Pre-monitoring Robot for Military Application

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Abstract In today's world security is a very vital factor. An electro-mechanical machine that is robot can perform tasks automatically. The pre-monitoring system can be used for a security system in hazardous areas. Surveillance is achieved by deploying workforce near sensitive areas in order to continuously examine the changes. The main objective behind this paper is to develop a robot that will perform an act of surveillance in military areas. This robot will spy the areas before the war and give an idea about the environment there. It will capture and archive real-time video and all data from the robot using the inbuilt camera. We can use a robot with manual control or automatically based on the requirements. Wi-Fi module will be provided for premonitoring areas. Additionally, it will have face detection, object detection, obstacle avoidance, and such relative features. The anticipated security solution will be integrated by a camera on raspberry Pi 3 B+. Raspberry Pi 3 B+ will operate and control video along with records for future playbacks.

Keywords —Raspberry Pi 3b+ based camera, Robotic wheel, SD card, Surveillance system, Wi-Fi module.

I. INTRODUCTION

Surveillance is the process of monitoring situation, of area or person. Human surveillance is achieved by deploying sensitive areas in order to constantly monitor the changes. In a advances technology over the years, it is possible to remotely monitor area by using robots replaced by humans. By using them with high-resolution cameras and various sensors, it is possible to obtain information about the specific area remotely. Thus, in recent times, surveillance technology or pre-monitoring the area has become an area of great research interest. It would detect the location of the absolute precise point using GPS. This generally occurs in a military scenario where surveillance of border side and enemy territory is essential to a country's safety. Using high-resolution cameras and different sensors, it is possible to gain information about the particular location remotely.

The main principle of our robot is the principle of Humanity based on basic three laws of the robotic system. it is designed to replace human beings in various hazardous areas. To overcome the complexity of wired communications, we are using advanced wireless RF and Wi-Fi technology. The control signal from the transmitter is sent to the receiver which is connected to a device or vehicle that is to be remotely controlled. Similarly, this project mentions a wirelessly controlled commando robot controlled using radio frequency technology.

This robot will pre-monitor the areas which need to be under surveillance for security purpose. Even additional features of face detection, object detection, video surveillance is done. If a robot is in the Wi-Fi range there is no need of internet.

II. LITERATURE SURVEY

The field of Surveillance organization is completely well admired. The number of researches has been carried out in navigational procedures and circuitry system of wireless surveillance robot. A common motivation is usages of a camera on the robot in order to receive live video stream at receiver. Several research works are done so far surveillance system. Some inventive research works have been successfully approved. Various authors discussed various aspects of different types of observing activities and tracing applications[1].

The wireless robot made using the Arduino microcontroller have been implemented, but wireless communication occurs using the Zigbee protocol, which limits the range of the robot[2].

A robot which performs image processing using the camera on an Android smartphone has also been implemented[3]. In an Adriano based robot is designed which use Bluetooth technology to control robot and Wi-Fi network to transmit the video. In this system, the robot and controller both should control the robot. The range of Bluetooth is very limited when compared to the Wi-Fi network, the controller can't move away from the region[4]. Another one research uses the features of both WSN (Wireless Sensor Network) and CCTV (Closed Circuit Television). When a sensor detects any unusual event, then sends a notification to the central surveillance system, then

the centralized system triggers the identical camera to capture the image evidence. In this method, the network delay between sensor to the main system and main system to the camera will degrade the system performance gradually[5].

System are emerging technology have metamorphosed the environment of surveillance and monitor applications.

Sensors information collected using the gadget still remains undependable and poorly synchronized. Surveillance system covers only a meticulous course. Not probable to turn to a particular direction based on priority. The output is stored in hard disk with help of DVR, which require more disk space. The systems do not have conventional features.

Security to access the robot is lacked so anybody nearby can access the robot.

The field of the surveillance system is exclusively well popular. The number of researches have been carried out in navigational processes and circuitry of wireless surveillance robots. A widespread enthusiasm is a usage of a camera on the robot to organize and receive live video stream at receiver. Few research works are done so far on the surveillance system. Some modern research works have been successfully carried out. Various authors have discussed various aspects of special types of observing activities and tracing the applications. An examination team in DRDO has prepared a shared research work where they have recommended and applied intrusion detection in a huge secure place using ad-hoc wireless sensor network. They placed PIR sensors for human footstep acknowledgment purpose to captured sensory data and establish a training based algorithm that helps in definite intruder recognition in the open environment [6]. The existing system is unique in the sense that, it is a low-cost solution that we can automatically control a robot from any range (by using the internet) and also offers the live video transmission. There is no constraint on any extra processing as everything is done from remote location [7].

III. COMPARATIVE ANALYSIS

The below table represents the comparison between the technologies which is used previous. It gives the perfect comparison considering various parameters such as the operating system, the technology used, advantages,. This comparison can be helpful for analyzing technologies. We can briefly consider this aspect of using them.

TABLE NO. 1 Comparative analysis

Parameter	Android Based System	Raspberry pi Based System
Arduino	Yes	NO
Raspberry pi	No	Yes
Operating System	Android Os	Raspberry pi os
Technology	Application Programming Interface	Graphical User Interface,Capturing images
Advantages	Video Streaming	Video streaming, playback Video

IV. PROPOSED SYSTEM

The objective is to use the robot for a premonitoring system on a Wi-Fi network. The surveillance system grant conference choice and its output are controlled by Android phone throughout internet connection. This model also includes night vision in a monitoring system and to move and turn to a particular direction using mobile application. The data loss occurs by network failure is limited via the memory over the robot itself. This system is helpful for people in dangerous areas, where life threat and the possibility of losing the property is more. Another motivation is to decrease expenses in companies, labs, and factories. People may use easy and inexpensive security system in their homes.

In this development, control of robotic component is from a remote end with the use of internet and we are able to obtain the videos from the robot end for the purpose of surveillance. At the user computer, we will have videos on the web browser and also we can control the robotic movement and also the camera progress in a vertical direction and horizontal direction. DC motors are used for the movement of robotic wheels and used for camera movement i.e. for vertical movement and horizontal movement. The PIR sensor on the robotic section gives us all the data about the Living bodies. Motors and the PIR sensor are being interfaced to the PIC microcontroller. Raspberry Pi 3B+ is used for video processing and sending the processed video to user PC with the help of the Internet or Wi-Fi network. The use of the internet does not have the limitation of range into consideration as we are having the internet access, we can control the robot from anywhere. The images captured by the camera must be processed very fast to provide real-time visualization of location to the user. For this purpose along with low cost, we will be using ARM-based Processors. Few reasons for the proliferation of ARMbased processors include low cost, low power consumption, and decent processing power, and an open development environment. The Raspberry Pi 3B+ is a credit-card sized computer which has the plugs into our TV and a keyboard. It is a capacity for a little computer, which

can be used for projects, and for many of the things that our desktop PC does, like spreadsheets, word processing and games. It also plays the high-definition video.

The Raspberry Pi 3 Model B+ is the latest product in the Raspberry Pi 3 range, boasting a 64-bit quad core processor running at 1.4GHz, dual-band 2.4GHz and 5GHz wireless LAN, faster Ethernet, 4.2/BLE Bluetooth.

The dual-band wireless LAN allowing the board to be designed into end products with significantly reduced wireless LAN compliance testing, improving both cost and time to market.

The wheels of a robot are being controlled by DC motors and stepper motors are used for moving the camera. The user controls it and assists web browser, where it also shows the video streaming of the environment. At the robotic unit, the PIC microcontroller is used for the control of DC motors and the stepper motors.

PIR (Pyroelectric Passive Infrared) sensor here is used for living body detection. A passive infrared sensor is designed to pick up heat radiation of wavelengths in a band nearby 10 microns. It contains the two active elements configured as balanced differential series in opposed type. This consequences in good compensation of environmental temperature and brilliant sensitivity for minute changes of a spatial temperature pattern. Thermal signals below one microwatt are enough to trigger a sufficient output voltage change. PIR sensor stands for the Passive Infrared sensor. It is a low price sensor which can detect the presence of human beings or animals. This sensor has mainly three output pins Vcc, Output, and Ground. Ever since the output pin is 3.3V TTL logic it can use with any platforms like Arduino, Raspberry Pi.

 IR obstacle sensor is simple to build, easy to adjust and still. It provides a range of 10- 30 cm for detection. This sensor can be used for most inside applications where no important ambient light is present. It is the similar principle in all Infra-Red proximity sensors. The idea is to send infrared light through IR-LEDs, then reflected by any other object in front of the sensor. IR is an obstacle based detector. The Logic output of the IR sensor is 1 or 0.The Sensitivity up to 30cm adjustable.

An ultrasonic sensor is a 4 pin module, whose pin are Vcc, Trigger, Echo, and Ground respectively. The sensor is a very popular sensor used in many applications where the measuring distance or sensing objects are essential. The sensor works with the straightforward high school formula that is

$$Distance = Speed \times Time.$$

The Ultrasonic transmitter transmits an ultrasonic wave, then this wave travels in the air and when it gets objected by any substance that time it gets reflected back toward the sensor. It is used to measure the distance within a broad range of 2cm to 400cm.

A photoresistor is prepared of a high resistance semiconductor. In the darkness, a photoresistor can have a resistance as high as several megohms, while in the bright light, a photoresistor can have a resistance as low as a few hundred ohms only. If incident light on a photoresistor exceeds a certain frequency, then the photons are absorbed by the semiconductor given bound electrons, where enough energy needed to jump into the conduction band. The consequential free electrons conduct electricity, thereby lowering the resistance. The resistance range and sensitivity of a photoresistor can considerably differ among disparate devices.
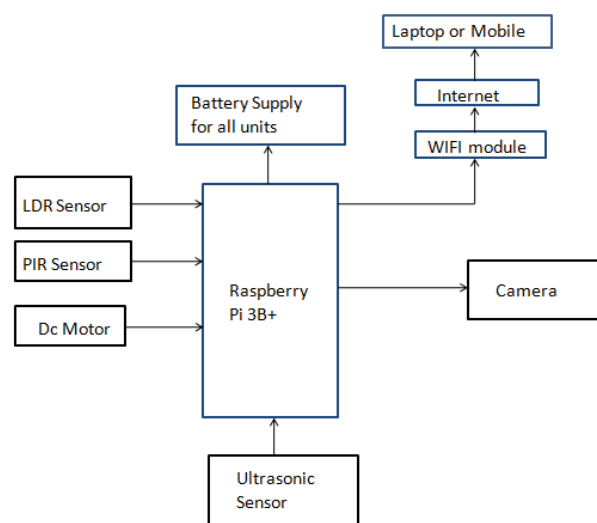

Fig 1: Block Diagram

Above figure represents the layout of the premonitoring system. Here Raspberry pi3B+ is the main component. We attach sensors, camera and wi-fi module to Raspberry pi3B+.

V. CONCLUSION

The proposed technology is giving a helping hand to our security forces in detection, monitoring, and intruders. This robot can be used in areas where it is difficult for humans to survive and it can be used as a spy robot. If a robot is within the Wi-Fi range then there is no need of internet also we can control a robot using Wi-Fi as a medium. A system can be used for military application with suitable sensors. This robot is very economical and its possibilities are endless. In the current state the robot provides a platform for further research into the improving capabilities.

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