

## SMART SURVEILLANCE ROVER

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### ABSTRACT

Robotics integrated with IOT applications is being widely used in different fields today. The main objective of this paper is to propose a surveillance rover that can help monitor remote areas wirelessly. Smart Surveillance Robot is an IOT based monitoring system with remote human control designed to be used in military applications. With surveillance being a very important application in defense systems, an advanced robotic system is required for efficient monitoring. The proposed system is built around Node MCU with camera, temperature and humidity sensor and gas detector. It will capture images and live stream videos of remote areas along with temperature, humidity and gas data being collected and displayed at the user end.

**KEYWORDS:** IOT, surveillance, Node MCU, camera, sensors.

### I. INTRODUCTION

Today, a lot of people around the world use internet for performing a lot of tasks like social media, browsing, online gaming, educational activities and many more. More people have access to global information. The current revolution of "Internet of Things" (IOT) has already gained momentum and is going to dominate the computing era. Surveillance system has been used to observe specific activities or areas in terms of monitoring, managing, or security purposes. By inspecting certain activities or areas continuously by using the surveillance system, users are able to keep a track of activities and actions can be taken if required. Combining Robot and surveillance is when we have an electro-mechanical machine controlled by a computer program or an electronic device. It helps in doing an allotted task/tasks bringing convenience to humans. This has proved to be advantageous in terms of efficiency, safety and ease.

The main objective of this project is to combine surveillance, robotics and IOT to design a mobile rover equipped with a camera to form an intelligence surveillance system. The proposed Surveillance rover captures video efficiently as it has its multiple viewing angles that can be varied. It also captures temperature and humidity of the area being monitored along with detecting the presence of gases. It can be remotely-controlled by human via phone wirelessly.

This project presents a modern approach to surveillance by providing visual information of places that are difficult to access, for example a building under a hostage situation. In addition, the robot is compact and self-contained with an on-board battery pack and wireless interface to the human controller.

### II. METHODOLOGY

This section will explain the hardware and software requirements and the methodology used to achieve the proposed system.

#### Hardware Requirements

##### 1. ESP8266 NodeMCU

Node MCU is an open source development board and firmware based in the widely used ESP8266 -12E Wi-Fi module. It helps in prototyping IOT products. It allows the user to program ESP8266 Wi-Fi module with Arduino IDE. For Node MCU, a few lines of code can establish a Wi-Fi connection and define input/output pins according to requirements, it can be turned into a web server and a lot more applications can be obtained. It is the Wi-Fi equivalent of Ethernet module acting as internet of things (IoT) real tool. It supports directly flashing from USB port with its USB-TTL. Its features of combining Wi-

Fi access point/station and microcontroller makes it a useful powerful tool for Wi-Fi networking, hosting a webserver or connecting to internet.

## **2. L2N3D Motor Driver Circuit**

L293D IC is a Motor Driver IC, which allows the DC motor to move in any direction. This IC consisting of 16-pins can be used to control a set of two DC motors instantaneously to move in any direction. The basic working principle of L293D IC is based on H-bridge, which allows the voltage to flow in any direction. which is required to rotate the DC motor in both the directions. Hence, H-bridge circuit using L293D ICs are perfect for driving a motor.

## **3. MQ-135 Gas Detector**

MQ-135 is a gas detector that helps to detect the presence of gases in an area. It used to detect a gas leak or other emissions and can interface with a controller so that the process can be automatically stopped as part of action to be taken. It is interfaced to Node MCU and the data is received on blynk IOT application at the user end.

## **4. DHT 11 Temperature and Humidity Sensor**

The DHT11 is a basic, low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin. It's comparatively simple to use, but requires careful timing to grab data. It captures data every 2 seconds. It is connected to Node MCU and the data from sensors is obtained on Blynk App.

## **5. V380 Camera Module**

It is a Wi-Fi camera which can be used to achieve remote monitoring. It is controlled by V380 cloud application which can be downloaded in our mobile phones. In our proposed system this module is connected to Node MCU to perform live video streaming and is controlled by V380 camera application from mobile phone/ computer remotely.

## **Software Requirements**

### **1. Arduino IDE**

The Arduino integrated development environment (IDE) is a cross-platform application which is written in the programming language Java. It is used to write and upload programs to many development boards including Node MCU ESP8266. It supports languages like C and C++ using special rules of code structuring. It also supplies a software library from the Wiring project, which provides multiple common input and output procedures. User-written code requires only two basic functions, to start the sketch and the main program loop, that are compiled and linked with a program into an executable cyclic program. The Arduino IDE can convert the executable code into a text file in hexadecimal encoding which is loaded into the Node MCU board by a loader program in the board's firmware.

### **2. V380 Camera Application**

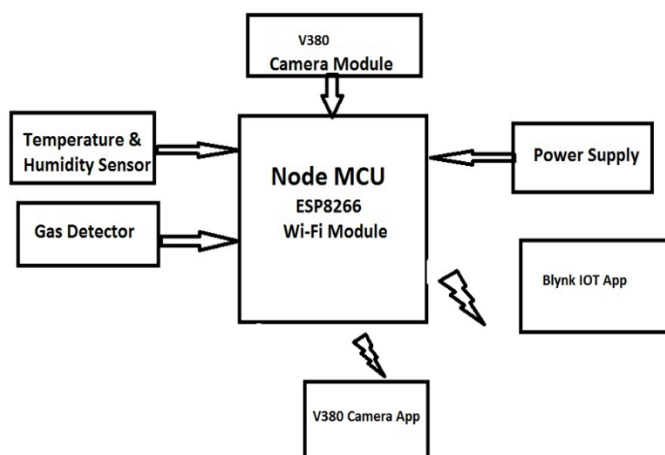
It is an app downloaded on to the PC/Mobile phone to control V380 camera module connected to Node MCU. It can control the camera movement and vary the viewing angles for efficient monitoring while live video streaming.

### **3. Blynk IOT Application**

Blynk is an IoT Platform which can be used to control Arduino, Raspberry Pi, Node MCU and other microcontrollers over the Internet. Blynk app is a digital platform where a graphic interface can be formed for any IoT based project by simply dragging and dropping widgets. It can easily be used to build complex applications for IOT based systems. In our project, through this platform we are collecting information by using Wi-Fi module ESP8266. It controls the movement of rover by controlling the movement of DC motor and displays the data captured by sensor and gas detector.

## Proposed system

Figure 1 shows the block diagram of the proposed system - Smart Surveillance Rover



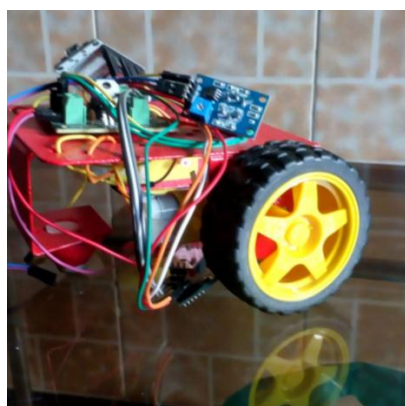
**Fig. 1:** Block diagram of Smart Surveillance Rover

In the proposed system a robotic rover is used to monitor remote areas and provide information of those areas wirelessly. The information includes live video streaming, temperature, humidity and presence of gases in those areas. The rover is controlled remotely by humans using mobile phones. The surveillance rover is built around Node MCU ESP 8266 and is interfaced to V380 camera module, temperature and humidity sensor, and gas detector. It uses a power supply of 9V. The rover is built on DC motor which helps in the movement of rover in remote areas. The movement of DC motors is controlled using Blynk IOT application installed on the mobile phone of the user that gives instruction of the direction to move such as FORWARD, BACKWARD, LEFT and RIGHT. The movement of camera is controlled with V380 camera application at the user end. It is possible to capture images and videos with multiple viewing angles. The video is live streamed on mobile using the camera application. The temperature, humidity sensor and gas detector capture the data which can be viewed on the Blynk IOT application.

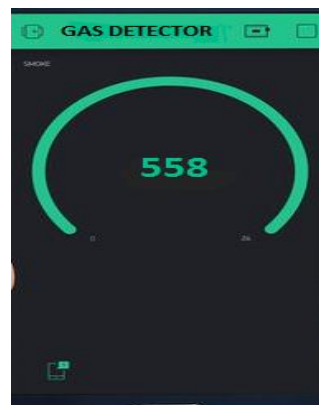
## III. RESULTS AND DISCUSSION

The results obtained by the surveillance rover are mentioned below:

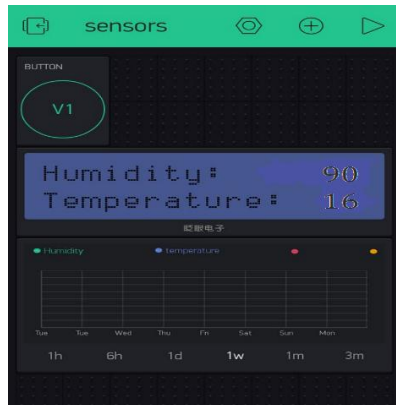
In figure 2, the prototype of smart surveillance rover is displayed. The system consists of Node MCU, V380 camera module, temperature and humidity sensor, gas detector and power supply.



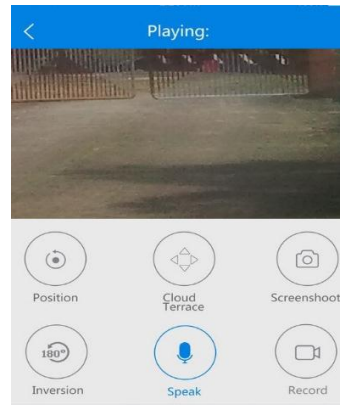
**Fig-2:** Prototype of proposed model



**Fig-3:** Gas detector output



**Fig-4:** Sensor output data



**Fig-5:** Live video camera feed

In figure 3, the data obtained by gas detector is shown on the blynk IOT application. It displays the amount of gas detected.

In figure 4, the data obtained from temperature and humidity sensor on the blynk IOT application is shown. It shows the values of temperature and humidity sensed in that area.

In figure 5, the live video streamed captured by camera module on V380 camera application is shown.

#### IV. CONCLUSION

The surveillance robot is designed to deliver a reasonable level of efficiency. It is successfully controlled by remote user and live video streaming is achieved along with the values obtained by the sensors and gas detector. It is aimed at providing monitoring inclusive of vision, motion, fire, and carbon monoxide with limited setup.

In future it can be customized to fuse seamlessly to any home, apartments or multi-dwelling units.

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