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MULTIPURPOSE NIGHT PATROL AND RESCUE ROBOT USING IoT

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Abstract: This paper 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 analyzing, 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 minimalize 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.

Index Terms – Arduino,IoT,multipurpose,Blynk

I. INTRODUCTION

The first fully functional mechanical robot, called "The Unimate," was introduced to the public in 1954. Since then, scientists and engineers have collaborated to make innovative and dynamic advancements in the fields of computerization and mechanical autonomy, resulting in more efficient and quicker daily tasks. The use of robots in the sectors of automation and development is growing daily, and it seems inevitable that in the end, humans will be largely governed by robots and artificial intelligence. The Observation Framework keeps a careful eye on and investigates the situations, gathering data in real time about them. It is mainly necessary in high-risk areas, borders, public spaces, jails, or enterprises, where it is mostly used to monitor employee behavior and activities. group or individual. When a client requires extremely accurate data and the life chance is too high, the demand for observation robots arises. Robots are just fully automated electronic devices that can be operated via the internet. They can carry out a variety of tasks that a human would not be able to. Thus, one of the most notable advances in the field of mechanization is the use of robots for reconnaissance. These multipurpose robots may carry out tasks in dangerous environments, such as radioactive zones or crumbling structures. One of its best uses is in security and protection operations following unanticipated disasters or unwanted incursions, such as Russia-Ukraine Cold War or catastrophes such as the Bhopal Gas Plant or Chernobyl. The protect faces many obstacles in their path. capabilities in the wake of such as abrupt and shockingevents such as the splitting of contracts and the collapse of damaged structures. An ordinary human finds it difficult to negotiate such dangerous tasks and enter zones without being aware of the display data. Because they are autonomous by nature, these robots are designed to work well in environments free from human interference and to be highly portable. This IoT-based, independent,

multipurpose observation and protection robot is mainly constructed on two frameworks .Initially, the robot's motorized operation with all of its associations and moments, the device's interface with the user, and the seamless transfer of data from the sensors to the cloud platform. These frameworks help ensure that tasks are completed correctly. The main goal of this extension is to integrate the two different frameworks into a single machine so they can operate simultaneously and do the designated tasks. To do this, the robot also comes with an Internet of Things (IoT) based checking framework that the customer may use to screen through their device. The majority of applications include:

1. Record and broadcast video content to clients.
2. Transfer data to the IoT channel from sensors.
3. Is able to explore dangerous areas for people.
4. Employed to examine border zones.

II. LITERATURE REVIEW

TABLE 2.1 LITERATURE REVIEW SUMMARY

Published year	Author Name	Title of the paper	Proposed technique	Limitations
2005 [1]	Hwan-Seok Choi, Ok-Deu 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 , 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]	Telkar, Aishwarya K., and Baswaraj Gadgay.	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	-cayenne -Raspberry pi	Limited Battery backup, short range

		Robot for real – time monitoring and control	-updates a new person after taking 20 pictures	
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	IoT based 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	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

III. METHODOLOGY

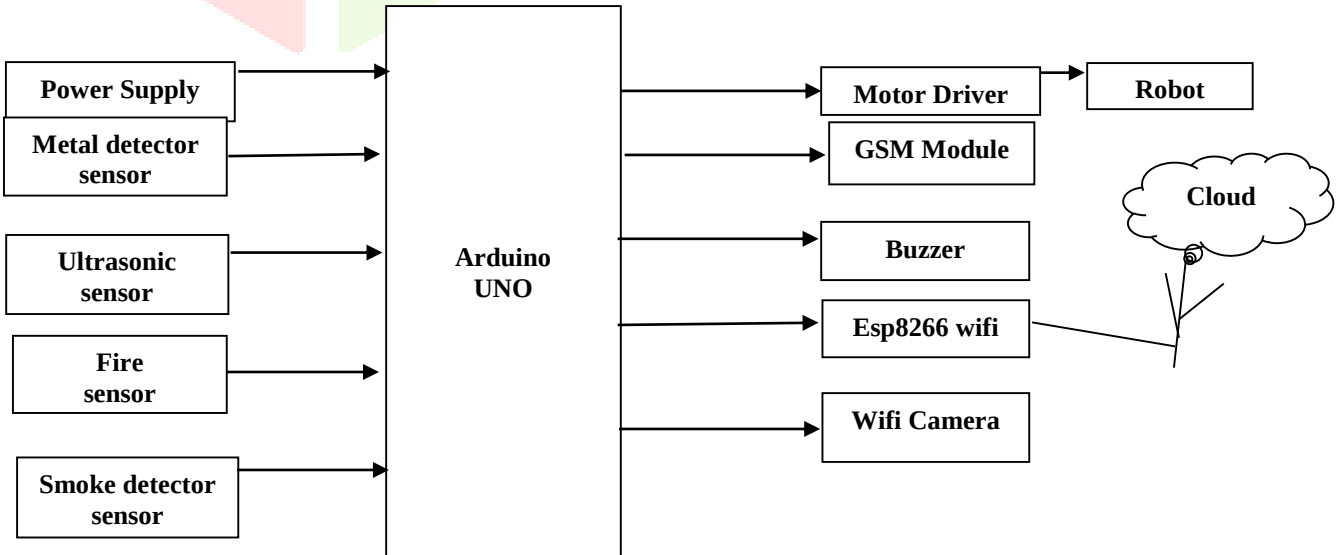

Fig 1: Block diagram of Night Patrol and Rescue Robot using IoT

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. Current System-A variety of current systems are in place and address various issues. Some systems are designed solely to monitor activity, others have a small number of sensors for detection, and still others have a restricted communication range with short-range cameras. Executed System-To create a robot that can take the place of people in hazardous situations A robot equipped with many sensors, including fire, object, gas, and metal 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 The Executed system has two parts: automated mode and mobility mode**.** An Arduino Uno controls the robot's motors, IoT connects the user to the robot via blynk, Sensors and Camera Wi-Fi Module connect to the Arduino Board for Wi-Fi, The robot sends data through Wi-Fi and the IoT platform, Mobility includes wheels, motors, battery, Wi-Fi Module, GSM and sensors**,** Arduino controls DC motors for movement, Sensors like Gas, Ultrasonic, PIR are mounted and connected to the microcontroller.

The Arduino Uno microcontroller board is built with user-friendly hardware and software. Sensors and motors are connected to the microcontroller, which also has the ability to read inputs and convert them into outputs. Robot movement is accomplished by DC motors, which run on a 12V power source. Because they transform the electrical supply into kinetic energy, these are sometimes referred to as rotating electrical machines. There are some tool for figuring out whether gasses are present in the surroundings. These sensors employ batteries for operation, and Wi-Fi modules are used to transmit the data to the user. The ultrasonic sensors in this robot device allow it to estimate the distance between things in front of it. Data on any object that approaches the robot can also be obtained via these sensors. A fire sensor is a device that detects smoke or fire and sends out an auditory or visual signal to anyone around. It is often referred to as a smoke detector or fire alarm. An electronic instrument that senses the presence of metal nearby is called a metal detector. It functions by creating a magnetic field and then looking for any changes brought on by metal items in that field. The metal detector alerts the user by emitting an auditory or visual signal when it detects the presence of a metal object. A beeper, or electronic buzzer, functions as an audio device and can be controlled by the user or activated as a signal from a distance. Electrical cable with a pin or connection at both ends and is typically employed to link electronic parts together using a breadboard. A well-liked and adaptable Wi-Fi module, the ESP8266 is utilized in a wide range of Internet of Things (IoT) applications. It is an inexpensive, low-power, highly integrated device with microcontroller functionality and a complete TCP/IP stack. A specific kind of hardware called a GSM (Global System for Mobile Communications) module makes it possible to communicate across a GSM network. GSM modules are widely utilized in embedded systems and the Internet of Things to provide cellular access to devices. A Wi-Fi camera is a particular kind of camera that can establish a wireless connection with another device on the network or over the internet, enabling it to send wireless video and occasionally audio.

The Arduino Software (IDE), the Arduino Integrated Development Environment (IDE) comprises a text editor for composing code, a message section, a text console, a toolbar with buttons for frequently used operations, and a number of menus. In order to upload and interact with programs, it establishes a connection with the Arduino hardware. The Blynk platform's primary goal is to make mobile application development incredibly simple. It's as simple as dragging a widget and setting up a pin to create a mobile app that communicates with your Arduino, as you will discover during this course. Blynk was created with the Internet of Things in mind. It has remote hardware control capabilities. It can perform a lot of other amazing things, including display and store data. We have been using the Android app Blynk to display the collected data of sensors.

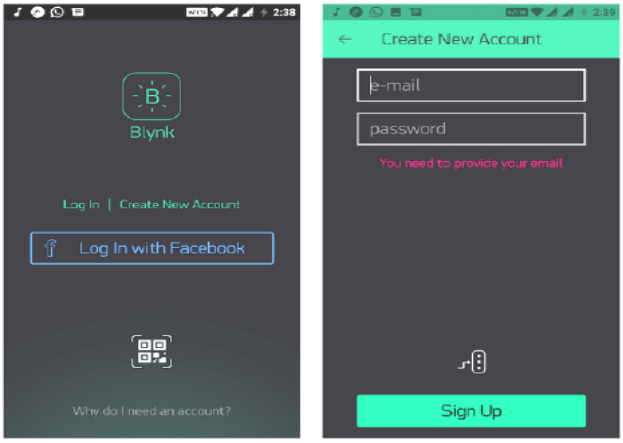

Fig 2:Blynk Login page

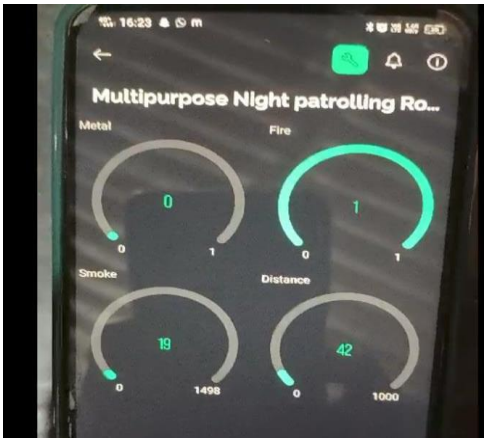

Fig 3: Blynk channels to the Robot

The Arduino Uno serves as the microcontroller in this project, and it interfaces with every other component. The metal is detected using a metal detect sensor. A gas sensor can identify various gasses, a fire sensor can identify flames, and an ultrasonic sensor may identify things. When sensors above that threshold value, a buzzer will sound and an SMS will be sent to us via the GSM module. Using the esp8266 Wi-Fi, every sensor data will be sent to the cloud. The robot's DC motor has a motor driver linked to it. The robot may be moved left, right, forward, and backward by employing a motor driver. Using a laptop or mobile device, we can view a live broadcast from a Wi-Fi camera.

IV. RESULTS AND DISCUSSION

As a result, we came to the conclusion that the project's WiFi camera and Arduino will be used for patrol and surveillance in the designated region. In order to be helpful for women's safety and to be used for area monitoring. We utilized a ultrasonic sensors in order to avoid the barrier.

Fig 4: Final Project Prototype

Fig 5: Live video streaming

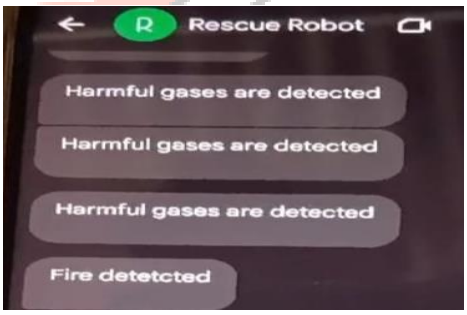

Fig 6: Via GSM message to user mobile

V. CONCLUSION

An IoT-based multifunctional patrol and rescue robot is presented in this research is suggested as a solution to the issues with inspecting challenging locations and unforeseen circumstances. This self-governing robot has the ability to completely replace humans and giving the user incredibly accurate info. By using the Blynk platform, it solves the issue of short-range communication and provides users with live video broadcasts. The robot can move over rough terrain and is tiny in size. It can also rotate in all directions. This robot has a wide range of uses, including stationary and mobile surveillance, environmental analysis, landmine detection, espionage, and other military activities.

VI. FUTURE SCOPE

The robot can be equipped with new technology to increase its efficiency. For accurate and quick data transfer, a dedicated HD camera and network can be created in place of the ESP8266 WIFI module. It is possible to create an API for data retrieval in place of using the Blynk platform. The robot's design can be updated to meet changing requirements, and it is possible to attach an arm to the machine that will provide additional sensors and new functions. A suitable solar-powered battery could be installed to power the robot instead of a battery. Additionally, the robot can be equipped with face/identity detection systems or infrared imaging to aid with human identification.

VII. ACKNOWLEDGEMENT

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