International Journal of Engineering Technology and Management Sciences
Website: ijetms.in Issue: 6 Volume No.6 October - November – 2022
DOI:10.46647/ijetms.2022.v06i06.098 ISSN: 2581-4621

SURVEILLANCE BOT

GOWTHAM A[1], DHANUSHKUMAR S[2], ABINANDHU P[3], GOWTHAMAN V[4], DINAKARAN M[5]

*[1]EEE, BANNARI AMMAN INSTITUTE OF TECHNOLOGY, ERODE, TAMILNADU, INDIA
*[2]EEE, BANNARI AMMAN INSTITUTE OF TECHNOLOGY, ERODE, TAMILNADU, INDIA
*[3]EEE, BANNARI AMMAN INSTITUTE OF TECHNOLOGY, ERODE, TAMILNADU, INDIA
*[4]EEE, BANNARI AMMAN INSTITUTE OF TECHNOLOGY, ERODE, TAMILNADU, INDIA
*[5]EEE, BANNARI AMMAN INSTITUTE OF TECHNOLOGY, ERODE, TAMILNADU, INDIA

ABSTRACT
A robotics and Internet of Things (IoT) combination is the foundation of the surveillance robot. Using a remote control, the user can manage the robot. The robot moves and broadcasts live video in response to user instructions. The Raspberry Pi's microprocessor is used to direct robot movement. In order to deliver live video content that people may view, the robot must travel around a given region. As a consequence, monitoring is done. Numerous industries, including defence, healthcare, apartment security, and others have numerous uses for the surveillance robot. When under risky conditions, a person cannot work. These situations and places include a burning structure, a region with hazardous chemicals or radiation, and a war. An unsuccessful surveillance system was created and put into use.
Keywords— Raspberry Pi, Micro-controller, Web Camera Module

1. Introduction

This fusion of robotics and IoT is the foundation of the surveillance robot. The user has remote control over the robot's movement. The robot follows user commands to move while streaming livevideo. The action of the robot is managed using a Raspberry Pi Micro-controller. The robot's job is to roam a space while transmitting real-time video that consumers may view on their screens. As a result, the surveillance is carried out. The surveillance robot can be used in a variety of settings, including defence, healthcare, apartment security, etc.
Raspberry Pi and a webcam are used in a robotic surveillance vehicle. This may be an effective and affordable security and espionage tool that can be constructed in a matter of hours and has a widerange of configurable features. In order to make this robotic automobile, we mostly used a RaspberryPi, a USB web camera, and two DC motors.
It has a web camera set on top of it, providing us with a live video feed. What's interesting aboutthis situation is that we can move and operate this robot using an internet browser. It can also be controlled using a page on the web since it is typically controlled using a page.

2. Detailed Description of the Invention:

2.1 Recording video and live video feed:

Video cannot be securely recorded by a human in dangerous circumstances or settings. Buildingsthat catch fire, areas with poisonous chemicals or damaging radiation, and locations where there is an exchange of fire, such as a battlefield, may all fall under these situations and environments. This paper describes the design and implementation of a surveillance tanked robot based on the Windows operating system and the Wi-Fi protocol.
Robots can now be used to remotely monitor crucial regions instead of people thanks to advancesin network and robot technology. Robots that are on the ground and in the air can gather informationthat humans cannot understand. By giving the robots accurate sensors and cameras, it is possible to remotely collect data about a specific area. The development of wireless communication makes it easier to communicate with robots and obtain real-time footage. As a result, a lot of academics are

DOI:10.46647/ijetms.2022.v06i06.098 ISSN: 2581-4621

now using surveillance technology in their studies.

3. Design and working:

3.1 Internet of Things (IoT):

The fourth industrial revolution is referred to as the Internet of Things (IoT). IoT has become a significant component of civilization, from tiny wearables to smart cities. Robotics has been impacted by IoT as well. Such an integration of IoT and robotics is the foundation of the surveillance robot. The user can remotely direct the robot's movement. The robot travels in accordance with user commands and broadcasts real-time video. The Raspberry Pi microcontroller is utilised to manage robot movement. The robot's job is to travel around a space while transmitting live video data that consumers can view on a user screen. As a result, monitoring is conducted. There are numerous uses for the surveillance robot in the fields of defence, healthcare, and apartments.

The term "wireless robot" describes a small robot that captures, stores, and streams monochrome video live. A compatible web page is controlling the bot over a local Wi-Fi server. The goal of the proposed project is to put into practise the previously mentioned technology related to the micro robot, which is capable of carrying out a variety of activities at a reasonable price. The robot will be made using an Arduino Uno R3-based robot control board. In this study, we propose a surveillance robot with the ability to transmit real-time video, transfer audio, and navigate around obstacles. The system will be created such that it may feed the video to the person watching the bot in real time. In order to stream videos and transfer audio, we used two Android phones in our experiment. This project employs a completely novel method for Blynk-based robot control. For the project's wireless connectivity, we used Node Mcu ESP Module.

3.2 Proposed Method:

Proposed Approach The suggested approach makes use of a mobile surveillance robot [2, 6] to scan the area and find out-of-the-ordinary actions inside the home. Depending on the task and user comfort, the bot can operate in two modes. Manual and autonomous operating modes are available. The user's input can be used to change the mode. Through the mobile web interface, the bot can be manually operated in manual mode by using a joystick. Through live video streaming on a mobile device, the viewer can view real-time footage of the locations. While in autonomous mode the bot operates independently without the need for outside assistance, this mode can be used when the userneeds to inspect some areas inside and around the house.

In the autonomous mode, the bot initially hovers over the user-specified path while scanning the surrounding area for intruders. Additionally, the camera is installed on a servo motor to allow for 360-degree rotation, and the path is inspected every predetermined amount of time. This mode is useful at night or when no one is home since it enables the bot to independently check, alert, and notify the user in the event of any unusual conditions, such as the identification of an intruder, an intentional obstruction of the path, or an attack on the bot. With the alert, the user receives a photo of the invader. The bot alerts the authorities with the user's position and image if they haven't responded to the notification after 10 minutes. When the user is aware of the individual being spotted,there is also the option to disregard the alert.

3.3 Hardware Design:

Automation is the never-ending process in the modern day. Increased automation results in less energy being used, more benefits, and better working conditions for employees. Nowadays, autonomous robots work better for surveillance than cctv cameras. When utilising standard CCTV, additional cameras are needed and a separate individual (security officer) is needed to continuously watch it, but the majority of apartments and villas just use cameras and not security for monitoring, which is not helping to minimise theft. Knowing who stole something is only useful after the fact. Therefore, using an automated system is preferable for surveillance.

International Journal of Engineering Technology and Management Sciences
Website: ijetms.in Issue: 6 Volume No.6 October - November – 2022
DOI:10.46647/ijetms.2022.v06i06.098 ISSN: 2581-4621

SURVEILLANCE BOT

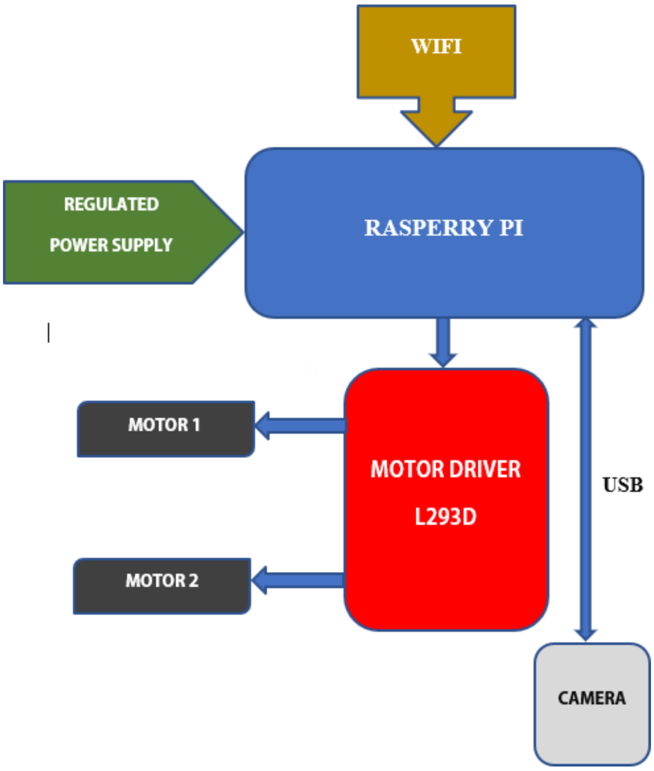

Fig. 1. Block Diagram

3.4 Description of above block diagram:

The suggested system's general block diagram is seen in the above picture. Human and property security is crucial, as was previously mentioned. In order to continuously monitor the guarded region, a surveillance bot has been created. It is designed with a variety of sensors, including a gyroscope, to guard against theft and other hazards. For protection, it contains a camera for monitoring an alert. Wi-fi connectivity allows the bot to communicate with the user, monitor the environment from a distance, and be controlled by the user via a mobile interface. Only when a person is present will thebot issue an alert. To provide the DC motors with the necessary voltage, a buck converter is connectedbetween the battery and the motor controller**.** This design essentially has two modes, a manual modeand an autonomous mode. The bot is turned on first, after which it connects to mobile devices [13] via an app or website. The working mode is then chosen (i.e., Manual or Autonomous mode) via a toggle switch. The bot is controlled manually in Manual mode, which does not require any ultrasonicsensors because it is controlled manually, and the footage captured by the camera is streamed live in the same app. This mode is used to keep an eye on children and elderly people at home. In autonomous mode, the bot follows a predetermined path that the user specifies while rotating the camera periodically in both clockwise and anticlockwise directions while mounted on a servo motor.Ultrasonic sensors are utilised for obstacle avoidance; if there is an obstruction in the path, the robotpauses travelling, looks for a new path, and then resumes movement. When running, if it detects an intruder (person detection), the bot stops and takes a picture of the intruder before sending an alert tothe user through email along with the picture. After a very little interval, the alarm will then begin tosound. If it was a recognised individual, the user can examine the image in the email and turn off thebuzzer on the app or web server; otherwise, the buzz continues, and if the user doesn't react to the alert, the buzzer also continues. In order to ensure the robot's safety, it is also equipped with a gyroscope sensor that will alert authorities if someone attempts to lift the robot, if it is disturbed, or if its position changes. The system repeats the action taken upon intruder detection, and it won't returnto normal operation unless

DOI:10.46647/ijetms.2022.v06i06.098 ISSN: 2581-4621

the user resets the settings.

3.5 Hardware Diagrams:

Fig.2 Front view of surveillance bot

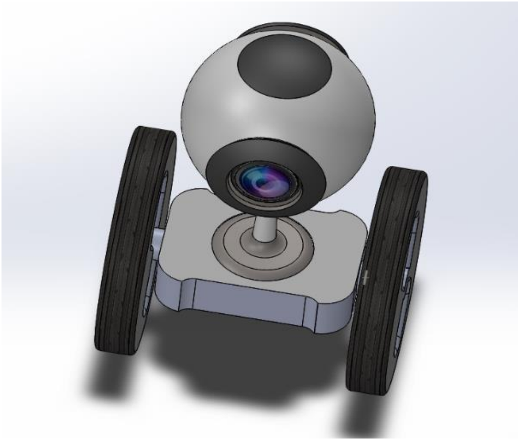

Fig.3 Top view of surveillance bot

3.6 Brief Description of the Drawings:

The interesting aspect of this is that we have some control over and can move this surveillance robot from an internet browser over the internet. The surveillance robot has a web camera set over it,through which we will get a live video feed. It can also be controlled using a page on the web since it is typically controlled using a page. A lot of sites, including homes, workplaces, military bases, and borders, have a great demand for protection. The need for security measures that might safeguard people, property, and international borders has long been great. With the help of this project, surveillance may be provided in dangerous locations like border regions and terrorist hotspots without endangering human lives.

Such an integration of IoT and robotics is the foundation of the surveillance robot. The user can remotely direct the robot's movement. The robot travels in accordance with user commands and broadcasts real-time video. The Raspberry Pi micro-controller is utilised to manage robot movement. The robot's job is to travel around a space while transmitting live video data that consumers can view on a user screen. As a result, monitoring is conducted. There are numerous uses for the surveillance robot in the fields of defence, healthcare, apartment security, etc.

Video cannot be securely recorded by a human in dangerous circumstances or settings. Buildingsthat

International Journal of Engineering Technology and Management Sciences
Website: ijetms.in Issue: 6 Volume No.6 October - November – 2022
DOI:10.46647/ijetms.2022.v06i06.098 ISSN: 2581-4621

catch fire, areas with poisonous chemicals or damaging radiation, and locations where there is an exchange of fire, such as a battlefield, may all fall under these situations and environments. This paper describes the design and implementation of a surveillance tanked robot based on the Windows operating system and the Wi-Fi protocol. The ability to remotely monitor important locations using robots rather than people is made possible by the rapid advancement of networks and robot technology. Robots on the ground and in the air can gather information that is obscure to humans. The robots can be outfitted with accurate sensors and cameras to remotely collect data about a particular area. The development of wireless connectivity makes it easier to interact withrobots and obtain real-time footage. As a result, several academics have recently become interested in using surveillance technology in their studies.

4. Prototype:

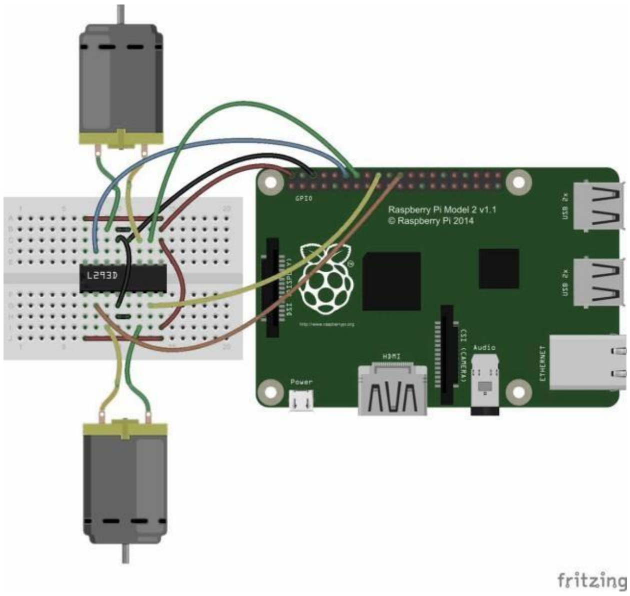

Fig.4 Simulation

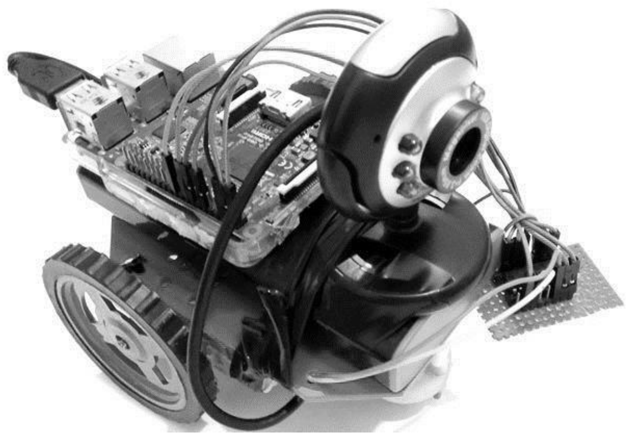

Fig.5 Prototype

International Journal of Engineering Technology and Management Sciences
Website: ijetms.in Issue: 6 Volume No.6 October - November – 2022
DOI:10.46647/ijetms.2022.v06i06.098 ISSN: 2581-4621

4.1 Hardware Components Applications:

For optimal operation, this surveillance robot needs a lot of crucial hardware parts. These surveillance robots are used in residential and remote places due to technological advancements. Thefollowing are the primary components used in our project, their specifications, and their functions;

4.1.1 Dc Motors:

In general, DC machines are employed to supply an alternator's excitation. They are also utilisedin a wide range of processes, including welding, variable-speed motor drives, electrolytic and electroplating processes. Small DC machines are employed as a control mechanism for tasks including tracking, positioning, and speed sensing. The use of motors requires a 12V DC power supply. These rotary electrical machines transform electrical energy from direct current into mechanical energy. The motors in use operate at a speed of 30 rpm.

Fig.6 Dc Motor

4.1.2 Motor Driver:

Robotics, embedded systems, and other industries employ the L298N motor driver IC. We are aware that motors require significant voltage and current while micro-controllers operate with very low voltage and current. For this reason, high voltage and current are provided via motor driver ICs.

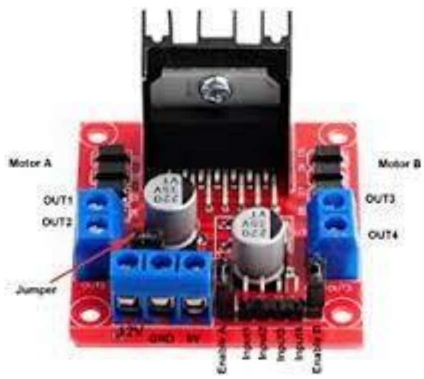

Fig.7 Motor Driver

4.1.3 Wi-Fi Module:

Robotic and electronic projects are connected to the internet via Wi-Fi modules. IoT (Internet of Things) projects can be developed with the help of Wi-Fi modules. You can direct your robot to send data over the internet or transfer data over the internet by using Wi-F modules.

DOI:10.46647/ijetms.2022.v06i06.098 ISSN: 2581-4621

Fig.8 Wi-Fi Module

4.1.4 Raspberry Pi:

Raspberry Pi can be used to build a standard desktop PC. Raspberry Pi, a micro SD card with an operating system on it, a source of continuous power, and an output display device, such as an old monitor or television, are all components of the hardware. A USB mouse and keyboard are also necessary. The Raspberry Pi is a little computer that is roughly the size of a deck of cards (Opens in a new window). With the RAM, USB ports, and other components soldered onto the board for an all-in-one package, it employs what's known as a system on a chip (Opens in a new window), which combines the CPU and GPU in a single integrated circuit.

Fig.9 Raspberry Pi

5. Conclusion:

The framework for building a robot for surveillance purposes is suggested in this study. By utilising the idea of IOT, the issue of limited range monitoring is resolved. We can manually controlthe robot with the aid of a laptop or mobile device. Additionally, automatic monitoring is possible. Our suggested robot can fit into spaces that are impossible for humans to access because of its smallsize. One of the most important technologies in the realm of electronics is wireless technology. This technology is employed as a key component of our project's surveillance strategy. This delivers a highly effective and economical robot that sub-stitutes human work, eliminates the need for human labour, and efficiently performs monitoring tasks. We created the surveillance robot utilised in industrial and combat zones. We created a website to operate the robot in this project. Our robot is compact and light, making it simple to operate in places where humans cannot. This type of robot also helps save human lives. Using an ESP32 camera, we employ wi-fi technology to instantly deliver a live image to the organization.

References

[1] N. Sebastian, E. Listijorini and S. Dw., “Designing and Prototyping Surveillance Robot with Self – P r o tection using Nail Gun’’, Journal of Applied Mechanics and Materials, Vol.493, pp. 401-407,

January, 2014.

[2] K. Shantanu and S. Dhayagonde, "Design and Implementation of E-Surveillance Robot for Video Monitoring and Living Body Detection'', International Journal of Scientific and Research Publications (IJSRP), Vol. 4, Issue. 4, pp. 1-3, April, 2014.

[3] Ch. Kulkarni, S. Grama, P. Gubbi, Ch. Krishnaand J. Antony, "Surveillance Robot Using Arduino Microcontroller, Android APIs and the Internet'', IEEE International Conference on Systems Informatics, Modeling and Simulation, pp. 83 – 87, 2014.

[4] S. Maroof, K. Sufiyan, A. Ali, M. Ibrahim and K. Bodke, "Wireless Video Surveillance Robot Controlled Using Android Mobile Device'', JAFRSE.

[5] **5**. World Health Organization (WHO), "7 million premature deaths annually linked to air pollution," Mar. 2014. [Online]. Available:
http://www.who.int/mediacentre/news/releases/2014/airpollution/en/

[6] B. Zou, J. G. Wilson, F. B. Zhan, and Y. N. Zeng, "Air pollution exposure assessment methods utilized in epidemiological studies," *Journal of Environmental Monitoring*, vol. 11,no. 3, pp. 475–490, 2009.

[7] Y. C. Wang, "Mobile sensor networks: system hardware and dispatch software," *ACM Computing Surveys*, vol. 47, no. 1, pp. 12:1–12:36, 2014.

[8] Y. C. Wang, Y. Y. Hsieh, and Y. C. Tseng, "Multiresolution spatial and temporal coding in a wireless sensor network for long-term monitoring applications," *IEEE Transactions on Computers*, vol. 58, no. 6, pp. 827– 838, 2009. [5] P. Wang and I. F. Akyildiz, "Spatial correlation and mobility-aware traffic modeling for wireless sensor networks," *IEEE/ACM Transactions on Networking*, vol. 19, no. 6, pp. 1860–1873, 2011.

[9] F. Aurenhammer, R. Klein, and D. T. Lee, *Voronoi Diagrams and Delaunay Triangulations*. Singapore: World Scientific Publishing, 2013.

[10] D. Krajzewicz, J. Erdmann, M. Behrisch, and L. Bieker,

[11] "Recent development and applications of SUMO – Simulation of Urban Mobility," *International Journal on Advances in Systems and Measurements*, vol. 5, no. 3 & 4, pp. 128–138, 2012.

a. U.S. Environmental Protection Agency, *Industrial Source*

[12] *Complex (ISC) Dispersion Model User's Guide*. Columbus: BiblioGov Publishing, 2013.

[13] U.S. Environmental Protection Agency, "Technical assistance document for the reporting of daily air quality – the air quality index (AQI)," Dec. 2013. [Online]. Available: aqi-technicalassistance-document-dec2013.pdf

[14] L. Bedogni, M. Gramaglia, A. Vesco, M. Fiore, J. Harri, and

[15] F. Ferrero, "The Bologna ringway dataset: improving road network conversion in SUMO and validating urban mobility via navigation services," *IEEE Transactions on Vehicular Technology*, vol. 64, no. 12, pp. 5464–5476, 2015.