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Realistic Deployment of Hybrid Wireless Sensor Networks based on Zigbee and Lora for Search and Rescue Robot Applications

Rubika.K, Mr. M. Karthikeyan, Ph.D

Department of ECE (Applied Electronics), Erode Sengundhar Engineering College, Perundurai, Erode,
Tamil Nadu, India

Guide, Department of ECE, Erode Sengundhar Engineering College, Perundurai, Erode, Tamil Nadu, India

ABSTRACT: This project aims to develop a multi-purpose surveillance robot to perform surveillance activities in industrial areas, militarized war zones or radioactive field areas with the objective of analysing, governing and protecting the areas from unwanted threats. The use of robots and their role in our day to day life has been rapidly increasing since the day they were introduced to the world, further reducing the errors and life risk to humans. The objective is to design and develop an Internet of Things (IoT) based autonomous multi-purpose surveillance robot at a low cost that will roam around freely and give live updates about their surroundings by broadcasting video and information through the sensors installed. The sensors collect the data from the surroundings and send it to the Arduino microcontroller which can be seen by the user any time. This technology is controlled by the user remotely through any device such as mobile phone, tablet or laptop with the help of IoT based services. The entire project is built and monitored by wireless platform to minimize the use of wire and help it work smoothly in remote places. Further improvements and advancements in this project can help in reducing life risk of valuable soldiers or identification of any hostage in unknown places.

I. INTRODUCTION

The Internet of Things (IOT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifier and the ability to transfer data over a network without requiring human- to-human or human to-computer interaction. The IOT allows objects to be sensed or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention. In today's world, robotics is fastest growing and very interesting field. ROBOT has various input and output to sense the environment and take appropriate action.. With the development and research of technology, scientist has come up with invention of military robots. This makes soldier's life more secure on war field. Military robots are used to perform various risky tasks like monitor war field, diffuse live unexploded bombs, detect landmines and shoot enemies.. These military robots appointed with the integrated systems like sensors, gripper, weapons, cameras and actuators. based purpose of robot it comes in different shapes and features. The need for self con-trolled robots is due to the terrorism and insurgency problems faced by the people and soldiers. Huge investments are made by nations for the research of new defence systems which are capable of safeguarding citizens from terrorist threats.

Coal mines can face major accidents due to a lack of communication and a poor alert system. This can be lessened or even avoid by using a Coal mine Monitoring Robot. This robot will monitor the current temperature, and humidity level and update the data. This will also look for fire accidents using flame and gas sensors. More than in primary accidents, these robots are more suitable for secondary accidents since the human intervention in a coal mine after an accident might be dangerous and unnecessary. So, in order to save the lives of many people, a single robot can be sent inside the mine and can be used to extract the data from the site. This can help to minimize the loss of equipment and human lives, hence it is cost efficient. Another advantage of the monitoring robot is that instead of using separate sensors for each factor for the safety measures, a single robot can wear all the necessary sensors which can save time and is more effective.

II. EXISTING SYSTEM

The existing system has a drawback that is it has less range and we cannot determine the exact location of robot so with this we cannot know where it is going and location of the robot if we have a robot location when it detects the human beings we can plan attack on them wisely. As well as existing systems which track or detects the land mines by manually holding device with human so it may have some tracking problems and it is less range communication. It will not give security to the soldiers to avoid the problem we have invented a robot with more range and exact location of the robot with global positioning system.

III. PROPOSED SYSTEM

The proposed system has a more range to track the robot and wirelessly it detects the exact location of the robot such that it completely eliminates the man and give security to the human life. IOT is new wireless technology guided by IEEE 802.15.4 Personal Area Network standard. It is primarily designed for the wide range controlling applications and to replace the existing nonstandard technologies. One of the main advantages of this IOT communication is that it provides a noise free communication, the amount of noise added in this type of communication is very less compared to the other wireless communications. In this system, a robot is fitted with motors. A micro controller is used to control all operations. According to the motor operations the ROBOT will operate in specified directions. This robot can control by commands received from the user through IOT technology. The is equipped with sensors like Air quality, Temperature and Object detectors. The robot runs in a DC Battery which is a rechargeable one.

To ensure the security of the area, the monitoring system places numerous sensors on a robotic vehicle. The car has a number of sensors and travels along a predetermined route. It works in a predetermined area, stopping at particular locations when sounds are heard, and then moving on. Using a variety of sensors, the vehicle continuously scans each location for possible issues such as gas leaks or mining accidents. We conclude by recommending the use of a completely autonomous security robot to continuously patrol large areas and maintain facility security.

IV. LITERATURE REVIEW

Sensor systems are as of late quickly developing exploration territory in remote interchanges and conveyed arrange. Sensor organize is a thickly sent remote system of little, ease sensors, which can be utilized as a part of different applications like well being, natural checking, military, home, assembling and detecting data in aloof areas and so forth. Remote sensor systems screen and control physical conditions from remote areas. Sensor hubs endure different vitality and computational requirements for their ease highlight and impromptu arrangement strategy. Diverse application zones of sensor systems comprise distinctive specialized issues and scientists are at present shedding their lights to settling these issues. The unmistakable inadequacies are: vitality proficient steering, conventions, limitation calculations and framework outline. This study paper will conceal all these open research issues and their answers and will call attention to and portrays extremely critical fields of sensor systems[1].

Around the globe, human intruder system is one of the testing frameworks to outline because of the advancement of innovation in the cutting edge world. Conveying interloper framework in high security regions, for example, military outskirts is troublesome and costly. The proposed framework builds up a novel approach that naturally distinguishes interloper and produces a notice alert to the base station. Seismic sensors are utilized to distinguish the seismic waves (P, S waves) as indicated by the earth (ground) vibrations. In any case, it is hard to distinguish and order the different flags as it by human interloper. Different frameworks executed before utilize frameworks with camera, PIR sensors, and so on. A low pass channel can be utilized to isolate the low recurrence signals from people.[2-3].

Kelvin Ashton invented at first the concept; "Internet of Things" (IoT) back in 1999. The aim of this concept was to connect everything with everyone anytime everywhere. It is widely used in various sectors to connect the virtual and physical world [7]. The concept of IoT is used in Radio-Frequency Identification (RFID) tag, sensor, reader, and actuator. The number of connected devices grew quickly and the total number of devices overcame the world population in 2011. Statista (2018) enumerated that the total numbers of interconnected devices will grow continuously to 30 billion in 2020 and reach 75 billion in 2025 [7]. This autonomous Surveillance robot with IoT based rescue system enhancement has two different parts that carry out their own task simultaneously. The main goal of this system is to combine these two different systems into one advanced, user-friendly and more intelligent surveillance system that

performs many times better than all existing systems. To meet the goal, an IoT based monitoring system is combined with an autonomous surveillance robot that can be used, monitored wirelessly by users remotely via a computer.

BLOCK DIAGRAM:

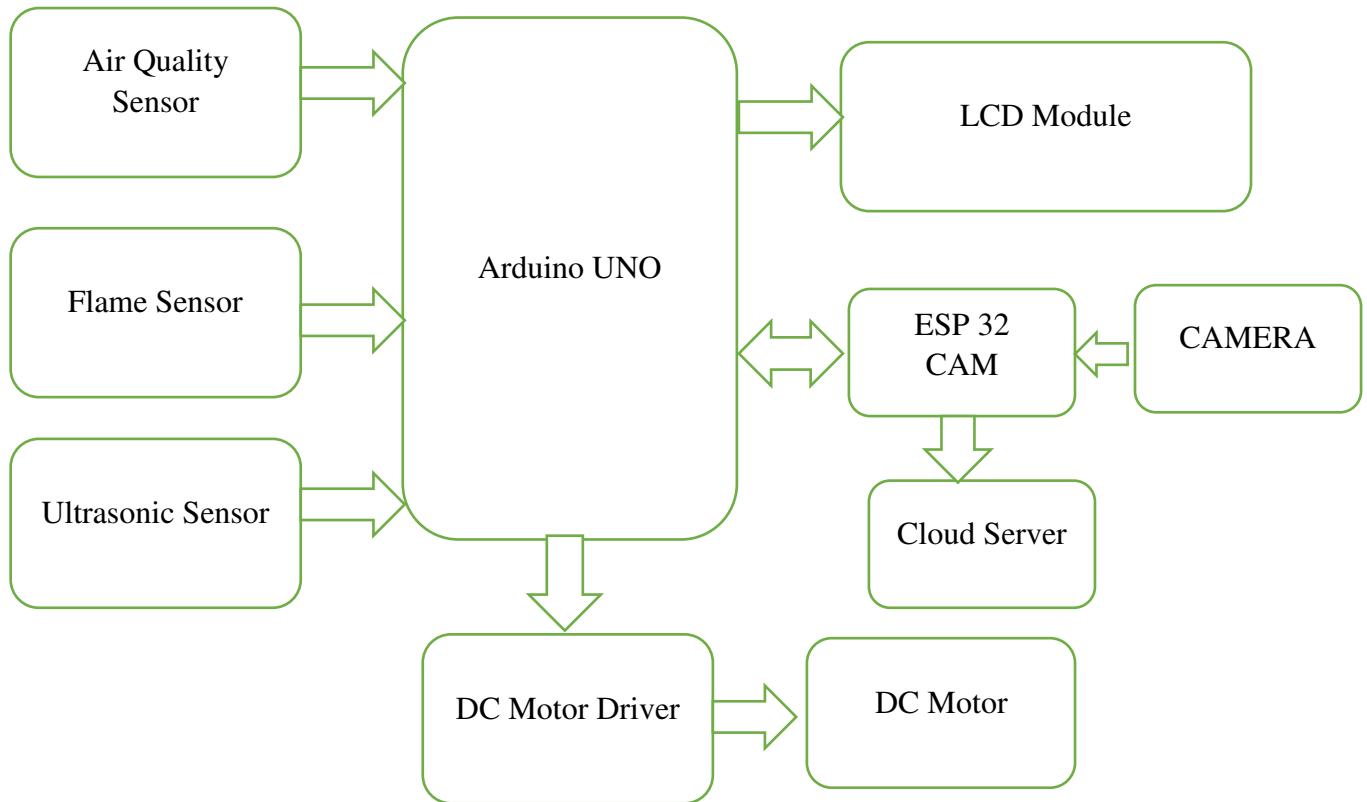


Fig1: Functional Block Diagram

V. METHODOLOGY

The system consists of two major sections – one is the user control section and the other one is the mobility section. The robot has an Arduino uno microcontroller which acts as the brain of system as it is used for controlling the motors and movement of the robot. In the user section, with the help of a mobile or a laptop user control is much better as compared to the old versions where a big control instructed panel was required to make the robot move and perform tasks. The communication from the user end to the robotic mobile section can be performed in various ways, using a Zigbee device or any Bluetooth controlled technology, but in these the range of communication is limited. So in order to make the robot remotely controlled from a far distance, user Section can be connected with the internet using the IoT technology. For connecting the user with the robot from far distance, blynk ,an IoT based technology is used. For receiving the live video visuals and the data from the sensors, blynk channel plays a vital role. The sensors and ESP32 Camera Wi-Fi Module is connected to the Arduino Board that further provides the Wi-Fi facility to the Robot. After the full connection, the robot can send the data collected from the sensors using the Wi-Fi modules and the IoT platform to the users. In mobility part, the robot consists of wheels, motors, battery, ESP32 Wi-Fi Module and various different sensors. The arduino board is placed on the body of robot which gives input supplies to the DC Motors and the motors are further connected to the wheels which move according to the user instructions. The arduino microcontroller is coded through its IDE software where the code is defined for appropriate movement. Parallel to the movement of the robot, various sensors such as Gas sensor, Ultrasonic sensor, Flame sensor are also mounted on the robot interfaced with the microcontroller.

VI. RESULTS

The Schematic diagram for this project is designed using Proteus simulator, The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly by electronic design engineers and technicians to create schematics and electronic prints for manufacturing printed circuit boards.

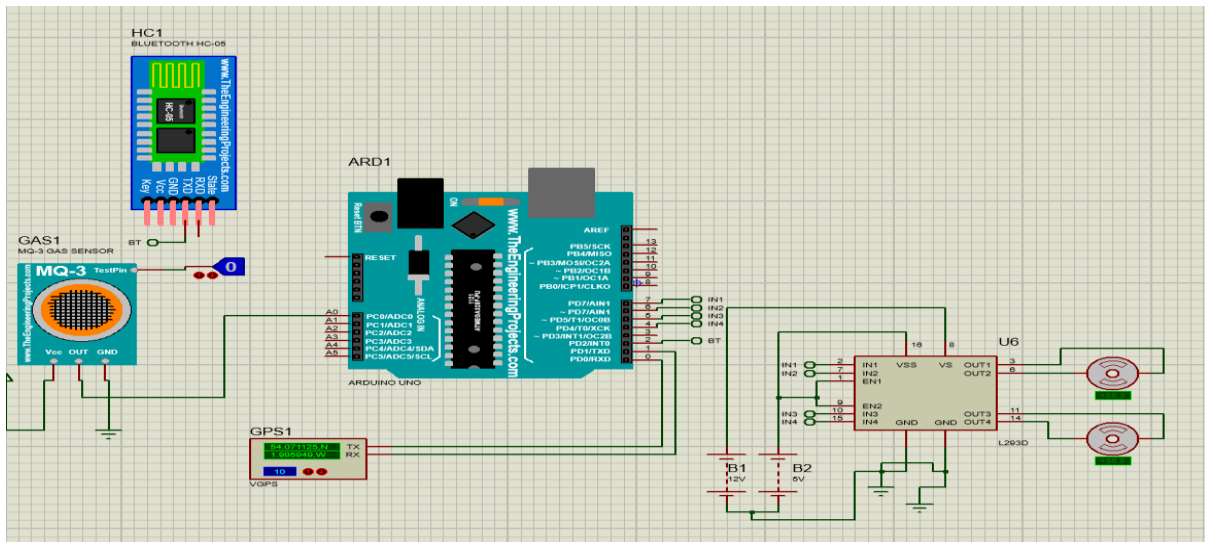


Fig 2: Proteus Simulation Diagram

The above diagram shows the circuit designed for the project, it has a gas sensor module connected to the analog pin of the robot, HC 05 Bluetooth Module is connected to the serial pins of the microcontroller. A L298 motor driver is used to control the direction of two DC motors. The control pins are connected to port pins of the Arduino board. The power for the DC motor is provided with a battery. A code written in Arduino IDE is compiled and fed to the Arduino board. When the simulation is started the results are shown in a virtual terminal. Next step is to design a Hardware circuit by using this simulation results.

HARDWARE IMPLEMENTATION:

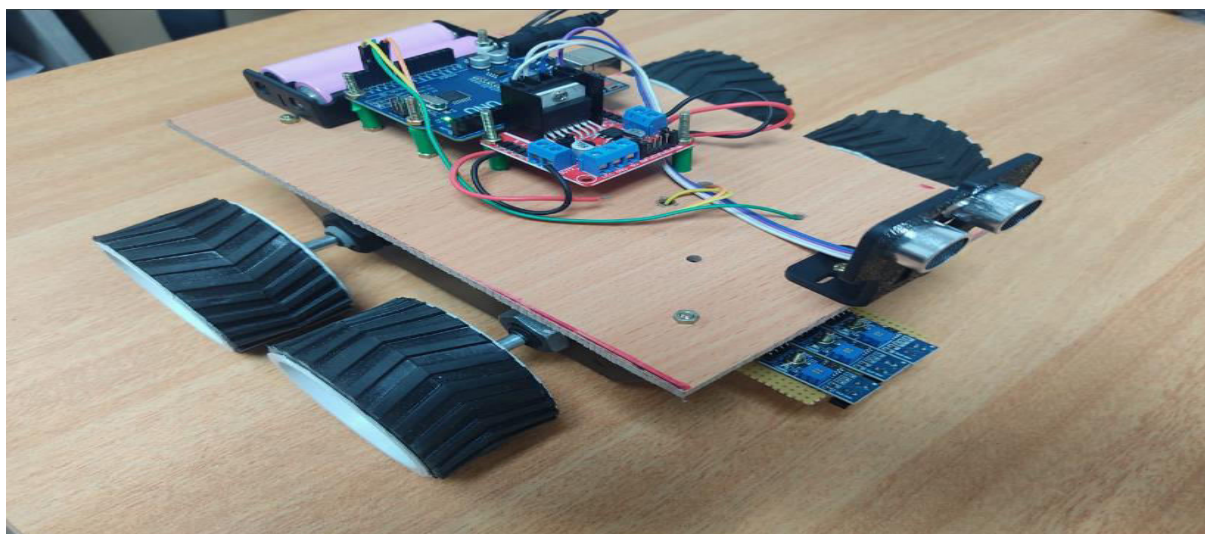


Fig3: Working Model of the Robot

The above picture shows the working model of the robot, a chassis is used to fix the DC motors, wheels are mounted on the motor and are properly screwed. The robot is powered by lithium batteries, L298D motor is connected with the DC motor to control its speed and direction. The control pins of the Motor driver is connected to port pins of the Arduino. Ultrasonic sensor is used to check the objects in front of the robot and to stop the vehicle whenever a object is found. The pins of the sensor are controlled by the microcontroller. A flame sensor is used to detect the presence of fire in the surrounding area, a gas sensor senses the leakage of gas. These two sensors are also interfaced with Arduino Board.

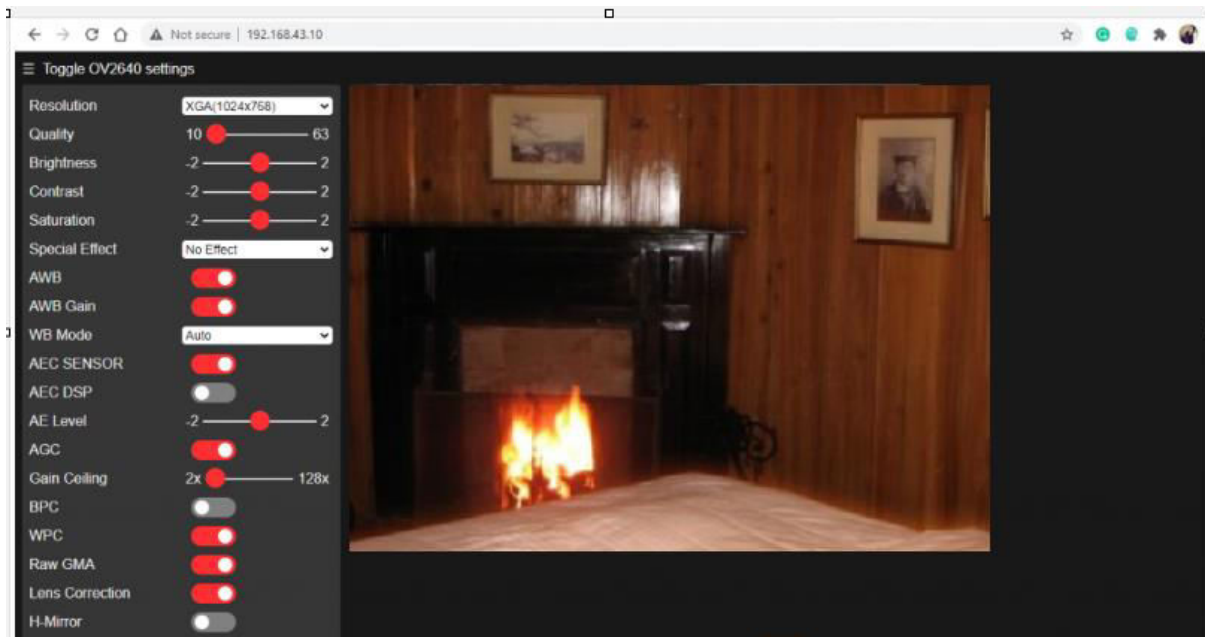


Fig 4: ESP32 CAM Capturing Live video of a Fire

A Bluetooth module is used to control the robot's movement and direction, an Android application has control functions which are transferred from mobile Bluetooth to Bluetooth module connected with Arduino. The Sensor values are also shown in the APP.

ESP32 Cam is wireless camera module which transfers the live images from the camera to the a IOT server, where visuals can be viewed live.

VII. CONCLUSION

The proposed IOT based Rescue robot has solved the problem to a large extent laid out in chapter one. This robot is capable of replacing humans in undertaking high-risk investigation works in risky places where it would be a very challenging task for humans to effort. After switching on, the robot is capable of manoeuvring its surroundings competently while simultaneously updating the contiguous condition of that place through IoT platform and providing video feedback to the user through team viewer software. The robot will also rotate successfully to allow it to embark on its return journey. Besides that, in this robot, we can use full android system for controlling and monitoring. For connect and exchange sensor values, we used the Internet of things. Now-a-days Internet of things is a very popular network to connect and exchange sensor values. There are still a lot of scopes for robots to work in future. If we can use a high-power IP camera instead of a mobile camera and add a robotic arm with various functionalities sensors, the performance of the robot will be increased by many times. There are many applications we can use this surveillance and rescue system enhancement robot such that displaying hidden Land mines, Surveillance home security, spying, nuclear research, and military applications.

REFERENCES

- [1]. Gasparetto A, Scalera L. From the Unimate to the Delta Robot: The Early Decades of Industrial Robotics. In: Zhang, B., Ceccarelli, M. (eds) Explorations in the History and Heritage of Machines and Mechanisms. History of Mechanism and Machine Science: Springer, Cham; 2019. 37.
- [2]. Basan A, Basan E, Makarevich O. Analysis of ways to secure group control for autonomous mobile robots. In: Proceedings of the 10th International Conference on Security of Information and Networks (SIN '17) 13 October 2017: IEEE; 2017., pp. 134- 139 [3].Mahmud H, Ahamed JU. An Autonomous Surveillance Robot with IoT based Rescue System Enhancement. International Journal on Emerging Technologies.2020; 11(5): 489 – 494.
- [4].Thiele LP. Rise of the Centaurs: The Internet of Things Intelligence Augmentation. In: Keskin, T., Kiggins, R.D. (eds) Towards an International Political Economy of Artificial Intelligence. International Political Economy Series. Palgrave Macmillan: Cham; 2021.39 – 61.
- [5]. Akilan T, Kumari P, Chaudhary S, Utkarsh P. A Survey on Surveillance Robot in Hazardous Place Using IoT Technology, International Journal of Research in Engineering, Science and Management. 2020; 3(6): 310 – 315.
- [6] Shin MS, Kim B C, Hwang SM, Ko MC. Design and Implementation of IoT-based Intelligent Surveillance Robot. Studies in Informatics and Control. 2016; 25(4); 421-432.
- [7] Ghouse Z, Hiwrale N, Ranjan N. Military robot for reconnaissance and surveillance using image processing. International Research Journal of Engineering and Technology. 2017; 4(5): 2395-0072
- [8]. Witwicki S, Castillo JC, Messias J, Capitan J, Melo FS, Lima PU, Veloso M. Autonomous surveillance robots: A decision-making framework for networked multiagent systems. IEEE Robotics & Automation Magazine.2017; 24(3):52-64.
- [9]. Singh, D., Nandgaonkar, A. IOT-Based Wi-Fi Surveillance Robot with Real-Time Audio and Video Streaming. In: Iyer, B., Nalbalwar, S., Pathak, N. (eds) Computing, Communication and Signal Processing. Advances in Intelligent Systems and Computing: Springer; 2019.



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