts processing according to the commands. The microcontroller operates the motor to move the vehicle through a motor driver IC. The metal detecting system connected to the system detects any metal beneath it. On detection, it automatically sends the signals to web application and user gets notified about it and also it simultaneously sends message to ESP32. Thus, the metal detecting system couples with a robotic vehicle and allows it to operate globally.”

**KEYWORDS:** Metal detection, ESP32 Microcontroller, Temperature Sensor, WIFI Camera, Obstacle Sensor, Motor.

## I. INTRODUCTION

Nowadays robots are used to accomplish the work in hazardous region and can be used to manage troublesome instability levels in that type of areas. Gradually robots are becoming dynamically essential for standard subject applications, for instance. Different types of robotic applications are now coming to light, where robots are used to complete the different combination of tasks. Mostly, robots are still used for unsafe work which is dangerous for humans. Metal detecting robots are utilized for searching the metallic objects which are hidden under the ground. Electricians also use metal detectors to examine the electrical cables which are hidden in the walls. At airports, metal finders are utilized for scanning the travellers' baggages for metal protests, for example, cuts and firearms. For searching old war zones and historical as well as archeological sites, hoping to find treasures, jewelry and old coins, metal detectors are frequently used. In food factories, they are used for checking and verifying that no metal things have fallen from industrial factories into the food unintentionally.

Different technological terms such as Telecommunication, Internet of Things (IOT), and robotics have been considered as an essential part of our daily life activities. Although its advances and limitations, innovative tech can be used to solve fundamental issues and save lives of many people for political or financial purposes. In the electronic age, speed, flexibility and automation are major confrontations that will be enabling the researchers to cope up with the challenges of the society against the fast development of the technology. Robotics is becoming dynamically essential for several standard applications. It can be employed for purposes like military operations, recovery missions, and urban search tasks, since its ability to function without human involvement makes it suitable for harsh or perilous settings that would put people at risk. Effectiveness in detection of metals and landmines are two important research areas that are still considered more attractive to researches due to investing tech according to Landmine and cluster monition monitor. Multi sensor robot, path planning algorithm and vehicle-mounted sensors are different strategies that used to search and detect mines.

## II. RELATED WORK

The idea of using metal detectors to find metal dates back to the late 19th century. Alexander Graham Bell is often credited with inventing the first metal .detector in 1881, although it was originally designed to locate a bullet lodged in President James Garfield's chest. However, the device proved ineffective for that purpose. [1] Fabrication of Metal

Detecting Robot. [2] This project presents a new type of robot that uses a metal detector sensor to detect metallic object passing over the metal detector. [3] The robotic bot is controlled using android application for metal detection operation controlled with the help of Wi-Fi technology based on cloud computing. [4] This project can be widely used because of its simplicity and ability to modify to meet changes of needs. [5] Current detection unit is only able to detect metal in a range of 10 cm but replacing with large circumference electromagnet coil can increase the depth of detection. The main aim of this project is to design a robotic vehicle which can sense metals near to it on its track, and this robot is controlled by an android application. This project comprises of a metal detector circuit which is interfaced to the control unit that produces a buzzer sound to the user when a metal object is close to it. A microcontroller is used for the desire operation. Obstacle detection sensor can be installed to avoid collision of robot with object which are coming in front of it.

### III.METHODODOLOGY

The robotic vehicle is controlled using android application for metal detection operation controlled with the help of WIFI technology. Based on experimental studies, it was found that the mobile controlled robot can move in any direction as per the desired instruction and the beeper in the metal detector circuit beeps whenever it encounters any metallic object. The embedded hardware has been developed on ESP32 microcontroller and controlled by an Android smart phone. This controller receives the commands from the Android phone, takes the data and controls the motors of the robot by the motor driver L293D. The Smartphone is been interfaced to the device by using WIFI. A WIFI device ESP32 camera module was used with ESP32 MC to receive commands from the Smartphone. A temperature sensor is connected to MC to alert if any fire and avoid that path from moving further. An ESP32 camera is connected to live streaming of video which can be watched online in mobile or web page. An ultrasonic sensor is connected to MC as an obstacle sensor if any obstacle find while moving it stop from further motion to avoid damage to robot. All information are passed to IOT web server which can be easily viewed and controlled.

### IV.BLOCK DIAGRAM AND WORKING

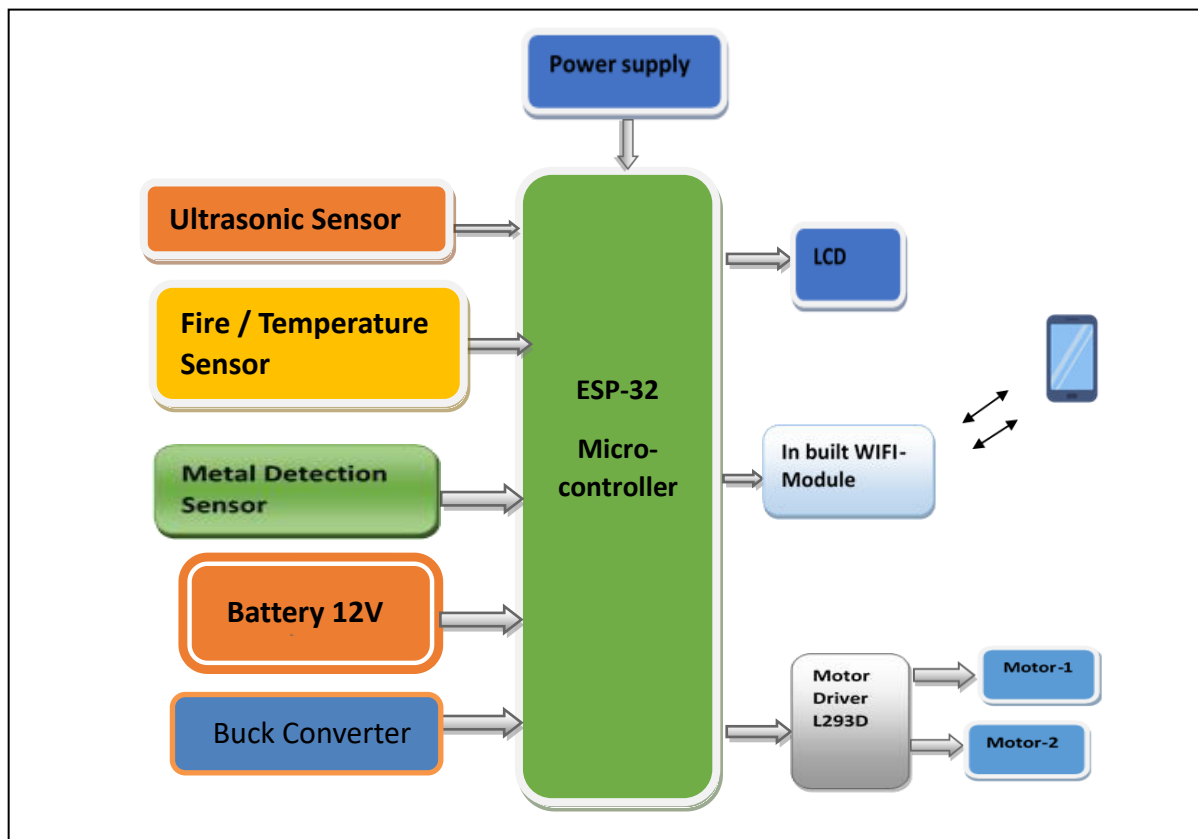
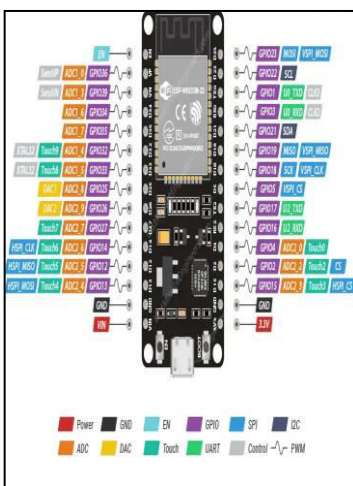


Fig (a): Block Diagram

The robotic vehicle is controlled using android application for metal detection operation controlled with the help of WIFI technology. Based on experimental studies, it was found that the mobile controlled robot can move in any direction as per the desired instruction and the beeper in the metal detector circuit beeps whenever it encounters any metallic object. The embedded hardware has been developed on ESP32 microcontroller and controlled by an Android smart phone. This controller receives the commands from the Android phone, takes the data and controls the motors of the robot by the motor driver IC L293D. The Smartphone is been interfaced to the device by using WIFI. A WIFI device ESP32 camera module was used with ESP32 MC to receive commands from the Smartphone. A temperature sensor is connected to MC to alert if any fire and avoid that path from moving further. An ESP32 camera is connected to live streaming of video which can be watched online in mobile or web page. An ultrasonic sensor is connected to MC as an obstacle sensor if any obstacle find while moving it stop from further motion to avoid damage to robot. All information are passed to IOT web server which can be easily viewed and controlled.

### V. COMPONENTS



Fig(b): ESP32MUC

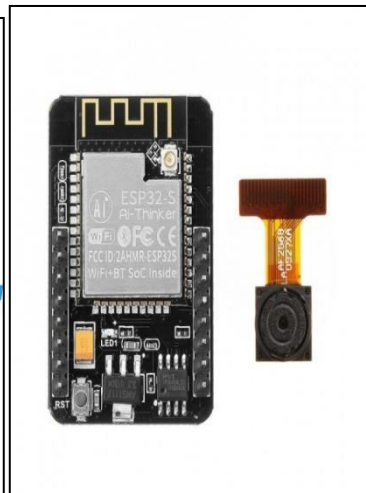


Fig (c): WIFI Camera Module

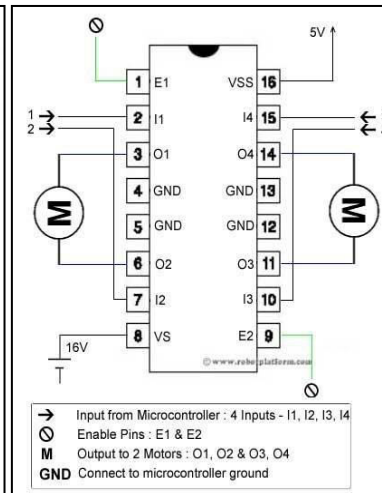


Fig (d): Motor Driver IC



Fig(e): Temperature Sensor

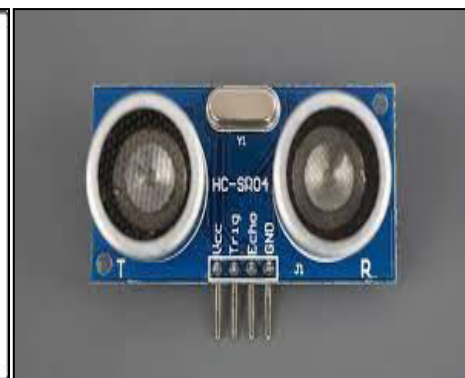


Fig (f): Ultrasonic Sensor

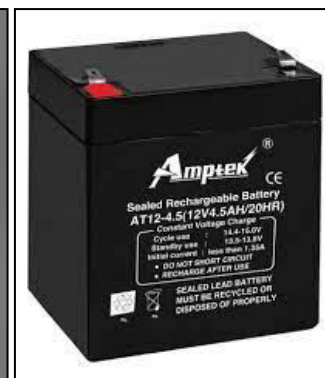


Fig (g): Battery



Fig (h): Metal Detector

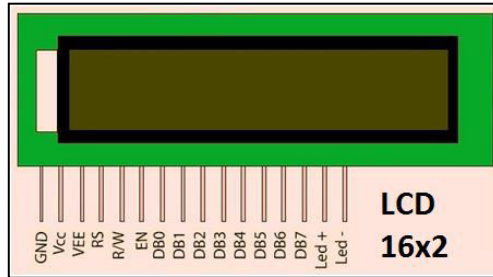


Fig (i): 16X2 LCD Display



Fig (j): DC Gear Motor

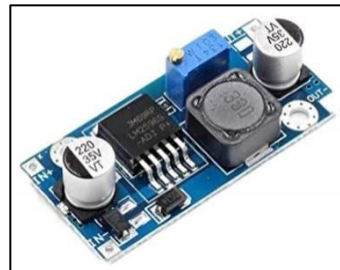


Fig (k): Buck converter

## VI. EXPERIMENTAL RESULTS

- **Metal Detection Accuracy:** The metal detector module was able to reliably detect the presence of metallic landmines with accuracy in controlled laboratory conditions.
- **Obstacle Avoidance:** The ultrasonic sensor successfully detected obstacles in the robot's path, allowing it to navigate around them with obstacle avoidance.
- **Mobility and Navigation:** The DC motors and wheels provided the robot with the ability to navigate through various terrains, including uneven surfaces and small obstacles.
- **IOT Integration:** The Wi-Fi module enabled remote control and monitoring of the robot through an IOT platform. Operators were able to receive real-time sensor data, control the robot's movements, and receive alerts for detected landmines.
- **Power Efficiency:** The ESP32 microcontroller demonstrated efficient power management, allowing the robot to operate for up to 3-4 hours on a single battery charge.
- **Moving in four directions:** The robot can be controlled through the mobile phone and we can operate the robot in all four directions without any error.
- **Temperature Sensing:** If any fire or high temperature like situations found around the robot, it sends a signal to the IOT platform about the fire.

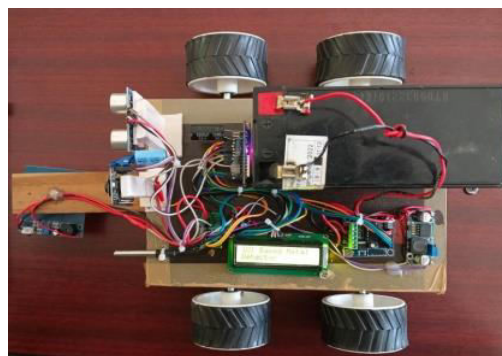


Fig (l): Metal Detecting Robot Model

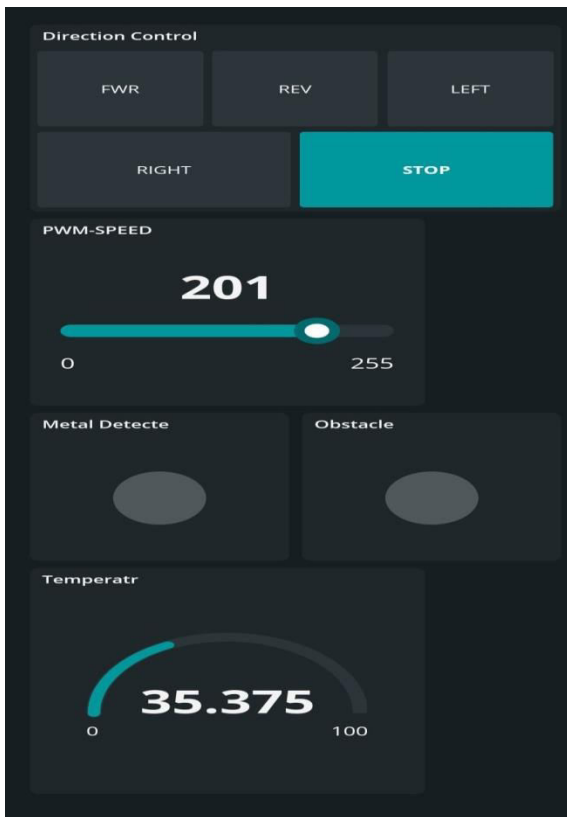


Fig (m): Control Screen before Metal and Obstacle Detection

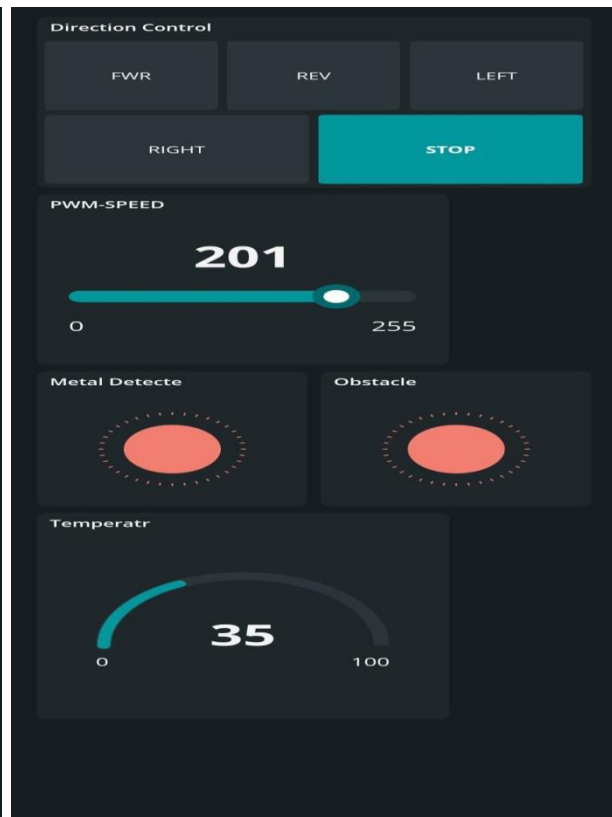


Fig (n): Control Screen after Metal and Obstacle Detection

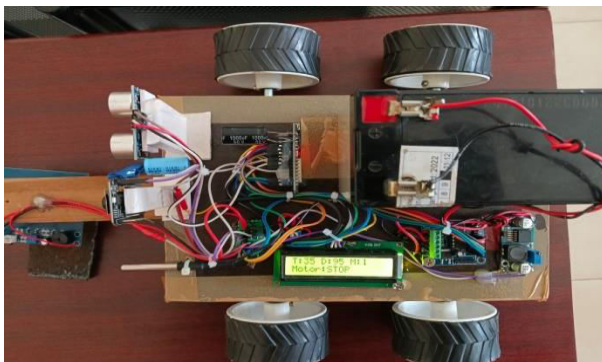


Fig (o): Detections in LCD Display

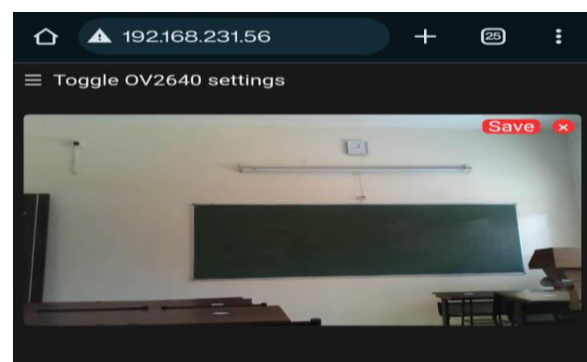


Fig (p): Video Visual in Camera

Fig (m) shows the Control Screen of the Robot. Forward, Reverse, Left and Right are the direction buttons. By pressing any one of the button, it moves according to the direction given by the button and whenever we want to stop the robot we can press the Stop button. PMW Speed is the duty cycle which sets the RPM Speed. Range is 0-255 which means 0=0% and 255=100%. It also shows the temperature indicator, metal detection indicator and obstacle indicator. Whenever the robot encounters with a metallic object, the metal indicator turns into red as shown in the Fig (n). This is also true in the case of obstacle indicator also. It also shows the surrounding temperature of the robot wherever it is moving. All these information can be seen in the LCD Display where temperature indication is in degree Celsius and obstacle detection is indicated in mm. In the Fig (o) it is indicated as 95mm. Whenever the metal is detected it shows as 1. Till then it shows as 0. When the metal is detected, the robot stops automatically and LCD Displays as STOP in it. Fig (p) shows the visual captured by the WIFI Camera module.

## VII.CONCLUSION

The IOT-based landmines detecting robot using ESP32S microcontroller project presents a significant advancement in addressing the perilous issue of landmine detection. Through the integration of IOT technology and the ESP32S microcontroller, the robot demonstrates enhanced efficiency and accuracy in identifying buried landmines. The real-time data acquisition and communication capabilities of the ESP32S contribute to swift and precise detection, minimizing the risk for human operators. Moreover, the project showcases the potential of leveraging IOT for remote monitoring and control, allowing operators to manage the robot remotely. Overall, the implementation of this technology in landmine detection not only enhances safety but also exemplifies the transformative impact of IOT in addressing critical challenges.

## REFERENCES

1. Pratik Bewnale, Sujit Barge, Shriniwas Pawar, Rohit Bansode, "Fabrication of Metal Detector Robotic Vehicle" ,Journal of Emerging Tecnologies and Innovative Research (JETIR), August 2022, Volume 9, Issue 8.
2. Zatie AdibaMohdZin, Fuead Ali, DiyanaAbKadir, "Automatic and Obstacle Avoidance in Metal Detector Robot", Journal of Computing Technologies and Creative Content 1(1) (JTEC), 1-5, August 2016.
3. Tanpure Ganesh.D, NangadePradip.N, UkirdeShrikant.V, Asst.Prof. M.H.Gholve "Landmine detection robotic vehicle with GPS positioning", Journal of Information, Knowledge and Research in Electronics and Communication Engineering Issn: 0975 – 6779| Nov 16 To Oct 17 | Volume – 04, Issue – 02.
4. YogeshJathar, UtkarshaPawar, Bhagyshri Thakur, NehaJadhav, "Landmine Detector Robot Vehicle", International Research Journal of Modernization in Engineering Technology and Science, Volume:05/Issue:11/November-2023.
5. S. MohanaSundari, V. Sinduja, B. Vanitha, K. Vennila, "Automatic Landmine Detection using Robot", International Journal of Engineering Research & Technology (IJERT), Volume 8, Issue 07.
6. Shiva Prakash K, Vijay S, Tamilarasu S R, Rajesh R, "Landmine Detection Robotic Vehicle with GPS Positioning", 2023 JETIR April 2023, Volume 10, Issue 4 .
7. Vinayak Gupta, UddeshyaSrivastava, AniketTiwari, Shivam Singh, Kishan Kumar, "Landmine Detector Robotic Vehicle", International Journal for Multidisciplinary Research (IJFMR), Volume 5, Issue 3, May-June 2023.
8. Jitendra Gupta, Dr.HimanshuAgrawal, Dr. V. C. Jha, "A Comparative Analysis on Metal Detection By Using The Concept of Robotic System With Internet of Things", Turkish Journal of Computer and Mathematics Education, Vol.12 No.2 (2021), 3166 – 3175.
9. Mujiarto, Aceng Sambas, IrpanHaerudin, "Design of Arduino-Based Metal Detector Robot", Solid State Technology Volume: 63 Issue: 6 Publication Year: 2020.
10. Rasaan Bello, "Literature Review on Landmines and Detection Methods" Frontiers in Science.
11. WaqarFarooq,Nehal Butt, SameedShukat, Nouman Ali Baig,Sheikh Muhammad Ahmed, "Wirelessly Controlled Mine Detection Robot" 2016 International Conference on Intelligent Systems Engineering (ICISE)
12. JebasinghKirubakaran.S.J, Anishkumarjha, Dheerajkumar, SadambiPoornachandramPrakash, "Mine Detecting Robot with Multi Sensors Controlled Using HC-12 Module" International Journal of Engineering & Technology
13. V. Abilash and J. Paul Chandra Kumar, "Arduino Controlled Landmine Detection Robot" 2017 Third International Conference On Science Technology Engineering and Management (ICONSTEM)
14. Mr. Rahul S. Pol, et al., " Realistic Optimal Path Planning Algorithm for Indoor Real time Mobile Robot Navigation", International Journal of Web Engineeirng, ISSN: 1540-9589 (Print Version) ISSN: 1544-5976 (Online Version), vol 17.
15. Dr. B. Sheela Rani. et al., " Socio-realistic optimal path planning for indoor real-time autonomous mobile robot navigation" International Journal of Vehicle Autonomous system Volume 15 Issue 2: 2020. Print ISSN: 1471-0226 Online ISSN: 1741-5306 DOI : <https://doi.org/10.1504/IJVAS.2020.108399>



INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  [ijirset@gmail.com](mailto:ijirset@gmail.com)



[www.ijirset.com](http://www.ijirset.com)

Scan to save the contact details