

WEB BASED 2WD ROBOTIC CAR FOR SECURITY APPLICATIONS

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Abstract— The present days Security is most key role plays in every human life. Terrorist attacks are on a rise throughout the world. This has led to an increasing need for surveillance, which is a very daunting task. There are surveillance cameras in some areas, but they have a very limited vision. This is not of much use as the view can get obstructed easily, which has provided an impetus to build a robotic vehicle for surveillance purposes. This problem over come the Build and interface of a real time wheeled mobile robot installed above it and a camera. This robot operated remotely anywhere from world and controlled by help of a laptop, a mobile or a tablet. The proposed robotic unit is used for video surveillance of remote place as well as remotely control of the unit using Wi-Fi as medium. Raspberry pi serve the purpose of server as well as the microprocessor for the system. The present paper explains the working of the proposed mobile robot camera model. Like this very useful surveillance application for defiance field. The proposed robotic unit is used for video surveillance of remote place as well as remotely control of the unit using Wi-Fi as medium. Raspberry pi serve the purpose of server as well as the microprocessor for the system. An embedded web server creates an easy way for monitoring & controlling any device which is at remote place. Video is captured through the webcam placed on the robotic unit and lively transmitted to the remote end. Controls are provided on the console page where one can see the live streaming as well as can control the movement of robotic unit.

Index Terms—Mobile robot, Wi-Fi, Raspberry pi, robotic vehicle

I. INTRODUCTION

Raspberry Pi is a card sized computer. It functions almost same as a computer. There are different types of surveillance systems available such as camera, CCTV etc., In these types of surveillance systems, the person who is stationary and is located in that particular area can only able to view what is happening in that place. Whereas, here, even if the user is moving from one place to another, he/she can keep track of what is happening in that particular place at exact time. Also, another advantage is that it offers privacy on both sides since it is being viewed by only one person[1]. The other big advantage is that, it is a easy and simple circuit for understanding and designing. The operating system used here is Raspbian OS. Raspbian OS has to be installed so that the image can be transmitted to the smartphone Closed circuit television monitoring system has now become an indispensable device in today's society. Robots have found an drastically increasing demand for different range of work in our life[2].

.Robots ensemble human beings in many ways be it looks or functioning, but previously robots were not controlled by computer programs or electronic circuitry. Back then they were built using principle of mechanics improving over time with the coming of electronic age. Robots have found drastically increasing demand for different range of work in our life. Their use in army and other security sector increases day by day. A mobile robot can replace human to do work. The robot is controlled by wireless mode to ensure that it can be used from long distance by the user. Mobile robots are generally those robots which can move from place to place across the ground. The proposed system includes one such instance of how a robot can be of use to human race in general. The use of internet to establish communication between the user and a robotic vehicle. This is a dependable connection and a continuous video feedback is available to control the

robotic vehicle. Due to the use of the web, there is no limitation on range or distance between the user and the robotic vehicle Web-Controlled Surveillance Robotic car is one such application, where a vehicular robot can be controlled wirelessly via the internet. The main application is surveillance across the international borders for monitoring of any illegal or suspicious activities, intrusions or ceasefires violations[3].

As the growth rate of crime has been increased in past years, as a result, everyone is concerned about their safety and security. Due to this reason, people started to consider the significance of surveillance systems. The majority of the people are doing Internet Protocol (IP) based installations rather than analog because of IP-based installations. In order to make the IP-based systems affordable for the people having a low budget, the need to develop a system which is cost. As internet of things is the concept newly introduced in the field of electronics, the concept is about handling the things with the use of internet and the best model for these applications is Raspberry Pi[4].

II. LITERATURE SURVEY

Ron Oommen Thomas et.al[5] , describes the use of internet to control the robotic arm from a remote end by means of a visual feedback so the user can see the movement of the robotic arm from anywhere. It uses the Raspberry Pi module which is connected to the internet via LAN or WIFI. The USB webcam which provides the visual feedback necessary for monitoring the robotic arm from a remote end. The robotic arm is controlled from the client side via the visual feedback. A web server is set up on the single board computer named Raspberry Pi. The primary role of web servers is to deliver web content that can be accessed through the internet to the clients. Hypertext Transfer Protocol (HTTP) is the protocol that helps in the communication between client and server.

Dhanabal R et.al[6], to control the robotic arm from internet with live video streaming as a means of visual feedback. This proposed system provides the advantage of port forwarding so that it is possible for a person in a different country to see the robotic arm and control it according to his needs. The main theme of this proposed system is to develop an FPGA based robot which can be controlled remotely by using internet. The robot direction is controlled by using Bluetooth module. The transmitter is android mobile. This mobile which controls the robot through Bluetooth has limited range. So mobile is placed inside the robot and it will be controlled via the internet from another android platform or Pc. Camera in the mobile is used to visually control the robot directions even from far places. Text to speech converter at the robot is used to communicate with the people near the robot. GPS in the android mobile is used to track the robot from the internet itself. The implementation of Remote access machine using FPGA board through internet was successful. The communications between different modules were perfect without any interference. The design met all the required specifications. Altera quartus II, Model sim were the software tools used. The performance of the system was more efficient when methodology of placing an android phone on the robot instead of GPRS controlled robot. It can be concluded that placing android mobile in the robot and controlling it provides portability and flexibility.

Kunal Borker et.al[7], presents a wireless controlled robot system for surveillance purpose. The robot is equipped with an Android smart phone which will capture the scenario in front of it will transfer the images to the server on which the user will be controlling and watching the live feed. The robot is controlled by the user operating the Remote computer. The essential component here is the web browser and web server on which the control page to control the robotic action will be opened. The web consists of a log-in interface and control page with video screen or a webcam page. For server side programming language PHP was used and for embedding the scripts in the page HTML was used. The controlling of robot provided easy user interface as the various buttons were available on the web page specifying the various actions. The Android device used here makes possible the fast and good quality of image transmission. The programming used gave very good control on the movements of the robot. The Controlled Wireless communication was achieved using Wi-Fi network.

The proposed system consist of two units mainly a robotic unit and a remotely control unit. The robotic unit is consisting of the webcam, Wi-Fi dongle and the heart of the proposed system, Raspberry Pi along with the PCB containing motor driven IC and voltage regulator circuitry. The main reason behind selecting Raspberry Pi is its excellent performance with respect to speed as well as user friendliness at a very low cost. An embedded web server creates an easy way for controlling any device which is at remote place. We implement a system which is portable, low cost & having less maintenance.

In this proposed system we use internet to establish communication between the user and a robotic vehicle. This is a reliable connection and a continuous video feedback is available to control the robotic vehicle. Due to the use of internet, there is no limitation on range or distance between the user and the robotic vehicle. Internet robotics has opened up a completely new range of real-world applications namely tele-surgery, tele-manufacturing, tele-training, tele-surgery, traffic control, health care, space exploration, disaster rescue etc. and the list is supposed to increase further in the coming years.

There are different types of surveillance systems available such as camera, CCTV etc., In these types of surveillance systems, the person who is stationary and is located in that particular area can only able to view what is happening in that place. Whereas, here, even if the user is moving from one place to another, he/she can keep track of what is happening in that particular place at exact time. The main advantage behind using Raspberry Pi is its portability along with a powerful processor.

To design and develop a user friendly and cost effective web enabled robot using Raspberry Pi and smart phone that can controlled over the internet without any complexity and high cost. Robots are more and more being built-into working task to replace humans especially to operate on repeated actions. Alternatively hand internet and WI-FI have become most typical resource for everything. People prefer to go shopping online rather than getting them by hand Now a days internet has become everywhere, compare to the final decades where it was just wired, and people needs to monitor while watching computer to gain access to the web but now a days, internet is simply in the tip of the finger. This really is an advantage where we are able to introducing robot to house hold works.

The robot is build robotically and electrical components were also accustomed to build the automatic arm. Mostly the internet controlled robots are going to be wired these wired robots possess some space limitation. To steer clear of the limitation, the automatic control is created wireless that's, it's controlled by Wi-Fi. Wirelessly does mean using Bluetooth but the advancement used this is actually the WI-FI that is most widely used now a days. We can use this system for military applications installing suitable sensors. Just by changing the robotic unit design we can use it in hospitals for patient monitoring. Using some chemical sensors we can detect harmful gas leakage in the chamber the time delay which occurs in the execution of commands can be reduced and thus we can have more real time access to the robot. With reduced time delay we can have faster operation and quick response to any illegal activities in the monitored area. Also it can be used as a spy robot. The robot is very economical.

Developing surveillance and monitoring systems can be quite challenging at times, since the systems should be designed with consideration of the environment to be monitored. Good surveillance systems need to have dynamic features, e.g. monitoring cameras. Monitoring such a large area would also be a challenge for the security officers, as they will need to spend too much time to patrol

covering all places. To address the challenges like surveillance of a large building with many levels, which would insure a high cost to install many cameras at many places dynamic surveillance systems include dangerous areas.

The core problem faced by any system is its cost effectiveness, the traditional methods employed for building such systems includes costly sensors and different modules which unnecessarily increase the cost and complexity. Also, the problem faced was that, these systems used Zigbee, GSM or Wi-Fi modules which were wired and were reliable over a short range. These limitations provided us an impetus to build a cost effective, efficient, high speed processing robot that can be controlled miles and miles away through the internet.

III. PROPOSED SYSTEM

The proposed a system to build a real-time live streaming and monitoring system using Raspberry Pi with installed Wi-Fi connectivity. In monitoring phase, the pi will record the video of the location in real-time. Capturing video is done through commands given through the computer to the Raspberry Pi. The connection of Raspberry Pi with the motor driver is done using the General Purpose Input Output (GPIO) pins of Raspberry Pi. The GPIO pins are connected to the input pins of the motor shield. The output pins of the motor shield are connected to the motors. A portable charger of 2 amp current is connected to the motor shield and Raspberry Pi. A Python program is written for controlling the motors, wherein the GPIO pins will give output. The output from the Raspberry Pi is sent to the motor shield. The robot movement is controlled through the directions mentioned on the web page created using Hyper Text Mark up Language (HTML) code and webpage Universal Resource Locator (URL) address. The camera module is installed into its port and it is enabled in Raspberry Pi settings. For the Live Streaming of videos MOTION software is installed and configured. After the configuration steps are done just view the live streaming in the app as well as the website. The website has been developed to allow a large number of people to experience the live streaming irrespective of their location. Here in this proposed system, one can control the robot from remote end say mobile or laptop with the use of Wi-Fi as well as Internet and also we can get the live streaming of video from the robot for the purpose of surveillance, this video is obtained on web browser of the remote device from where we are operating the device and also we are able to control the robotic movement. DC motors are being used for the movement of robotic wheels. Raspberry Pi3 Model B is used for video processing and sending the processed video to user PC with the help of Wi-Fi as well as internet.

We are using a 25MP USB Camera for capturing video with the Raspberry Pi. This video will be available on any browser just by entering the IP address of the Raspberry Pi in the address window. We are using MOTION software for building a webcam server and WebIOPi software for controlling the robot via the internet and the robot is

controlled through webpage's created. The system is programmed using python programming language.

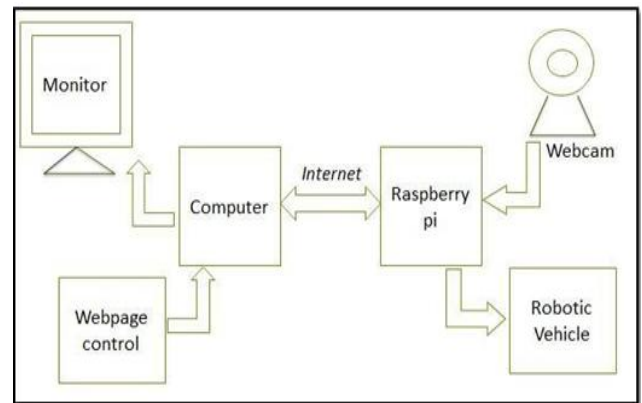


Fig.1. Proposed robot vehicle system.

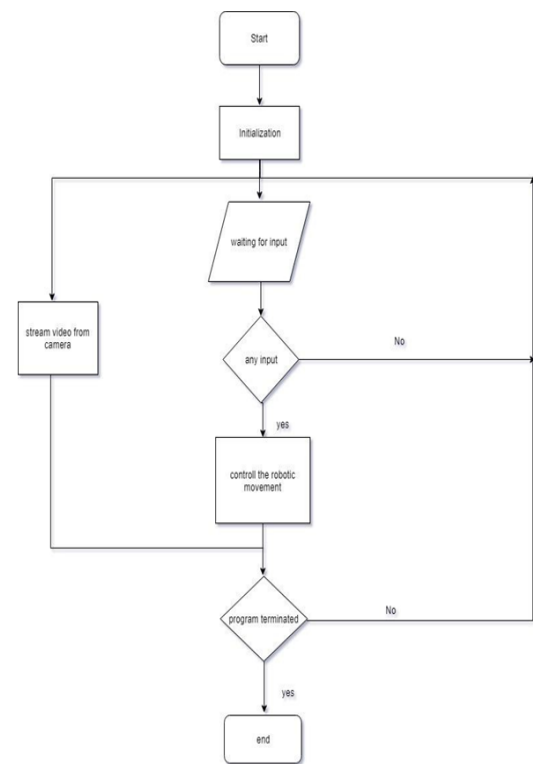


Fig.2. Flow Chart Diagram Of Proposed System.

The proposed system advantages are The System is useful for the organization where they can't afford the costly surveillance systems. Once coded, the system is password protected and can be accessed only by specific users who are authenticated. Can occupy the wide area for surveillance i.e.; whole auditorium or big hall. It has all utilities and software's required for live streaming and surveillance so that the user can use it without any hesitation or fear that they might not be able to control it. Wireless cameras come with an increased flexibility since there is lack of wires allowing us to place it in any directions. Raspberry Pi uses software which are either free or open source.

The limitation of proposed system are Separate Wi-Fi adapter has to be connected. Only one location would be

under surveillance at a time. For configuring the robot user has to go to the system every time. Not compatible with Windows operating system. The system doesn't work if the IP address is different for pi and laptop. Batteries can become weak and become render the system ineffective as it ages.

IV. RESULTS

The final output of the proposed system give a webpage designed specifically for the user's purpose. Also, a camera module is fixed for live recording sessions when required. In the above webpage design, we can find that there directions provided. These symbols appropriately prompt the robotic system to move in the desired directions. This may vary from field to field. Once clicked, the system loads the robot to move in that particular direction. When the Robot moves according to the directions given by the operator, the same video where the robot moves will be done using the webcam and that live streaming can be seen in the left side corner of the webpage.

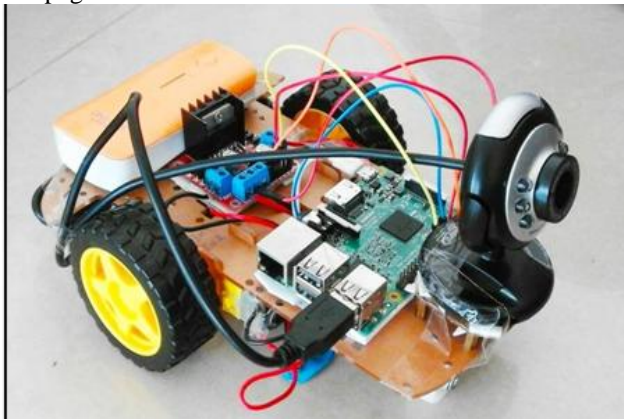


Fig.3. Robotic Car

This Smart Container can tell you about its status like whether it is full or empty, by sending a mail to your Email ID. We can also monitor the weight of container in real time using web browser, where you can monitor your container from anywhere using internet. weight of the container will be updated in every 5 seconds on the web browser, this duration can be easily changed in HTML code file. We can set the threshold weight value of 300 gram to send the email about that "Container is Full", this limit can also be changed.



Fig.4. Output Of Smart Container

We all are familiar with the Wireless Notice Board as we have already built Wireless Notice Board using GSM and Arduino. Instead of using GSM as wireless medium, this time we are using Internet to wirelessly send the

message from Web Browser to the LCD which is connected to Raspberry Pi. As message is sent through the web browser, so it can be sent using Computer, smart phone or tablet.



Fig.5. Web Controlled Notice Board Setup

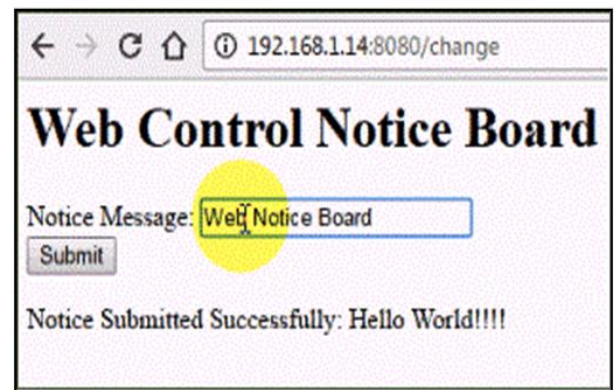


Fig.6 Output Message On Notice Board

IV. CONCLUSION

We can use this system for military applications installing suitable sensors. Just by changing the robotic unit design we can use it in hospitals for patient monitoring. Using some chemical sensors we can detect harmful gas leakage in the chamber the time delay which occurs in the execution of commands can be reduced and thus we can have more real time access to the robot. With reduced time delay we can have faster operation and quick response to any illegal activities in the monitored area. Also it can be used as a spy robot. The robot is very economical. Using this robotic system a remote area can be monitored easily from remote end. One can easily monitor as well as control the activity of the robotic unit. This system can be used any conditions and areas where it is difficult for the security forces to reach it can monitor the areas. As the communication is done with the help of internet so limitation of range of operation does not arise and thus we can monitor any remote areas. If this robot is within the Wi-Fi range there is no need of internet too. We control the robot using the Wi-Fi as a medium. The world is moving towards the automation by using the various techniques for the communication. The Raspberry Pi can be used for the control of a Robotic motion with obstacle detection from a remote end through the web

page. This data can be provided worldwide with port forwarding. The wireless solution by using the Raspberry Pi provides fast transmission over long range. It saves resources and time. Thus data can be monitored and controlled at remote locations with much secured manner. After working this much on Raspberry Pi, many conclusions were raised, like the Raspberry Pi is highly sensitive, one small mistake in the connections can damage the Raspberry Pi, its adverse effects re seen on the GPIO pins, like the pins not functioning properly or some of the pins not working at all. So before starting with the pi, it is important to have a great knowledge about the pi. After the B model, various new models of Raspberry Pi have been launched, each model having its own specifications. Raspberry Pi is a very great field to work upon, especially for those who are more in to robotics and embedded systems. It can be a great learning for them. And innovations can be done using this technology. There are lots of improvements that can be made on the current design and technology and lots of additional feature scan be added. We can use different types of sensor so that we can use robot in different field i.e. Temperature Sensor, Pressure Sensor, Heat Sensor, Position Sensor, Proximity Sensor. A multipurpose robot can be made by wireless network, ranging from surveillance and home security to industrial applications where the user need not be present at the work place in person but can do it from his home itself.

We can use this system for military applications installing suitable sensors. Just by changing the robotic unit design we can use it in hospitals for patient monitoring. Using some chemical sensors we can detect harmful gas leakage in the chamber the time delay which occurs in the execution of commands can be reduced and thus we can have more real time access to the robot. With reduced time delay we can have faster operation and quick response to any illegal activities in the monitored area. Also, it can be used as a spy robot. The robot is very economical. The present model application are Indoor spying of warehouse, campus surveillance to check the improper activities. Tracking locations of terrorist organizations and then plan an attack at a suitable time. Making video surveillance of any disaster affected area where human beings can't go. Field view surveillance of indoor & outdoor commercial complex, factories & government buildings/organization.

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