



## **A Comprehensive study on Multipurpose Rescue Night Patrol Robot using IoT**

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### **ABSTRACT**

This paper points to create a multi-purpose reconnaissance robot to perform observation exercises in mechanical ranges, militarized war zones or radioactive field regions with the objective of analyzing, overseeing and securing the ranges from undesirable dangers. The utilize of robots and their part in our day to day life has been quickly expanding since the day they were presented to the world, encourage lessening the blunders and life hazard to people. The objective is to plan and create a Web of Things (IoT) based independent multi-purpose observation robot at a moo fetched that will wander around openly and deliver live upgrades almost their environment by broadcasting video and data through the sensors introduced. The sensors collect the information from the environment and send it to the Arduino microcontroller which can be seen by the client any time. This innovation is controlled by the client remotely through any gadget such as versatile phone, tablet or tablet with the assistance of IoT based administrations. The complete venture is built and observed by remote stage to minimize the utilize of wire and offer assistance it work easily in inaccessible places. Advance advancements and progressions in this venture can offer assistance in diminishing life hazard of profitable troopers distinguishing proof of any prisoner in obscure places

Keywords: Arduino, IoT, multipurpose, ESP32 Module, Things board

### **Introduction**

In 1954, people were presented to the world's to begin with completely working mechanical robot "The Unimate" and after that, researchers and engineers have come together to make dynamic and differing changes within the field of computerization and mechanical autonomy to form the day by day sympathetic errands simpler and speedier. The utilize of robots in improvement and automation fields is expanding day by day and there's no question around end of the being to a great extent controlled by robots and manufactured insights. The Observation Framework closely watches and investigations the encompassing and get moment data almost the conditions. It is primarily required in regions of tall chance, borders, open places, and jail or in businesses which is basically utilized for checking conduct and exercises of a bunch or any person. The require of observation robots emerges when the life chance is as well tall and the client needs the data to be exceedingly precise .Robots are nothing but completely mechanized electronic and web controlled gadgets that are able of performing different assignments that a typical human might not be able to do. In this way, utilize of robots for reconnaissance is one of the most noteworthy progressions within the field of mechanization. These multifunctional robots are able to perform assignments in perilous situations like collapsing buildings or radioactive zones. One of its best employments is within the security and protect works after unforeseen catastrophe or undesirable intrusions like Ukraine-Russia Cold war or tragedies like Chernobyl/Bhopal Gas Plant. There are numerous deterrents confronted by the protect powers amid review of such sudden and startling occasions like contract dividing, collapsing of harmed structures. It gets to be troublesome for an conventional human to bargain with such hazardous errands to enter zones without knowing the display data. These robots being independent in nature are planned to perform productively without human obstructions and have tall portability.

Back in 1999, Kevin Ashton presented the term 'Internet of Things' to the world in one of his introductions. IoT associated individuals with everything on the web from anyplace around the world and since at that point the definition of IoT has advanced and development has quickly expanded. These days, we will see the wide utilize of IoT in different areas to associate the world essentially and physically. The number of gadgets associated by means of IoT as of 2021 are near to 30 billion and anticipated to respond 75 billion within the year 2025 identified by Statista .This IoT Based Independent multi-purpose observation and protect robot is built on primarily two frameworks as appeared in Fig.1.First, the motorized working of the robot with all the associations and moment, the communication of the gadget with the client and smooth information exchange from the sensors to the cloud stage. These frameworks offer assistance in carrying out errand appropriately. The most point of this extend is to combine the two diverse frameworks into one machine that would make them work at the same time and perform the specified assignments. To realize this point, an IoT based checking framework is additionally included with the robot which can be utilized to screen by the client through their gadget . The most applications incorporate:

1.Record video visuals and broadcast it to the client.

2. Send information from sensors to the IoT channel.
3. Can investigate ranges that are perilous for human.
4. Used for the review of border zones.

## Methodology

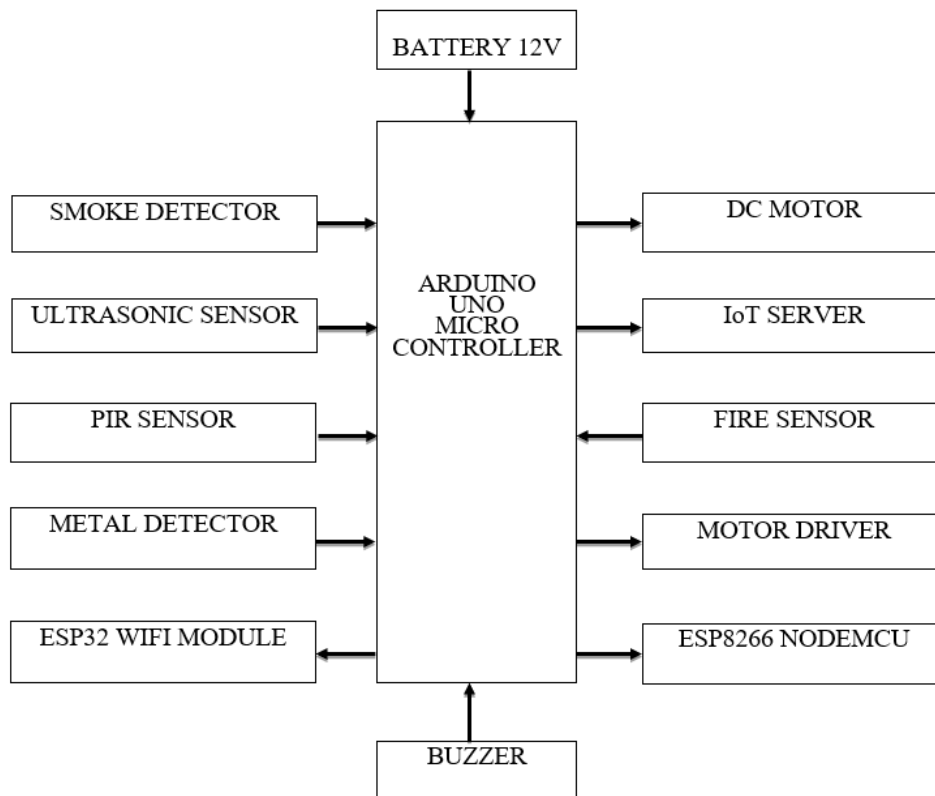


Fig: Block diagram of Multipurpose Night Patrol and Rescue Robot using IoT

Our goal was to create a monitoring robot with independent monitoring mode, manual mode that alerts the operator when movement is detected, and active and inactive monitoring capabilities due to the shortcomings of the previous versions. The footage will be captured by the robot and sent over Wi-Fi to the Android device. Many of the current robots on the market have several drawbacks, including being overly costly—they can cost thousands of dollars—needing a broad domain to interact with one another, and having certain design flaws including inadequate battery backup, little storage, and reliance on third-party apps. Our robot won't have as many advantages as those that are now available on the market, such as thermal imaging, solar panels for improved battery life, and detecting sensors.

An innovative initiative to improve nighttime surveillance and rescue operations is the IoT-powered Night Patrol and Rescue Robot. The robot uses Internet of Things (IoT) technology to discover people who need help, navigate through dark settings, and detect obstructions with the help of its sophisticated sensors and cameras. The robot is a vital tool for security and emergency response teams because of its real-time data transmission capabilities, which allow for remote monitoring and control.

Proposed System:

To create a robot that can take the place of people in hazardous situations

A robot equipped with many sensors, including PIR, fire, motion, gas, and thermal sensors; it also has an alarm system and a buzzer. Using an Arduino and WIFI module to improve connection. Clear night vision and long range cameras for monitoring.

## Literature Survey

[1] Hwan-Seok Choi, Ok-Deuk Stop, Han-Sil Kim "AUTONOMOUS Versatile ROBOT Utilizing GPS" 2005 Universal Conference on Control and Mechanization (ICCA2005) June 27-29, 2005, Budapest, Hungary.

This study describes a mobile autonomous robot that navigates using photosensors and GPS. The robot moves to a predetermined location using a GPS receiver, and it employs photosensors to avoid impediments. Additionally, a remote RF communication module allows the operator to see the robot's

movements in real time. The College of Ulsan is testing the robot, which has multiple uses. It focuses on employing GPS technology for position tracking and error correction. This topic is developing quickly as a result of recent developments in autonomous robot and GPS RTK (Real Time Kinematics) technologies. Mobile robots that are autonomous can be utilized in a variety of environments, including offices, farms, schools, hospitals, and even on distant worlds like Mars and Venus. The weather has no effect on them, nor do day-night cycles and can be navigated without the help of a human. In order to produce a reliable navigation system for land surveying, this research has designed a radio self-regulation transfer robot system that makes use of inexpensive GPS and RF communication. This inexpensive GPS receiver can track the location of cars and send that data to a receiver for assistance and monitoring via radio frequency communication.

**[2] R. Karthikeyan, S. Karthik, Prasanna Vishal T R, S. Vignesh understudy, Dept. of ECE SRM college, Vadapalani “SNITCH: Plan AND Improvement OFA Portable ROBOT FOR Reconnaissance AND RECONNAISSANCE” IEEE Supported 2nd Worldwide Conference on Developments in Data Inserted and Communication Frameworks ICIECS'15**

This study introduces the Snitch, a unique robot with surveillance capabilities that can traverse both horizontal and vertical surfaces and climb walls on its own. The Snitch minimizes noise and leaves almost any trace thanks to the sticky force provided by Microsuction Cups. In contrast to other robots that use vacuum engines to climb walls and make their presence known, the Snitch is able to navigate between surfaces with ease. The robot moves forward when its front wheels make contact with a vertical surface while it is on a horizontal one. The suction cups stick to the vertical surface and the motors raise the front wheels. Because of its design, the Snitch can watch people or regions in real time and record voice, video, and photos without drawing attention to itself.

**[3] Diksha Singh ,Dr Anil Nandgaonkar, Pooja Zaware Division of Gadgets & Media transmission, DBATU, Lonere “WI-FI Reconnaissance BOT WITH Genuine TIME Sound & VIDEO Gushing THROUGH ANDROID MOBILE” 2017 2nd IEEE Universal Conference On Later Patterns in Gadgets Data & Communication Innovation (RTEICT)**

The term "remote robot" in this research refers to a smaller robot that records and retains images in addition to live streaming monochrome video. An appropriate webpage is controlling the bot over a local Wi-Fi server. The goal of the suggested extension is to bring the previously mentioned innovation—a smaller-than-expected robot capable of running various tasks at a reasonable cost—to reality. Robot Control Board Based on Arduino Uno R3 Based will be used to plan the robot. This project has made use of a fully contemporary method for Blynk-based robot control. To integrate the project's remote network, we used the NodeMcu ESP Module. The idea is to use a robot surveillance system instead of a Wi-Fi network. to use the approach of exchanging sound and live streaming the video. The reconnaissance architecture uses the Blynk software to broadcast sound and provide a live video streaming option. A reconnaissance robot with the ability to exchange live audio and video has been proposed here. Because of the password's unique accessibility, the framework is incredibly secure and impossible for anyone to hack, but the battery backup is also incredibly strong.

**[4] Aishwarya K Telkar Dept. VLSI and Implanted frameworks, Visvesvaraya Mechanical College middle for PG ponders RO. Kalaburgi, India, Prof.Baswaraj Gadgay Teacher and Territorial Director(I/c), Visvesvaraya Innovative College middle for PG ponders RO Kalaburgi, India “IoT Based Shrewd Multi Application Observation Robot” Procedures of the Moment Worldwide Conference on Creative Inquire about in Computing Applications (ICIRCA-2020)**

A reconnaissance robot intended to lower battlefield casualties is presented in this study. It acts as an observation tool, gathering intelligence about potential attackers prior to an attack. It has a laser weapon that allows it to target and shoot on-site attackers. IoT technology solves short-range communication problems by enabling Android phone users to direct the robot's movement from any location. The project is divided into five phases: GSM & GPS technology, a laser weapon, a remote night vision camera with audio streaming, PIR and metal detecting sensors, and human or automatic robot control via the Internet of Things. A Cayenne software may be used to operate the robot and create an Internet of Things application that will improve military reconnaissance and lessen fatalities near borders. Live streaming of video allows operators to monitor and investigate areas.

**[5] Mona Kumari ,Ajitesh Kumar,Ritu Singhal CEA Deaprtment GLA College Mathura, India “DESIGN AND Investigation OF IOT-BASED Shrewdly ROBOT FOR REAL-TIME Observing AND CONTROL” 2020 Universal Conference on Control Hardware & IoT Applications in Renewable Vitality and its Control (PARC)**

This paper primarily focuses on the security, remote monitoring, and home surveillance provided by surveillance robots. Over the past ten years, remote surveillance has emerged as the most significant area of research. In this study, we propose a home-use surveillance robot that can be utilized in several. The design and application of a mobile robot for real-time obstacle avoidance and detection is the main topic of this research. suggested framework Through the usage of the Internet of Things, a user can interact with the robot and obtain information about the specific area the robot is sent to monitor. There is IoT software called CAYENNE that is used for designing IoT projects. This software uses software to communicate commands to the robot, and they are obtained by the Raspberry Pi through the ESP8266 Wi-Fi module because the two are interfaced. We can wirelessly operate the robot by using these components and software. In this research study, we employ a wireless transmitting camera that sends and receives pictures and videos to users' end points. Since their remote camera has a limited range, they are unable to take images that are not protected by the camera's location. These robots can only be operated manually, which necessitates constant human supervision during the observation process.

**[6] Dr.M.Sivachitra T.NaveenRaj V.G.Rekhasri N.Sowmiyaa “Women Safety Night Patrolling Robot” Annals of R.S.C.B., ISSN: 1583-6258, Vol. 25, Issue 4, 2021**

The safety of women is a vital global concern as, in spite of legislative protections, widespread abuse and harassment of women persist. By patrolling and identifying suspicious activity, the Women Safety Patrolling Robot is intended to actively improve safety—a proactive measure in contrast to passive

CCTV systems. Such solutions are developed in the multidisciplinary subject of robotics, which combines computer science and engineering. With the use of microcontrollers, these robots can function with little assistance from humans and effectively patrol the night to protect women. The purpose of the robot's presence and monitoring powers is to make women feel safer by discouraging possible attackers. Its self-navigating capabilities and anomaly detection can notify security or law enforcement, allowing for prompt intervention. These technologies are a step in the direction of more proactive and successful ways to protect women.

**[7] Mr. Sandeep Bhatia, Dr. Soniya Verma, Nidhi Singh, Isha Saxena, Ishika verma “IOT AND AI BASED WOMEN'S SAFETY NIGHT PATROLLING ROBOT” 2nd International Conference on Advancement in Electronics & Communication Engineering (AECE 2022) July 14-15, 2022**

Safety is a major concern in a world where worries about security increase with population, especially for women. CCTV cameras and other conventional security measures are reactive; they only capture events. An ultrasonic sensor, an Arduino, PIR sensors, and a night vision camera are used in the proposed women's safety night patrolling robot to address this. Large-scale security can be improved with this robot's ability to detect and alert users about live things. Robotics, a fast developing discipline, provides effective answers to security problems. Robots ensure long-range visibility and reduce hazards to human life by being able to function in dangerous areas and identify small details. Real-time monitoring and prompt action are made possible by the proposed robot's manual and IoT control options. Ultimately, the robot offers thorough protection and monitoring, particularly for ladies, bringing peace of mind in darkest hours.

**[8] R. Prakash Kumar, Santhosh Kumar Asst.Prof, ECE Department, CVR College of Engineering, JNTUH, Hyderabad, T.S, INDIA “AUTONOMOUS SURVEILLANCE AND NIGHT PATROLLING USING DRONE CAMERA”**

The suggested method includes employing lightweight unmanned aerial aircraft (UAVs), such quadcopters, for surveillance along with a Wireless Sensor Network (WSN). To improve surveillance, identify the environment, maintain the sensor network, track the environment, and send real-time video, the UAVs communicate with the WSN. A technique for scheduling is presented that maximizes the tracking mission by accelerating the speed at which surrounds are sensed. RFID technology is utilized in the design to enable sensor localization, along with electrical, mechanical, and software architecture considerations. Valid simulation parameters are provided by the created quadcopter prototype. With the use of radio control, this WSN-based surveillance system may be remotely operated and is intended to enhance surveillance performance, especially for nighttime monitoring.

**[9] Prof. Sreekantha B, Misbah Ahmed Shariff, Mohammed Abu Bakkar Khan, Mohammed Riyan Ahmed, Syed Mateenuddin Assistant Professor, Dept. Of Information Science & Engineering, HKBK College Of Engineering, Bengaluru, Karnataka, India. Student, Dept. Of Information Science & Engineering, HKBK College Of Engineering, Bengaluru, Karnataka, India “THE NIGHT PATROLLING ROBOT”.**

It is critical to address women's and other people's safety concerns while they are in remote places. A security robot driven by a Raspberry Pi and outfitted with cameras, microphones, and sensors is one possible remedy. This robot would travel a predefined route and halt when it heard noises at particular points. It monitors regions for any problems using HD cameras and IR-based path-following technology, transmitting pictures to an Internet of Things website for analysis. This self-governing robot could cover a wide region in continuous observation without experiencing tiredness. Including these robots in security protocols could improve response times and safety, particularly at night. Future developments could bring even more security, such as multi-robot systems, AI integration, and enhanced sensing and navigation.

**[10] J. N. Amrutha, K. R. Rekha ,M.Tech. Student, Department of Electronics and Communication Engineering, SJB Institute of Technology, Bangalore, India, Professor, Department of Electronics and Communication Engineering, SJB Institute of Technology, Bangalore, India “NIGHT VISION SECURITY PATROLLING ROBOT USING RASPBERRY PI”.**

The project's main goal is to use Raspberry Pi to create an affordable smart monitoring system, especially for outdoor video surveillance. Conventional security systems can be costly and intricate, including pricey installation and componentry. An inexpensive substitute that can be used as a stand-alone image processing workstation is Raspberry Pi. Many people place a high premium on security, and both businesses and homeowners set aside substantial sums of money for security measures. Security cameras are frequently used for monitoring, which helps identify offenders after a crime is committed. Alarm-equipped security systems might also discourage criminals. The idea suggests an autonomous security patrolling robot that can operate in both indoor and outdoor settings and integrates detection, authentication, and surveillance capabilities. The Raspberry Pi, a computer the size of a credit card, is essential to the system's functioning. Robots are becoming increasingly important as CCTV surveillance are being used more and more in military and security applications, and their features and efficacy are always being improved.

## Summary of Literature Review

TABLE: Literature review summary

Published year	Author Name	Title of the paper	Proposed technique	Limitations
2005 [1]	Hwan-Seok Choi, Ok-Deuk Park,Han-Sil Kim	Autonomous mobile Robot using GPS	-GPS -RF communication	Limited data storage up to 64GB laser gun to be replaced with much more powerful weapon

2015 [2]	R. Karthikeyan, S.Karthik, Prasanna Vishal T R, S. Vignesh	SNITCH: Design and development of a mobile robot for surveillance and reconnaissance	-city climber Robot -Microsuction cups	Only related to data collection about environmental aspects
2018 [3]	Diksha Singh , Dr.Anil Nandgaonkar, Pooja Zaware	WI-FI Surveillance bot with Real-time Audio and Video Streaming	-Smartphone app with easy UI -PIR sensors along with gas sensors, night vision camera instead of IP cam	Using third party app may create hindrance with the security Concerns like IP cam breach
2020 [4]	Aishwarya K Telkar	IOT based smart mutli application Surveillance Robot	Robots for human assistance -Gesture sensing like waving the camera for assistance	Decision making and the Robot cannot cover large area Irregular sensor data
2020 [5]	Mona Kumari , Ajitesh Kumar,Ritu Singhal	Design and analysis of IOT-based intelligent Robot for real –time monitoring and control	-cayenne -Raspberry pi -updates a new person after taking 20 pictures	Limited Battery backup,short range
2020 [6]	N. Amrutha, K. R. Rekha	Night vision security patrolling robot using raspberry pi	-Smartphone App -APIs	expensive
2021 [7]	Dr.M.Sivachitra T.NaveenRaj V.G.Rekhasri N.Sowmiyaa	Women Safety Night patrolling Robot	-SMART-I a mobile robot and moved on fixed line tracing -REAL TIME Video transmission -smartphone App	Limited Battery backup and No Night Vision Camera
2021 [8]	Prakash Kumar ,Santhosh Kumar	Autonomous surveillance and night patrolling using drone camera	GPS based Navigation system -It provides the Coordinates of final location	Environment weather support lacks
2022 [9]	Mr. Sandeep Bhatia, Dr.Soniya Verma, Nidhi Singh, Isha Saxena, Ishika verma	IOT and AI based Women’s safety Night patrolling Robot	-Smartphone App -APIs	Overall efficiency is less
2023 [10]	Prof.Sreekantha B, Misbah Ahmed Shariff, Mohammed Abu Bakkar Khan,	Night vision security patrolling robot using raspberry pi	-Smartphone App -APIs	expensive

## Conclusion and Future Scope

This study proposes an IoT-based multipurpose and rescue robot that can address challenges related to inspecting challenging locations and unforeseen circumstances. This self-sufficient robot is completely capable of taking the place of humans and giving the user incredibly precise data. With the aid of the ThingspeakIoT platform, it solves the issue of short-range communication and provides users with live video broadcasts. The robot is tiny in size, has all-around rotation, and can navigate challenging terrain. This robot has a wide range of uses, including stationary and mobile surveillance, environmental analysis, landmine detection, spying, and other military tasks.

Together, the survey articles showcase state-of-the-art advancements in the field of robotic surveillance. The special Microsuction Cups, the Snitch robot can climb walls with stealth, making very little noise and leaving very little trace—a feature that improves its ability to spy on people without being

noticed. The Wi-Fi Surveillance Bot emphasizes user-friendliness by introducing real-time audio and video streaming via an Android mobile smartphone that is managed by a local Wi-Fi server. With an emphasis on reducing deaths in border areas, the IoT-based Smart Multi-Application Surveillance Robot stands out for its integration of IoT technology, allowing remote operation from any place and addressing power supply difficulties through the use of solar panels. Together, these papers highlight creative approaches to sophisticated surveillance that combine secrecy, connectivity, and situational flexibility.

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- [14] Arduino Uno R3 based robot control board available at [robokits India. Easy to use. Versatile Robotics & DIY kits](#)
- [15]NodeMCU available at [New tab \(esp8266.com\)](#)