WEB CONTROLLED SURVEILLANCE ROBOT USING RASPBERRY PI

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ABSTRACT

The main aim of this paper is to design a cost-efficient and easy-to-run surveillance robotic vehicle operated via remote desktop for security and military purposes. The high risk at time of patrol and in military borders caused by enemy threats and bad weather conditions threatens the lives of fighters that requires a replacement. This can be achieved by using raspberry pi board, Pi camera.

The study for controlling security actions using Surveillance Technology is important to realize the safety estimates and applications. It is primarily developed to observe doubtful and specific regions or in chemical factories. For the robot’s performance the code is written in python.

The robotic vehicle is developed to constantly observe the specific residential areas to security and safety, spotting suspect objects or acting as a spy in surrounding region. It monitors the restricted area through Wi-fi means. The Pi camera on the robotic vehicle first record and then show the video on web. The Pi camera placed on robot is connected to the Raspberry pi. Pi camera is used to record and stream the video of specific location on webpage.

Using Internet of Things and Wi-Fi medium network connection is provided to the surveillance robotic vehicle. The raspberry Pi allows the Pi camera to monitor any location using Wi-Fi. The IOT system exclude the requirement of receiver and transmitter nodes hence it creates the node cost-efficient, compact/tightly packed and easy to use. Hence, the robotic vehicle is developed for surveillance purpose.

Keywords: Raspberry Pi, IOT, Pi Camera, Video Streaming, Surveillance Robot.

I. INTRODUCTION

In the today’s situation, assuring security and safety enhance an unavoidable necessity. In every security-critical area, surveillance systems were installed. These systems include several computers for observing, servers for recording the videos and multiple security persons for observing those videos and good quality cameras. In recent years wireless systems grow rapidly.

The control systems have been made robust and compact by communication in absence of wiring. The main aspect of this technology is that it reads transmitted signal, then convert it into a low frequency waveform which is then decrypted into a restricted signal, the receiver then decrypted the wave/signal into the earlier transferred signal which results in expected wireless data communication.

This technology in robotics is highly demanding. By using wireless data communication, a robotic system can become more compact and effective.

The surveillance system includes two main units: a robotic unit and a remotely controlled unit. Robotic unit is composed of the raspberry pi which is heart of the project and the Pi camera.

The recommended system i.e. robotic vehicle uses raspberry pi 4 model B as the main control unit in our project.

The Pi camera displays live video feed on the web page via Wi-Fi. Here we use web framework Flask to form the web page which controls to direct the robotic vehicle and it will also stream a live video feed. The web page has five buttons to run the Robotic vehicle in Left, Right, Stop, Backward and Forward direction.
II. LITERATURE REVIEW

The robot is designed to constantly observe the specific dwelling place to be secure by monitoring or work as a secret agent and find suspicious entities surrounding it. It is designed for monitoring the specific places using Wi-fi means.[1]

It developed a cost-efficient and easy-to-control surveillance robotic car controlled by computer remotely for the military purposes. At the time of spying or observing adversary situations in borders which is threat to soldier's lives. Hence the surveillance system can be easily used in that situation.[2]

To identify the intruders near the borders and alert the security persons, surveillance system is developed to help people via live video feed. This, robotic car can be handled manually through internet connection. It gives live video feed through the Pi camera.[3]

For recording and streaming the live video, Pi camera is placed on the raspberry pi which observes the area and when obstacle is identified it will send a notification. IOT along with Wi-Fi provides internet connection to system. The raspberry pi permits the camera to provide live video feed to examine desired area through Wi-Fi.[4]

The robotic vehicle will move in various direction (right, left, backward and forward). It provides 24/7 surveillance and can be controlled from remote desktop to observe desired area through Wi-Fi connection.[5]

III. METHODOLOGY

In this project we use a component like Raspberry pi 4 controller, pi camera, 4 DC gear motors, L298n motor driver. L298n motor driver is connected to the raspberry pi 4 for controlling four DC gear motors. A Battery of 12 v or 6v is connecting with L298N for power supply and for raspberry pi power supply we connect the power bank. For connectivity the internet provided to raspberry pi 4 by using wi-fi. Raspberry pi camera, Raspberry pi 4 controller, 4 dc gear motor, L298n motor driver are deposited on the chassis board. Pi camera is connecting to the raspberry pi 4 controller for providing live video on the computer.

By using flask framework, we create the html web page and for giving direction to robot we create the buttons like left, right, forward, stop, backward on this web page. So, by pressing the button on webpage it gives the direction to robot, so that robot can move in anywhere, any direction that we can provided. Now we install the motion software for live video purpose so it captures the video with the help of pi camera. Popular used python framework that is Flask is used to send instruction from web page to raspberry pi 4 controller.

The python flask framework is python library that can be used in various web application. For controlling the robot, we create the html webpage using python flask framework. The webpage that has been crated to control the robot and move the robot in left, forward, reverse, stop, right direction. The web page can be open by entering the IP address on any electronic device such as laptop, android mobile, tablet etc. A webpage is created using Hypertext transfer protocol.
IV. SYSTEM OVERVIEW

A. Hardware Components:
1. Raspberry pi - It's an affordable, credit card-sized device that uses a standard keyboard and mouse and connects to a TV or computer monitor. It is a compact, lightweight computer that allows people of all ages to explore and learn programming using languages such as Python and Scratch. It can handle all the tasks you'd expect from a desktop computer, including browsing the web, watching high-definition videos, processing messages, and creating presentations, as well as gaming.

2. Pi camera - The Raspberry Pi camera generally referred as the Pi camera is developed to be used with the Raspberry Pi microcomputer. The Pi camera connects to the Raspberry Pi through a ribbon cable and can be used to capture videos and images. The module is available in two versions: the original 5 megapixel camera and a newer 8 megapixel camera. The Pi camera module is a compact and cost-effective imaging solution for capturing still images or video with the Raspberry Pi. It finds applications in a diverse range of projects, such as robotics, time-lapse photography and surveillance systems.

3. Dc gear motor - Dual shaft geared DC motors are functional in most applications of robotics. Shaft on adjacent sides permit the client to use an Encoder and wheel simultaneously. It is a plastic build geared Dual shaft DC motor has an of 100 and operating voltage is between 3V and 6V. It is suggested to use this motor with more than 5V.

4. L298n Motor driver - This L298n motor driver is used to drive and stepper motors. This module includes L298n motor driver IC and internal 5V regulator. L298n motor driver can operate 2 as well as 4 DC motors with reliable speed.

B. Software Components:
1. Flask Framework - Flask is a famous web framework based on python designed by Armin Ronacher of Pocoo. It is widely used to create web applications. As the Raspberry pi can easily process python language, flask is frequently utilized with the Raspberry pi. Due to Raspberry pi's inbuilt Wi-Fi feature, it is famous in creating web applications and developing IoT projects.

2. Motion software - Motion Software is free, open-source and motion detection CCTV software, designed for Linux. This software process videos and images from multiple types of cameras. Motion software can monitor videos from multiple cameras, and it can detect a change in the image. By using Motion software, you can convert the Raspberry Pi camera into a CCTV surveillance camera that can check the movements and sent alerts. Also motion software provide the live streaming of video on a Webpage.

Figure 2: Block Diagram of Surveillance Robot
V. RESULT AND DISCUSSION

In this section we define the performance of the project. So, for that we use hardware that is heart of this project such as raspberry pi 4 controller and uses the specialized software such as motion and create webpage using Flask framework this is designed with language python and HTML.

![Flowchart of the Surveillance Robot](image)

**Figure 3:** Flowchart of the Surveillance Robot

**Figure 4:** Prototype model for surveillance robot

**Figure 5:** Webpage contains live video feed and buttons
VI. FUTURE SCOPE

1. GPS Technology: To track the location of the robot we can connect the GPS module. So, it is easy to reach that place and avoid attacks from intruders in case of spying or military purpose.

2. Ultrasonic and Proximity sensor: If any obstacle in front of the robot it can be detected using ultrasonic sensor. From that information it can automatically turn from the object and avoid collision. Also, when any one cross the sensor range that can be detected by using the proximity sensor. So that we can get information about how many people are present in that location.

3. MQ2 and metal detect sensor: In a particular area there is detection of the gas sensor then we use a MQ2 gas sensor. So, this sensor detects the gas such as carbon dioxide, methane, ethane, smoke, carbon monoxide, butane, propane etc. Metal detect is used to detect metals near the robot.

4. Increased Accessibility: The development of more user-friendly interfaces and mobile apps could increase the accessibility of these technologies to a wider range of women, particularly those who may not be familiar with technology or have limited resources. In short, the future scope for surveillance robot using Raspberry Pi, Pi Camera, L298n motor driver and Flask Framework is bright and promising.

VII. CONCLUSION

The system was portable, flexible with compact size so that we can deposit in anywhere for surveillance. The places, areas where the security is required or it contains some sensitive information such as bank, military, nuclear sites so for that this surveillance system is useful.

This surveillance robot we can operate as manually and see the live video stream on webpage. Also, this robot not only monitor the physical presence it also monitors all the sensitive information, any storage information

The robot especially designed for that should we work in the dangerous places where it is harmful for human being. By entering the IP address of a raspberry pi on web browser we can control the robot in any electronic devices such as tablet, pc, laptop, android mobile by using a internet connectivity such as WIFI

Overall, this system provides a simple yet effective solution for live streaming and also it does not compulsory require any physical presence. So, this project we control the robot through a webpage from any electronic device such as laptop, mobile, tablet etc. and see live video on this webpage using internet connectivity such as WIFI.

VIII. REFERENCES


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