IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 5, May 2024

DOI: 10.17148/IJARCCE.2024.13577

SPY ROBOT WITH METAL DETECTION

Ms. HARSHITHA K R[1] , SHREEKAR[2], SRUSHTI KUMAR A[3], BHARGAVI.C[4] , KAVANA BELAGAL[5]

Department of Electronics and Communication Engineering, Ballari Institute of Technology and Management, Ballari, Affiliated to Visvesvaraya Technological University, Belagavi-590018, Karnataka, India[1-5]

Abstract: The development of an advanced spying robot equipped with metal detection capabilities, aimed at enhancing security and surveillance operations in various environments. At the heart of the system lies the ESP32 microcontroller, acting as the central processing unit to coordinate the robot's functions and interactions. Camera module is used for surveillance. Leveraging cutting-edge technologies, including dedicated sensors and communication modules, the spying robot offers a comprehensive solution for detecting metallic objects and ensuring effective surveillance. One of the standout features of the spying robot is its dedicated metal sensor, enabling it to identify metallic objects within its surroundings. This capability enables the robot to detect potential threats or target specific items of interest, enhancing security measures in diverse scenarios. Complementing the metal detection capability is the integration of an ultrasonic sensor, providing proximity detection to navigate obstacles and ensure safe traversal in various environments. The locomotion of the spying robot is powered by four DC motors, offering agile maneuverer ability across different terrains and environments. A enabling precise movement and swift response to commands. With integrated WiFi connectivity and compatibility with the Blynk IoT platform, the spying robot enables remote monitoring and control, enhancing its versatility and usability in various surveillance applications.

Keywords: Metal detection, Spying, Surveillance, Object detection, ESP32, Camera module.

I. INTRODUCTION

In an era marked by rapid advancements in robotics and Internet of Things (IoT) technologies, the landscape of surveillance has evolved significantly, ushering in a new era of sophistication and efficiency. The project at hand is poised at the forefront of this revolution, embarking on the development of an ingenious spying robot armed with an arsenal of cutting-edge sensors, communication modules, and control mechanisms. With a keen focus on achieving comprehensive surveillance objectives, this project aims to push the boundaries of innovation and redefine the capabilities of modern surveillance systems. At its core lies the camera module and ESP32 microcontrollers, a cornerstone of technological prowess renowned for its versatility and energy efficiency. Serving as the orchestrator of operations, empowers the spying robot to seamlessly integrate and synchronize various components, ensuring cohesive functionality and seamless interaction with the surrounding environment. This formidable microcontroller serves as the brain of the operation, guiding the robot through a labyrinth of tasks with unparalleled precision and agility. Central to the spying robot's capabilities is its groundbreaking metal detection feature, a testament to the project's commitment to enhancing security and reconnaissance capabilities. Equipped with a metal sensor, the robot possesses the remarkable ability to discern metallic objects within its proximity, opening avenues for threat detection, contraband identification, and targeted surveillance. This pivotal feature underscores the project's dedication to pioneering advancements in security technology and fortifying the defences of today's surveillance infrastructure. But the ingenuity of the spying robot extends beyond mere metal detection, incorporating an ultrasonic sensor to navigate the intricacies of its environment with finesse and acumen.

By harnessing the power of ultrasonic pulses, the robot can gauge distances, detect obstacles, and chart optimal pathways through a myriad of terrains and scenarios. This multifaceted sensor system imbues the robot with a level of adaptability and situational awareness that sets it apart as a formidable force in the realm of surveillance and reconnaissance. As the spying robot traverses its domain, it does so with unwavering agility and poise, propelled by a quartet of DC motors meticulously coordinated by a dedicated driver circuit. These motors serve as the mechanical muscles of the operation, propelling the robot forward with grace and precision, deftly navigating through a labyrinth of challenges and obstacles. Paired with auxiliary components such as a buzzer for audible alerts the robot stands as a beacon of technological prowess, a sentinel of security in an ever-evolving landscape of surveillance.

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 5, May 2024

DOI: 10.17148/IJARCCE.2024.13577

II. LITERATURE SURVEY

[1]. Autonomous Metal Detector Robot with Monitoring System that uses Global Positioning system (GPS) for an autonomous metal detector robot. The robot movements can be monitored from the computer through a graphical user interface. The main considerations involved in developing the system include controlling the GPS receiver to start the data collection operation, filtering and processing the data to prepare for transmission via transmitter and receivers and lastly, displaying the results on a monitor using the Geographic Information System (GIS). Based on the system, the location and the speed of the mobile robot were monitored and reported to a base station. The mapping program has been successfully implemented using visual programming languages integrated with the map Google Earth. The monitoring system was able to detect the position of the mobile robot. The integration between the hardware and software were successful where the longitude, latitude and the speed of the robot were displayed on the developed mapping system.

[2]. Surveillance Robot in Hazardous Place Using IoT Technology featuring robotics using an Arduino UNO microcontroller that is controlled by a smartphone and a PC. The objective is to develop a spy robotic car which is suited to provide an act of continuous surveillance in hazardous environment. The robot is capable to record the real-time streaming in day time and night time as well through wireless camera. Those movements of the robot are controlled manually at the user end. This robot reduces human intervention directly in a hazardous place where continuous supervision and security is necessary. The complete system comprises of various sensors like PIR sensor, ultrasonic sensor, and gas sensor interfaced with Arduino board. Spy robot monitor the live streaming information and transfer it to the connected Android device. Android application can control the navigation of the robot from a large distance using WIFI communication.

[3]. Implementation of Spy Robot for A Surveillance System using Internet Protocol of Raspberry Pi is Raspbian operating system-based spy robot platform with remote monitoring and control algorithm through Internet of Things (IoT)has been developed which will save human live, reduces manual error and protect the country from enemies. The spy robot system comprises the Raspberry Pi (small single-board computer), night vision pi camera and sensors. The information regarding the detection of living objects by PIR sensor is sent to the users through the web server and pi camera capture the moving object which is posted inside the webpage simultaneously. The user in control room able to access the robot with wheel drive control buttons on the webpage. The movement of a robot is also controlled automatically through obstacle detecting sensors to avoiding the collision.

[4]. A Reconfigurable Multipurpose System on Chip Platform for Metal Detection. In this work, we propose and implement a metal detection module using Terasic Spider Robot, planned to be used in landmine detection operations. A hardware circuit model to detect metal was designed for the metal detection module and embedded on the TSR. The onboard control system was implemented using a reconfigurable DE0 Nano System on Chip platform that can further process the information from the metal detector using efficient algorithm. The movement of the TSR was controlled remotely by Bluetooth using a smartphone app designed specifically for this application. The design also intimates the user with a message on detecting the metal. The design was implemented successfully and the metal detection module detected buried metals at a depth of maximum 7cm.

[5]. An Experimental Analysis of Metal Detecting Spy Robot and Its Application. The proposed system composed of metal alerting, surveillance robot, controlling system. Surveillance robot is rectangular shape and it has three wheels. This spy robot detects and alerting the metal whereas down of the robot flows. It communicates with device through wireless medium such as ZIGBEE. Robot has some sensors like Humidity, Temperature, Ultrasonic and PIR. Humidity sensor senses the Humidity around the robot. While Temp sensor senses the climate changes based on the numerical temperature value. Ultra-sonic sensor senses the object present in the way in which the robot must go. PIR sensor senses the presence of human near the robot. These sensor notations and the information can be received in the transmitter and receiver with the use of a ZIGBEE. Every change can be sensed and the changes can be seen in a television by a camera. The wireless charging system charges the battery in a robot and it gives the power to all the other modules.

III. METHODOLOGY

In this system there is two controller is used one is ESP32 and camera module

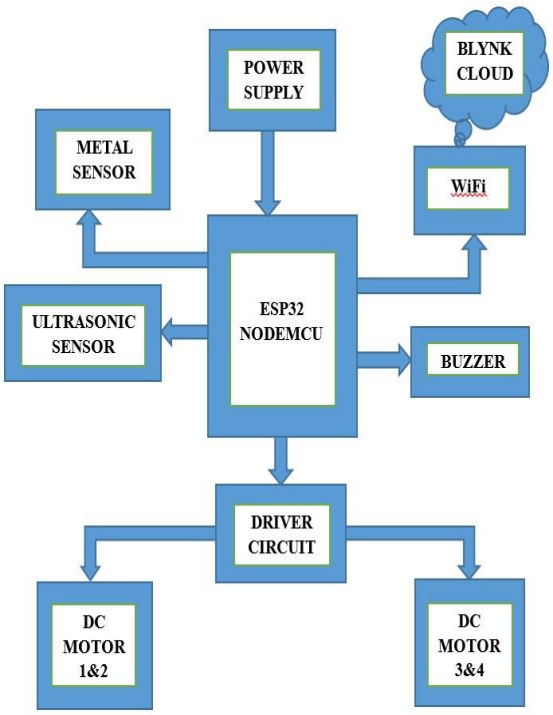
IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 5, May 2024

DOI: 10.17148/IJARCCE.2024.13577

A. BLOCK DIAGRAM



This part of the system using ESP32 as controller metal, ultrasonic, buzzer, motor driving circuits are interfaced. Ultrasonic sensor will detect the object Infront of the robot to keep safe distance, metal sensor will detect the metallic objects and motor driver unit is controlled using blynk IoT platform. DC motors are connected to motor drive unit, based on command signals sent using blynk the direction of motion of motor is controlled.

B. CAMERA MODULE

CAMERA MODULE

Camera module enables live streaming of video in cost effective way using WiFi. The camera module , which is capable of capturing images and video at resolutions of up to 1600x1200 pixels. The camera module communicates with the V380pro app over the Serial Camera Control Bus (SCCB) interface, allowing the V380pro to configure camera settings and capture images

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 5, May 2024

DOI: 10.17148/IJARCCE.2024.13577

IV. RESULT

This Project integrating a metal detection and spying, using ESP32 WiFi and Camera module, to develop a compact and efficient system capable of detecting metal objects and to spy remotely. The ESP32's versatility allows for seamless integration with various sensors and peripherals, enabling real-time metal detection while maintaining low power consumption. The robot can be controlled through internet remotely, halting, and relaying information to the user whenever metal is detected, making it an invaluable tool for surveillance, security, or exploration tasks. Spying robot becomes a versatile asset in numerous scenarios, from industrial settings to search and rescue operations. The metal detection capability enhances its utility by providing an additional layer of functionality, enabling it to locate metallic objects hidden from plain sight.

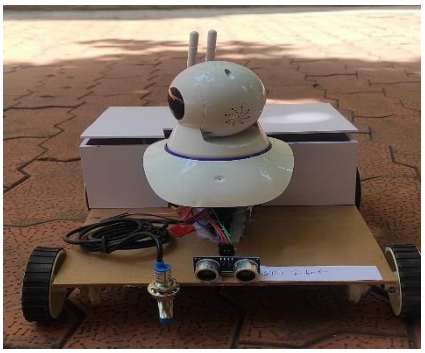


Figure 1 SPY ROBOT WITH METAL DETECTION

Figure 2 TOP VIEW OF ROBOT

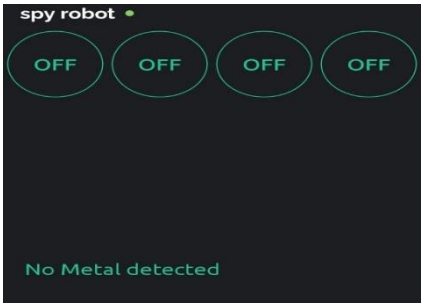


Figure 3 BLYNK APP INTERFACE WITH NO METAL DETECTION

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 5, May 2024

DOI: 10.17148/IJARCCE.2024.13577

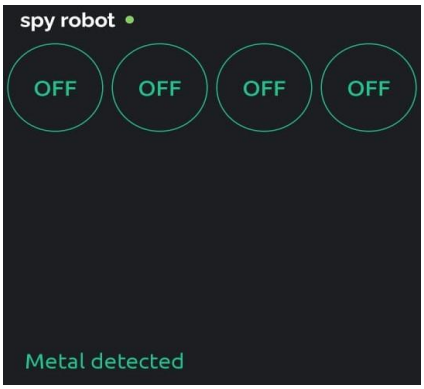


Figure 4 BLYNK APP INTERFACE WITH METAL DETECTION

V. FUTURE SCOPE

The integration of metal detection capabilities into spying robots using ESP32 modules opens-up promising avenues for future development. Advancements in sensing technologies could lead to the creation of more sensitive and accurate metal detectors, enabling robots to detect smaller or deeply buried metal objects with greater precision. Additionally, incorporating machine learning algorithms could enhance the robots' ability to classify and interpret detected metal objects, paving the way for more sophisticated decision-making capabilities. Future iterations may also focus on miniaturization and optimization to create smaller, more agile robots capable of accessing confined or hazardous spaces, expanding their range of applications across industries such as mining, construction, and archaeology

Furthermore, the potential for multi-robot collaboration presents intriguing possibilities for enhancing efficiency and scalability in tasks such as search and rescue missions. By deploying fleets of cooperating robots equipped with metal detection capabilities, coordinated through advanced algorithms and wireless communication protocols, teams could cover larger areas more effectively while sharing information in real-time. These developments have the potential to revolutionize various fields, offering innovative solutions to challenges related to security, exploration, and industrial operations, ultimately contributing to the advancement of intelligent robotic systems

VI. CONCLUSION

By leveraging the ESP32's versatility and the sensitivity of metal detector sensors, this project yields a compact and efficient system capable of autonomously detecting metal objects in real-time. The resulting spying robot offers a valuable tool for applications such as security, surveillance, exploration, and search and rescue operations. Its ability to navigate environments, halt upon detecting metal, and relay information back to the user demonstrates the potential for ESP32-based systems to address practical challenges effectively. Overall, this project underscores the significance of merging advanced technologies to create innovative solutions that bridge the gap between robotics and real-world tasks, new possibilities for intelligent and adaptable robotic platforms

REFERENCES

[1] Ishak, Hirzi Mohd; Kadir, Herdawatie Abdul; Lim Chain Fat; Mohd Helmy Abd Wahab, (2008). [IEEE 2008 International Symposium on Information Technology - Kuala Lumpur, Malaysia (2008.08.26-2008.08.28)] 2008 International Symposium on Information Technology - Autonomous metal detector robot with monitoring system. 1–7.

[2] T. Akilan; Satyam Chaudhary; Princi Kumari; Utkarsh Pandey; (2020). Surveillance Robot in Hazardous Place Using IoT Technology. 2020 2nd International Conference on Advances in Computing, Communication Control and Networking (ICACCCN).

[3] Abdalla, Ghanem Osman Elhaj; Veeramanikandasamy, T. (2017). [IEEE 2017 2nd IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT) - Bangalore, India (2017.5.19-2017.5.20)] 2017 2nd IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT) - Implementation of spy robot for a surveillance system using Internet protocol of Raspberry Pi.

[4] Mhaisen, Naram; Abazeed, Omran; Al-Hariri, Youssef; Nawaz, Naveed; Amira, Abbes (2019). [IEEE 2019 IEEE 10th GCC Conference & Exhibition (GCC) - Kuwait, Kuwait (2019.4.19-2019.4.23)] 2019 IEEE 10th GCC Conference & Exhibition (GCC) - A Reconfigurable Multipurpose System on Chip Platform for Metal Detection.

[5] Prabhu, S.R.Boselin and Pradeep, M., An Experimental Analysis of Metal Detecting Spy Robot and Its Application (December 6, 2016). IJRE - International Journal of Research in Electronics, Vol. 3, Issue 3, 2016, Available at SSRN: https://ssrn.com/abstract=2881366

International Journal of Advanced Research in Computer and Communication Engineering
Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 5, May 2024
DOI: 10.17148/IJARCCE.2024.13577

[6] Smart Phone-Based Robotic Control for Surveillance Application by M Selvam (Mar2014).
[7] Arduino controlled war field spy robot using night vision wireless camera and Android application by Hitesh Patel (Nov 2015).
[8] Multi-purpose Military Service Robot by E Amareswar (2017).
[9] Bluetooth Controlled Metal Detector Robot by Ananya Bhattacharya (May 2017).
[10] SMART SPY ROBOT by 1Ankit Yadav,2Anshul Tiwari, 3Divya Sharma, 4Ratnesh Srivastava, 5Sachin Kumar (April 2016).
[11] Military Spying and Bomb Disposal Robot Using IOT by 1CHAITRALI JADHAV, 2SHAMLI GIBILE, 3SNEHAL GAIKWAD, 4NEELUM DAVE (April 2018)
[12] Wi-Fi ROBOT FOR VIDEO MONITORING & SURVEILLANCE SYSTEM by Pavan.C, Dr. B. Sivakumar (August 2017)
[13] Cell Phone Operated Robotic Car by Awab Fakih, Jovita Serrao (ISSN 2229-5518)