IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9305

# IOT Based Multi-Purpose Surveillance BOT

**Vignesh R[1], Rokesh R[2], Vasanthakumar N[3], Sathis Kumar N.R[4]**

Student, Electronics and Communication Engineering, Agni College of Technology, Chennai, India[1,2,3]

Assistant Professor, Electronics and Communication Engineering, Agni College of Technology, Chennai, India[2]

**Abstract**: As robotic technology continues to advance; robots are becoming capable of performing ever more complex tasks. Robotic workers never get tired, do not need to be paid, and can be made to perform even the most dangerous tasks without concern. The purpose of this project was to combine several technologies like wireless internet, neural networks, and hardware controllers, into a system that can perform the job of a security guard.

**Keywords**: Robotic control, Wi-Fi, Surveillance, IoT, Arduino.

## I. INTRODUCTION

Surveillance is the monitoring of the behaviours, activities, or other changing information, usually of people for the purpose of influencing, managing, directing, or protecting them. surveillance is the process of monitoring a situation, an area or a person. by monitoring the certain activities or areas every time using the surveillance system, the users are able to know if something abnormal happens and further action can be taken after that. this generally occurs in a military scenario where surveillance of borderlines and enemy territory is essential to a country's safety. human surveillance is achieved by deploying personnel near sensitive areas to constantly monitor for changes. but humans do have their limitations, and deployment in inaccessible places is not always possible. there are also added risks of losing personnel in the event of getting caught by the enemy. with advances in technology over the years, however, it is possibly to remotely monitor areas of importance by using robots in place of humans. apart from the obvious advantage of not having to risk any personnel, terrestrial robots can also pick-up details that are not obvious to humans. by equipping them with high resolution cameras and various sensors, it is possible to obtain information about the specific area remotely.

Robot is an electro-mechanical machine that is controlled by a computer program or electronic apparatus. it is being used to give convenience to human by doing specific task. the robotics and automation industry which is ruled the sectors from manufacturing to household entertainments. it is widely used because of its simplicity and ability to modify to meet changes of needs. robots are able to execute the task that impossible or beyond capability of human. from this advantage, it can give many advantages in term of safety, ease and efficiency.

## II. OBJECTIVES OF THE PROJECT

- The main objective of the project is to build a wireless robot for surveillance and security with live audio video streaming.
- The goal of our BOT is to ensure and provide a crime free environment.
- The important objectives that are associated with the discovery of multipurpose surveillance BOT are;

1) A human guard can be replaced with such a robot system to take care of dangerous surveillance tasks.
2) It can be controlled by using automated mode and manual mode.
3) They can collect far more data than human could that can be viewed at any time. Bot can do the task even in low light using night vision camera.

## III.PROPOSED SYSTEM

Multi-purpose Surveillance BOT is a new approach of technological improvement in security solution for large facilities. It is an integration of security devices with intelligence and robot technology. It integrates many physical components to work as a friendly robot on patrol to ensure public safety. Our BOT is mainly used in ensuring security but it can also help in solving crimes with the recorded footages. It can be a replacement for conventional police patrolling activities.

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9305

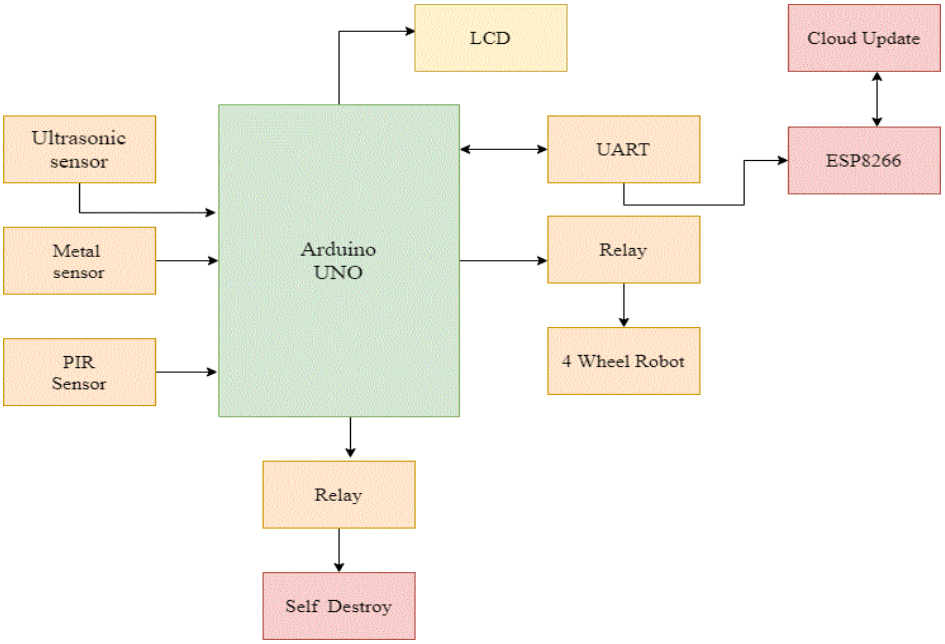



**fig.4.1 block diagram 4of multi-purpose surveillance bot**

The proposed design of multi-purpose surveillance bot is a new approach of technological improvement in security solution for large facilities. It is an integration of security devices that uses Arduino Uno ATmega328 board for the function.

## V. FLOW CHART

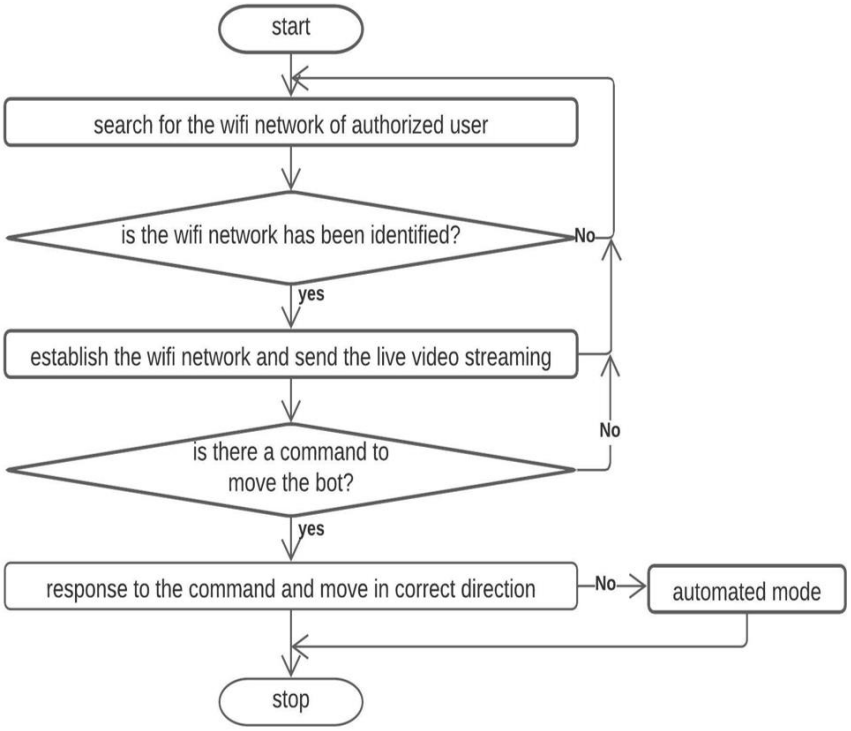



**Fig.5.1 flow chart of multi-purpose surveillance bot**

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9305

## VI. TECHNIQUES IMPLEMENTED

we have implemented three important techniques in our project to run it in a dedicated manner. They are, internet of things, Automation and firebase.

- **Internet of Things-**the network of devices, vehicles and home appliances that contain electronic, hardware, software, actuators and network connectivity which allows these things to connect, interact and exchange data. We can able to monitor the bot at anytime from anywhere. Conventional approach is a time-consuming process compared to the IoT- based approach.
- **Automation**-Automation can be defined as the technology by which a process or procedure is performed without human assistance.
- **Firebase-** Firebase helps you build and run successful apps. Backed by Google, loved by developers. Accelerate app development with fully managed backend infrastructure.

## VII. HARDWARE IMPLEMENTATION

### 1. Arduino UNO

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts

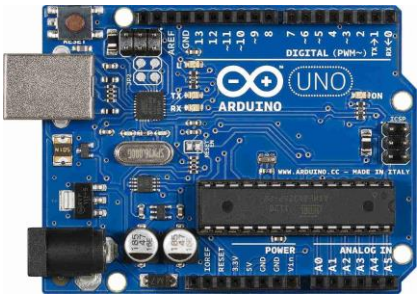



**Fig.7.1 Arduino UNO**

### 2. LCD Display

LCD is a flat –panel display or other electronically modulated optical device that uses the light –modulating properties of liquid crystals combined with polarizers. A 16x2 **LCD** means it can display **16** characters per line and there are **2** such lines. In this **LCD** each character is displayed in 5x7 pixel matrix. The **16** x **2** intelligent alphanumeric dot matrix display is capable of displaying 224 different characters and symbols.

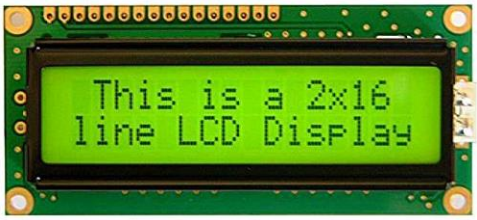



**Fig.7.2 LCD Display**

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9305

## 3. ULTRASONIC SENSOR

It used in the robot is as shown in the below Figure 3.4 An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object.

Ultrasonic sensors consist of two parts: transmitter and receiver, which create a transducer that converts ultrasound waves into electrical signals (A/C) or vice versa. The transceiver vibrates and creates an ultrasonic wave that is transmitted and travels until it hits an object and is reflected back to the receiver.


**Fig.7.3 Ultrasonic Sensor**

## 4. PASSIVE INFRARED SENSORS

A passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors. All objects with a temperature above absolute zero emit heat energy in the form of radiation. Usually, this radiation isn't visible to the human eye because it radiates at infrared wavelengths, but it can be detected by electronic devices designed for such a purpose.

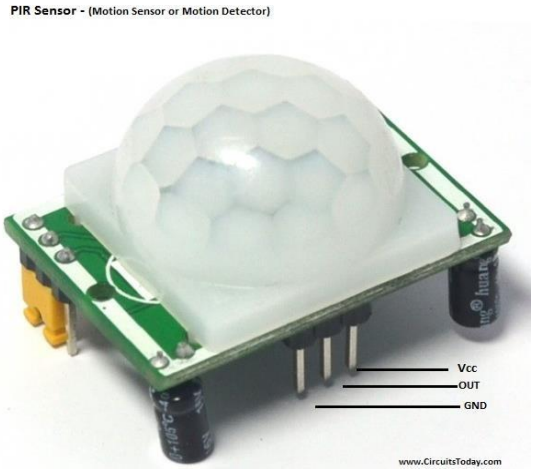



**Fig.7.4 PIR Sensor**

## 5. METAL SENSOR

A metal detector is an electronic instrument that detects the presence of metal nearby. Metal detectors are useful for finding metal inclusions hidden within objects, or metal objects buried underground. They often consist of a handheld unit with a sensor probe which can be swept over the ground or other objects.

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9305

**Fig.7.5 Metal Detector**

## 6. DC MOTOR

They are used for the robot movements. The dc motors used are geared with 100 rpm speed. A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.

**Fig.7.6 DC Motor**

## 7. WI-FI MODULE

The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area.

**Fig.7.7 ESP 8266 WI-FI Module**

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9305

## 8. IP CAMERA

Video data captured with the camera will be transmitted to base station. The camera used will be an **IP** camera which is capable of live video streaming to anywhere when connected to a router. An **Internet protocol camera** or **IP camera** is a type of digital video camera commonly employed for surveillance, and which can send and receive data via a computer network and the internet.

**Fig.7.8 IP Camera**

## VIII. SOFTWARE IMPLEMENTATION

### SOFTWARE

The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. This software can be used with any Arduino board.

### ALGORITHM

**Step 1:** Start.
**Step 2**: Turn on the Wi-Fi and wait for the required commands.
**Step 3:** If the error exists press reset button. And then retrain the VRC.
**Step4:** The signals are transmitted through RF wireless transmitter in the form of command codes.
**Step 5:** Transmitted signal is received through wireless receiver.
**Step6:** The program is simulated in Keil software and dumped into LPC2148 using flash magic, and the robot is operated for the particular program.
**Step7:** Set ports P0.16 – P0.19 with P0.8, P0.10 & P0.11 as inputs Set ports P0.0 – P0.3 and P1.16 – P1.19 as outputs.
**Step8:** The program enters a While loop. It keeps executing until there is an input. If no input is given, then it comes out of loop and jumps to Step 16.
**Step9:** If input =0x00010000, robot moves front (P0.0 and P0.2 are high). If Front obstacle is detected it moves back and waits for next command. Control comes out of Step 9 when new command is given.
**Step10:** If input =0x00020000, robot moves back (P0.1 and P0.3 are high) If obstacle is detected backside it moves front and waits for next Command and control comes out of Step 10 when new command is given.
**Step11:** If input =0x00030000 robot moves right (P0.1 and P0.2 are high).
**Step12:** If input =0x00040000 moves left (P0.0 and P0.3 are high).
**Step13:** If input=0x00050000 stepper motor rotates clockwise.
**Step14:** If I =0x0006000 stepper motor rotates anti clockwise.
**Step15:** After the comparison is done with all codes the loop flow jumps to step 8.
**Step16:** When no input is given the control comes out of loop and stops the robot.
**Step17:** Stop.

## IX. EXPERIMENTAL RESULT

Multi-purpose field surveillance robot has been successfully designed, constructed and integration tested using the best available resources. This multipurpose robot can be deployed in war fields for military use also. The robots successfully detect metal and toxic gases so the robot instead of humans can be put to detect a dangerous item. Our robot prototype employs Wi-Fi technology hence it has wide range of operation and can cover better distance. The robot can also be controlled by using Android which is used by most popular mobile and available to any kind of people around the world. The robot is safely encoded with an authentication token which provides maximum security

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9305

and hard for trafficking. The robot weighs less than a kilogram; hence it is easily portable and can be deployed on all kinds of terrain. Integration of modern IoT technology has profoundly supplied bounteous information of the field area at anytime and anywhere in the world. Use of Cloud technology makes our robot a market demand product and a must for military operations.

**Hardware setup**

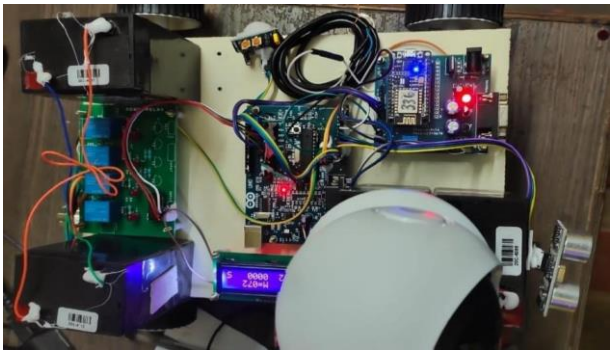


**Fig.9.1 Hardware Setup**

**UART & WI-FI Module**

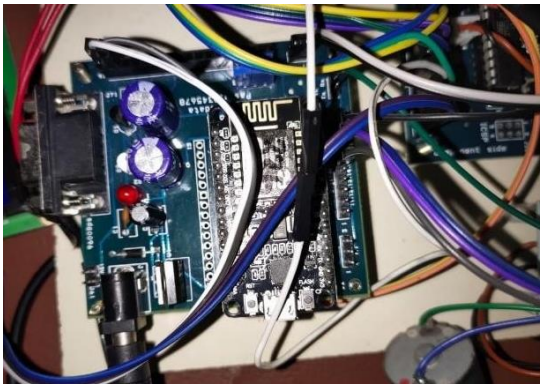


**Fig.9.2 UART & Wi-Fi Module**

- This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands.

**Robot-Relay Module**


**Fig.9.3 ROBOT-Relay Module**

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9305

**Front View**

**Fig.9.4 Front View**

**side view**

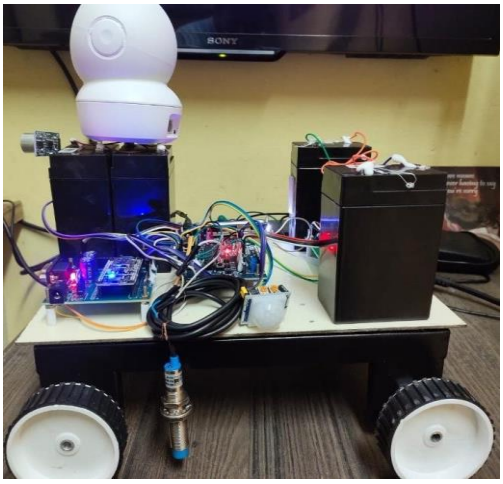


**Fig.9.5 Side View**

**Top view**

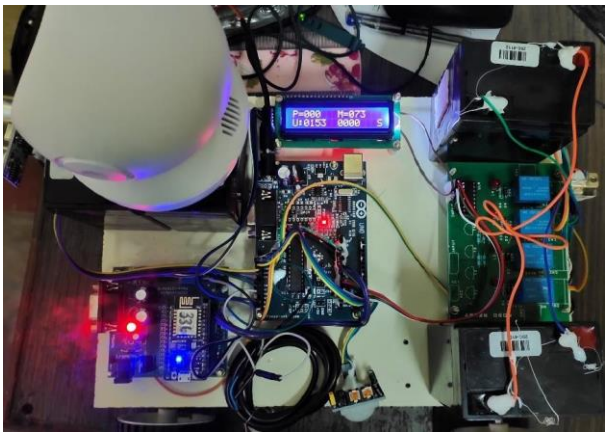


**Fig.9.6 Top view**

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

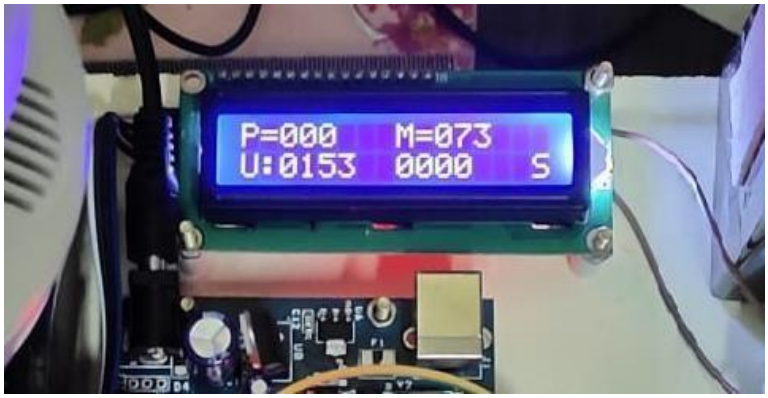
International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9305

**LCD display**

**Fig.9.7 LCD Display**




From the LCD we get the details of sensors in the robot the value in the lcd display indicates the detection of something by the bot and we can check it from the bot itself.

**Software Setup**

The software application is prepared using firebase. From here we can monitor the surveillance of bot from anywhere around the globe. This application site Also allows the user to control the bot. The video footages are stored with the help of this software and can be viewed at any time. We can use this with pc or mobile.

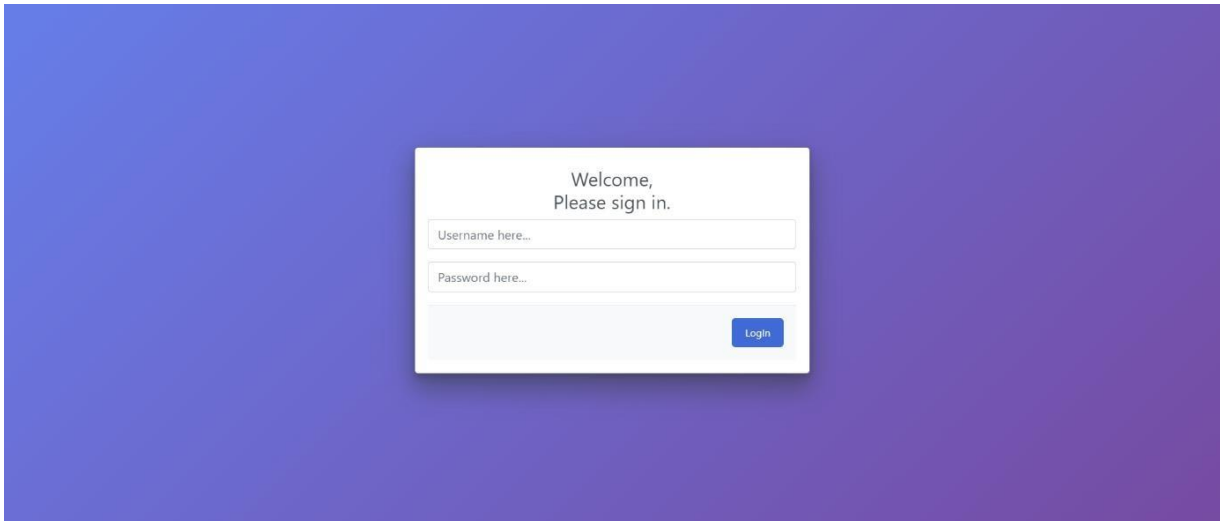



**Fig.9.8 Login Page**

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9305

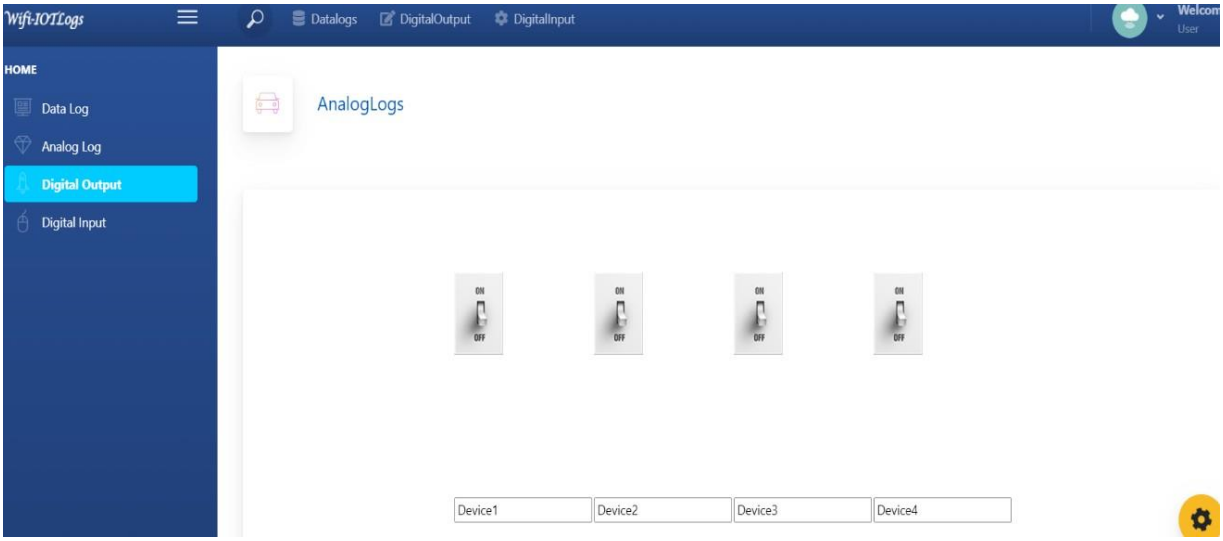



**Fig 9.9 Digital Output**

- This is the window that used to control the motions of the bot
- Switch one is for the path and when it is on the bot will move by fixed directions in continuous loop until another command is received.
- Switch two and three is for forward and reverse condition.
- Switch four is used when we want to turn the bot on
- Last 3 switch are only used to control the bot.

**Camera Views**


**Fig.9.10 Cam Footage**

- The camera has 360degree covering ability.
- We can watch the surveillance from a firebase application.
- Surveillance task can also be done in night times.

## X. FUTURE IMPROVEMENT

The increasing threat of terrorist attacks that research is ongoing on the understanding of the aggressive crowd dynamics and organization in order to reduce the risk of participants death and injury. From hitherto carried out researches on prediction and modelling crowd behaviour, it may be concluded that the study should be more improved

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9305

by increasing their methods with the latest available technical possibilities, for example image processing from camera containing intelligent video analysis system. The almost ubiquitous application of Closed-Circuit TV (CCTV) for security purposes (e.g., facility security such as manufacturing plants or banks, surveillance of public areas such as transportation hubs, etc.) has steered researchers to the obvious path of investigating the application of image processing techniques while making use of an already existing infrastructure. Image processing follows a specific process chain that starts with raw images (coming for example from an optical camera) and concludes with some form of intelligence about a particular object.

## XI. CONCLUSION

The robotic surveillance is very necessary, especially in dangerous environments. The results of the previous section lead to conclude that the surveillance robotic is implemented successfully. An excellent wireless communication between the user and robot is achieved using Wi-Fi circuit. The synchronization between the microcontroller and the firebase is seamless due to using the ESP 8266WI-FI Module. The use of servo motors and camera enables them to move with precise angles. An Arduino platform is used instead of others since it is programmed by computer via USB port and there is no need to an external programmer device this reduces the cost and saves the time.

## REFERENCES

[1]. Muhammad Hamza, M Atique-ur-Rehman, Hamza Shafqat, Subhan Bin Khalid's,"CGI SCRIPT AND MJPG VIDEO STREAMER BASED SURVEILLANCE ROBOT USING RASPBERRY PI" published in 16th
[2]. International Bhurban Conference on Applied Sciences & Technology (IBCAST) Islamabad, Pakistan, 8th – 12th January, 2019.
[3]. Mayuri Sonkusare, Akshata Raut, Dhanashree Tamhane, Deepali Palase,Amit Maurya "Surveillance Robot with Human Detection published in the 2nd International Conference on Inventive Communication and Computational Technologies (ICICCT 2018) .
[4]. Diksha Singh,Pooja Zaware and Dr Anil Nandgaonkar "Wi-Fi Surveillance Bot with Real Time Audio & Video Streaming Through Android Mobile" published in IEEE Transactions on International Conference On Recent Trends in Electronics Information & Communication Technology (RTEICT) in 2017.
[5]. Meghana S, Nikhil Teja V, Raghuveer Murali, Sanjana S, Vidhya R Khurram J Mohammed's" DESIGN AND IMPLEMENTATION OF SURVEILLANCE ROBOT FOR OUTDOOR SECURITY" published in 2nd IEEE International Conference.On Recent Trends In Electronics Information & Communication Technology, May 19-20, 2017, India.
[6]. Chirag B,Manjunath A.E,Badrinath KB "An Intelligent Cloud basedCost Effective Surveillance Robot" published in IEEE 2018.
[7]. Dr. Thair Ali Salh, Mustafa Zuhaer Nayef's "Intelligent Surveillance Robot " published in The First International Conference of Electrical Communication, Computer, Power and Control Engineering ICECCPCE'13!December17-18, 2019.
[8]. Xinyu Wu, Haitao Gong, Pei Chen, Zhong Zhi and Yangsheng Xu "Intelligent household surveillance robot "published in IEEE Transactions on International Conference on Robotics and Biomimetics in 2019.
[9]. S. Maroof, K. Sufiyan, A. Ali, M. Ibrahim and K. Bodke, "Wireless Video Surveillance Robot Controlled Using Android Mobile Device'', JAFRSE, Vol. 1, special Issue, 2017.
[10]. P. Surendra, V. Venkatesh, S. Geetha and Sk. Tausif, "Video Surveillance Robot with Multi Mode Operation", International Journal of Engineering Research & Technology (IJERT), Vol. 5, Issue. 02, pp. 458 – 461, February,
[11]. 2017.
[12]. J. Patoliya, H. Mehta and H. Patel, "Arduino Controlled War Field Spy Robot using Night Vision Wireless Camera and Android Application", IEEE International Conference on Engineering (NUiCONE), 2017.