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Internet Controlled Techrobot using Raspberry Pi

Rithvik VR[1], Deeksha Anchan[2], Shreya R[3], Shreyas G[4], Dr. Gopalaiah[5]

UG Student, Dept. of EIE, Dayananda Sagar College of Engineering, Bengaluru, Karnataka, India[1,2,3,4]

Assistant Professor, Dept. of EIE, Dayananda Sagar College of Engineering, Bengaluru, Karnataka, India[5]

ABSTRACT: A robot is a device that can automatically do a complex series of tasks, particularly one that can be programmed by a computer. In today's automation industry and surveillance systems, robots play a significant role. The applications and functionality of the robots have grown as a result of technological advancement. In this project, we're designing and putting a surveillance robot into action. The development of an integrated computing network environment for the use of various robotic systems is made possible by internet technology. This internet-controlled robotic vehicle may be operated from any location in the world. It also explains how to use the robot's camera, which can feed real-time video into a website page utilising Wi-Fi technology that we access through an IP address with the aid of the website we created utilising the Blynk IOT application, the application enables the robot to control interactions. We are utilising a robotic device based on the Raspberry Pi here that will travel to those places and send live video to us. Only those who have been verified can see the videos that are being recorded by the robot's camera, which is continuously recording footage from its surroundings to retain a record of the incident's specifics. It also explains how to use the robot's attached obstacle detector. The LED light will blink and a message will appear on the webpage if there is an obstruction displayed When metal is present, buzzing noises are produced.

KEYWORDS: Raspberry Pi, Wi-Fi Technology, Blynk IOT, Surveillance Robot.

I. INTRODUCTION

Machines are the primary cause of the rapid industrial progress and technological innovation, which has reduced human labor. Machines are crucial to our daily lives. A machine could be anything, including a robot, a bicycle, or a cell phone. In a variety of areas of human lives, the desire for robots is rising. Their defence usage has increased. Robots resemble humans in a variety of ways, including how they look and operate, but until recently, they were not managed by electronic circuits or computer programs. They were built back then utilizing the principles of mechanics, which were improved over time as the electronic age arrived. Robots are used in many different applications nowadays, such as finding hidden bombs and in the industrial sector. Robots are a form of embedded system because they are mechanical or virtual artificial agents that are often electro-mechanical machines that are controlled by a computer program or electronic circuit. Robotics is the area of technology that deals with the creation, maintenance, and application of robots as well as PC systems for their control, sensory input, and information processing. These technologies deal with automated machines that can replace people in hazardous environments or production processes or that behave and look like people. The difficulty of the tasks the robot must perform determines the complexity of the computer program. In this project, the user and a robotic car are connected via the internet to create communication. This is a dependable link, and controlling the autonomous vehicle is possible with live video feedback. There are no restrictions on the range or separation distance between the user and the robotic vehicle because of the utilization of the internet. Tele-surgery, tele-manufacturing, tele-training, traffic control, surveillance, health care-space exploration, disaster rescue, etc. are just a few of the brand-new real-world applications that the Internet of Things has made possible. This list is expected to become even longer in the future years. Surveillance is the process of keeping an eye on a situation, a region, or a person. This typically happens in a military setting where keeping an eye on the enemy's boundaries and territory is crucial for maintaining national security. Human surveillance is accomplished by stationing workers close to vulnerable regions to regularly check for changes. However, humans do have limitations, making deployment in inhospitable locations not always practical. Additionally, there is a chance that they could be lost if they are captured by the enemy. However, because to technological advancements over the years, it may now be possible to remotely monitor crucial locations by utilizing robots rather than people. Aerial and terrestrial robots can also pick up details that are not immediately apparent to people, in addition to the benefit of not putting any humans at risk. It is possible to obtain information about a certain area remotely by equipping them with

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high-definition cameras and other sensors. Real-time audio-visual feedback may be obtained and contact with the robots is easy thanks to satellite technology. As a result, surveillance has recently attracted a lot of scholarly interest. Therefore, our goal is to use a Raspberry Pi to construct a fully functional smart surveillance robot that can be operated remotely via the internet. Anyone can now easily control the robotic car from a distance because to the widespread use of the internet and its popularity. The majority of Americans spend more time online than they do sleeping. Therefore, by making the robotic vehicle controllable via the internet, anyone can utilize it from a distance.

II. PROBLEM DEFINITION

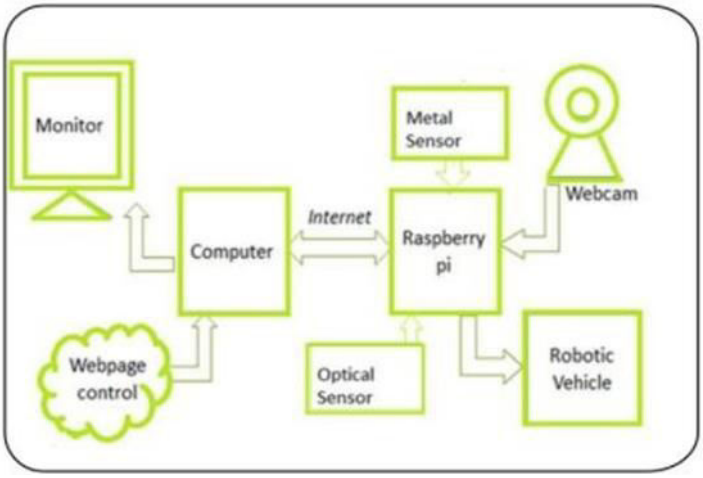
The design and implementation of an internet-controlled robot utilising a Raspberry Pi is the subject of this research project. It uses wireless technology to offer necessary security through a surveillance system and object avoidance over the internet from any location. The suggested solution will gather data and send it over Wi-Fi to a static IP, where it can be seen on any smart device utilising a web browser. Raspberry Pi is used to operate a surveillance camera. It records and streams live video. Anywhere in the world will be able to operate this robotic car via the internet. The cloud server will be housed on the Raspberry Pi. The information is broadcast to the user after the data is uploaded to the cloud. The user then utilizes a web page that is hosted by the server to control the robot's motion. Cloud server, GUI, and client are the three main components. The project's primary goal is to open lines of contact between these three parties. The robot is connected to the outside world by the server running on the Raspberry Pi. The web page, or GUI, serves as the Raspberry Pi's control interface. The user enters the server's IP address to operate the robot using various GUI buttons. When a button is clicked, a request is sent to the server, which then sends a command to the robot.

III. SYSTEM OVERVIEW

In this project, robotic vehicle control is accomplished remotely through the Internet, and we are also able to obtain video from the robot end for surveillance purposes. We will be able to monitor the live video, command the robot's movement, and direct the camera's direction from the client side. DC motors are utilized to rotate the camera 360 degrees as well as to move the robotic wheels. When streaming videos, the Raspberry Pi 3 model B uses the Internet to transfer the streams to the user's PC. Because we can operate the robot from anywhere with internet connectivity, using it does not take the robot's range into consideration. In this robot implementation, the web camera attached to the Raspberry Pi continuously records and stores what is happening at the host location. This idea uses wireless technology to supply or operate the security robot. It additionally offers the live footage that was obtained by the robot. The Raspberry Pi is the robot's platform. The Web website has been programmed to allow control of the robot.

IV. METHODOLOGY

The webcam will stream the live video of its surroundings and then deliver it over the internet to the webpage. This information will be shown on the user's end monitor for viewing. The user will operate the robotic vehicle via the user-end web page in accordance with the intended movement. Any obstruction in its path will be detected by the laptop. LEDs will glow in the dark to illuminate the path. The web page's input is subsequently transmitted across the internet, and the robot's end receives the desired movement.



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The Raspberry Pi, motors, motor driver L239d, optical sensor, metal buzzer, LDR, and web camera are used to build the robotic car. In the project's block diagram, the robotic vehicle and the user establish a link through the internet with the aid of a server. The server side is the robotic vehicle. The server is hosted by Raspberry Pi. The client side is the user. Using a webcam, the robot records the photos and video and sends the data to a webpage. The following task is to use the internet to record and transmit live images at a rate that will appear to the human eye as live video. Range of operation is not a restriction when using the internet. The robot may be commanded from anywhere in the world. Additionally, it features metal and obstacle sensors that are connected to the Raspberry Pi. If there is an obstruction in the way, the robot will stop, and if metal is found, the LED will glow.

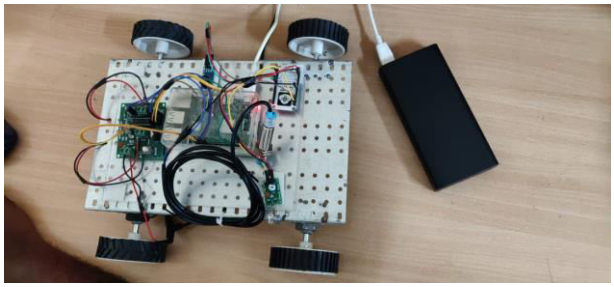
. V. IMPLEMENTATION

We put into practice our prototype, which consists of three key elements: an on-board camera, a voltage regulator, and an L293D motor driver. By entering a certain internet address, anyone in the globe can access the webpage that displays the real-time video and other sensor data. Since the Raspberry Pi lacks a hard drive and sufficient internal memory, we must use an SD card for data storage and all other Pi functions. The Raspberry Pi has to have an operating system installed first. Almost all single board computers prefer Linux-based operating systems, and the Raspberry Pi is no exception. Raspbian, Debian, Arch Linux, RISC OS, and other popular operating systems are available for the Raspberry Pi. Raspbian built on the Debian operating system is strongly favoured over all others. It is set up on an SD card. It requires a mouse and keyboard to operate, which may be connected to the system using one of the two available USB ports. A powered Pi is required in order to plug in another USB device.

Because the gadget requires electricity from the Pi to function, using a USB hub is necessary to prevent Pi from hanging. In order to ensure that Pi has the power it needs to function, an external adapter with the right rating should be used. After the initial boot up, configurations must be modified to meet our needs, such as the initial desktop boot. The Raspberry Pi is wired to a network, and the command "sudoifconfig" must be used to identify the system's IPV4 address. The address obtained will be a DHCP address; however, by modifying the interface file located in the /etc file, it is possible to convert it to a static IP address. Then, to bring the system up to date, upgrade the kernel and software as necessary. Using an appropriate editor, such as nano or leaf pad, the web page can be created. /var/www is the web server's default directory. Later, the Lighttpd configuration file can be modified to modify it. The Raspberry Pi supports a variety of languages in addition to Python, including Java, C, Ruby, and others.

- Configuring the Raspberry Pi. Go to raspberrypi.org in this step and download whichever operating system you need; in our case, we picked Raspbian Wheezy.
- After connecting the webcam to the Raspberry Pi and installing the necessary packages, you will receive the MJPG-streamer folder.
- Create the GUI now so that our robot can be controlled. This website was created using Python.
- To connect our Pi to the Wi-Fi router, we now need a Wi-Fi dongle. Open the WiConfig application and connect your PI to your Wi-Fi router after attaching the Wi-Fi dongle. To find the IP address if the Wi-Fi router is already connected, enter the following command into the terminal.

VI. RESULTS



It has been created and built the robotic vehicle. This is how the robotic car we created looks in its final form. The Raspberry Pi, motors, motor driver L239d, optical sensor, metal buzzer, LDR, and webcam are used to build the robotic car. The webpage's design is used to manage and observe the robot. Python was used to create the website. The user can control the robot and watch live streaming on the constructed website. To control the robot's movement, the homepage has the following buttons: forward, backward, right, left, and stop. For the robotic vehicle to be controlled, the respective buttons should be pressed on the webpage and the robots acts on the command. In case, a metal is

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detected on the path of the robot, the LED glows and a message is displayed on the webpage. Similarly if an object is detected by the IR sensor on the path of the robot, a buzzer sound along with a message displayed on the webpage.

VII. ADVANTAGES AND DISADVANTAGES

Robotic systems have the power to significantly improve work quality. They don't make the same faults and mistakes that people do. This helps to cut down on both production time and crucial output. They produce the most output, both in terms of quantity and quality. They are used in the medical field to undertake intricate surgeries that are highly challenging for doctors and surgeons to complete.

Robotic systems and robots have a high initial cost. Additional space and new technology may be required to accommodate them. It is important to use highly qualified and technical engineers, programmers, and others to set up robotic systems and robots in order to avoid unnecessary future problems.

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