Military Based Security System Using Raspberry Pi

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Abstract

In today's world Indian border military force is facing a huge destruction. Hence, most of the military organizations take the help of military robots to carry out risky jobs which cannot be handled by humans. In this proposal, we design and implement in such a way that the robotic vehicle can enter into an area of higher risks, move and place wherever the object wants to go and captures intruder's image. It has human detection Pi camera and temperature and gas detecting sensor that can provide precaution to potential crimes, fire and leakage of any gases. The credit card sized Raspberry Pi with Open Source Computer Vision (OpenCV) software controls the face detection algorithm and sends captured pictures to the user's email via WI-FI. The pi-camera serves as the eye of the robot and provides us live video streaming. The biggest advantage of the system is that the user can get the picture of the intruder from anywhere in the world and can respond according to the risks in the situations.

The prime objectives of this paper are:
- ✓ To find the presence of an intruder - if detects, captures images and sends it to the given email address.
- ✓ Enables control of the robotic vehicle –i.e. The robot can be moved in any directions from the user present in any location.
- ✓ To find the presence of any gases present in the surrounding other than the normal air and warns the nearby person with its buzzing.
- ✓ Can monitor the location at any remote distance via live surveillance.
- ✓ To find the temperature of the environment

Keywords— Robot, Raspberry pi, surveillance, defense, human detection.

Introduction

At present, human work is greatly reduced by machines in every possible way. Mostly, computers and robots play a major role in our day to day life. In recent times, almost all the military organizations take the help of military robots to carry many risky jobs. In general, a robot is a combination of mechanical and electronics prototype designed by humans to perform a specific task. Robots have huge applications in military and industrial area, such as, for lifting heavy weights and performing same task several times efficiently without any committing any errors unlike humans. In recent years, the Indian border military forces are facing a huge destruction due to the attacks of neighboring countries. In many situations, our soldiers need to venture into enemy's base which is a risky job. Such dangerous jobs could be avoided by using robots.

Robots with high resolution cameras can monitor over long distances. Robot loaded with different sensors performs various tasks. They can even detect hidden chemical objects with the help of gas sensor which cannot be done by humans. Generally, air is an odourless one which consists of compounds made of two main elements - carbon and hydrogen called hydrocarbons. If the toxic level exceeds the normal level, the sensor detects it. The main component used is Raspberry pi and like any other computer, it can also accept many programming languages including Python. It supports many operating systems like Raspbian, Fedora, Debian, Windows IOT Core, Kali Linux and Arch Linux ARM and we use Raspbian OS.

We have created a borderline military robot that prevents the massive destruction of human lives. This robot can also be used for spying enemy territories during critical situations in the border and it can also monitor the movements of enemies entering our country. Since the robot is very small in size it can send to the enemy's camp to monitor their movements.

Related Works

[1] In 2014, Widodo Budiharto developed a tracked robot with Obstacle Avoidance capability. It can be controlled by low cost remote controller Integrated Circuits(IC) and able to avoid obstacles using ultrasonic distance sensor named PING up to 20 meters.

[2] In 2015, Sushma.N.Nichal and Prof.J.K.Singh proposed a paper which deals with the design and implementation of a Smart surveillance monitoring system using Raspberry pi and PIR sensor. The proposed home security system captures information and transmits it via a 3G Dongle to a Smart phone using a web application. Raspberry pi operates and controls motion detectors and video cameras for remote sensing and surveillance, streams live video and records it for future playback. It can also find the number of persons located with the help of the Infrared sensor.

[3] In 2016, Ms. Renuka Chuimurkar and Vijay Bagdi proposed a mobile video surveillance system which is envisioned as either classical video streaming from a USB camera with an extension over the wire and wireless network to control the human operator. Remote monitor has become an important maintenance method that is based on the network. There are two units Raspberry Pi and Process unit with a wireless link between them. Process unit will send the sensor readings to the Raspberry Pi Unit, which will be uploaded in the server.

[4] In 2017, M Lokanath and Guruju Akhil Sai proposed a robotic system for live video monitoring using Raspberry Pi installed with WiFi connection. The computer or smart phone can be used to give commands to Raspberry pi for monitoring the real time video streaming recorded by Pi camera. The sequence of image frames or video gets recorded by Pi Camera with good quality. The input, output pin of Raspberry Pi named as GPIO (General Purpose Input Output). The GPIO connects between the Arduino and Raspberry Pi. The Arduino output pins are connected to the input motor shield. Raspberry pi operates and Arduino controls motion detectors and video cameras for remote sensing and

surveillance, streams live video and records it for future playback.

[5] In 2017, N. Sugumaran, G. V. Vijay and E. Annadevi proposed a paper which deals with the monitoring using Raspberry pi and PIR sensor from mobile devices. The home security system captures information and transmits it to the respective mail using the internet. Raspberry pi operates and controls motion detectors and video cameras for remote sensing and surveillance. It can also find the number of persons located with the help of the Infrared sensor.

[6] Chinmaya Kaundanya, Omkar Pathak, Akash Nalawade and Sanket Parode proposed a surveillance system using Raspberry Pi along with PIR sensor. PIR sensor is used to detect the motion whenever someone comes within its range. This image is then stored in the system and finds for a human face in the captured image using Open CV and Python. The detected human face is then compared with the faces stored in the database using Local Binary Pattern algorithm. An alert is generated else host gets a text message on his android mobile phone via Pushetta application using a WiFi adapter, this help system to identify only unauthorized persons..

Existing System

A smart surveillance system capable of capturing images and monitor video has been designed. The existing system is raspberry pi based controller system with PIR sensor .It can't monitor exact motion without the help of the PIR sensor. PIR sensor is used to detect the motion whenever someone comes within its range. As soon as PIR sensor detects the motion, Pi-camera activates and captures the images and stores it. It is advantageous as it offers reliability and privacy on both sides. Necessary action can be taken in a short span of time in case of emergency situations such as military areas, smart homes, offices and industrial areas.

Proposed System

The new age of technology like android has been used. Most people nowadays have access to mobile phones and thus the world has become a global village. At any given moment, any particular individual can be contacted through his mobile phone. Technologies such as Infra-red, Bluetooth, Wi-Fi which has developed in recent years goes to show the very fact that improvements are in fact possible and these improvements have eased our life and the way we live. Remote management of several home and office appliances is a subject of

growing interest and, in recent years we have seen many systems providing such controls.

Mobile robots are robots which have the ability to move around and interact with their environment and not just hinged to a particular place. There are many labs and research groups from various universities and industries which are completely dedicated on researching mobile robots, because of their immense potential and varied application in industry, military, security, and entertainment.

This paper deals with the design and implementation of Smart surveillance system using Raspberry pi and Pi camera which supports mobile devices. We use pi camera instead of the PIR sensor in order to improve the fps rate i.e. frames per second. This system also enables the use of mobile technology to provide security. In our proposed system the computer or smart phone can be used to give commands to raspberry pi. The communication between the raspberry pie and the web page can be done by WiFi or wired LAN. The pi camera captures images and sends it to the respective email address using the internet. Once the setup is ready the communication between the raspberry pi 3 and the web page happens through WiFi. The pi camera installed on the robot connected to the raspberry pi enables its settings to start the live video streaming.
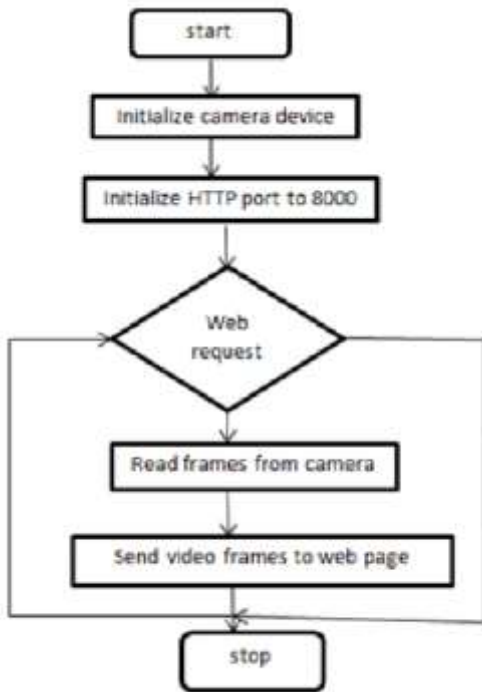

Fig 4.2 Flowchart For Device Operation
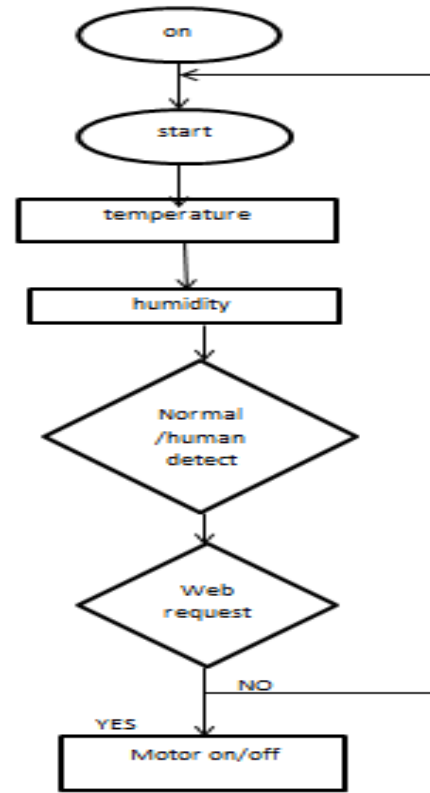

Fig. 4.1 Flowchart for Video Surveillance

Hardwarwe Implementation

The block diagram of the proposed system which includes raspberry pi and the other components is given below

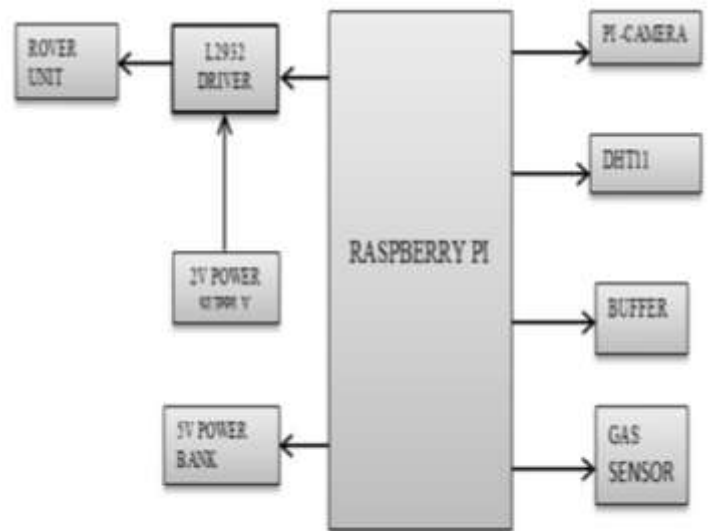
Fig.5.1 Block diagram

1. **Raspberry Pi**: Raspberry pi is a small credit-card sized computer capable of performing various functionalities such as in surveillance systems, military application, industrial application, Home application, etc.

The specification of the Raspberry Pi 3 model is, ARM8-quad core processor,1200 MHz Broadcom BCM2837, HDMI support, 1GB Ram with the support of 4 USB devices, and also micro SD card slot. The memory can be further increased to a capacity of about 1 GB. The 40 General Input output pins can be used to connect different types of sensors, multiple connector with expansion boards also can be added. The fully backward compatibility is given to the first 26 identical pins on Model B board.

Fig. 5. 2 Raspberry pi

✓ SD Card Slot is used to install OS/booting/long term storage. The total memory of the SD card is about 8GB.
✓ Micro USB Power Port provides 700mA at 5A.RCA.Video out is connected to display if HDMI output is not used. It is mainly used to carry audio and video signals. They are otherwise called as A/V jacks.
✓ Audio out Digital audio is obtained if HDMI is used to obtain stereo audio. Here analogue RCA connection is used.
✓ Ethernet Port is used to connect to the Internet. It also plays important role in updating, and getting new software easier.
✓ HDMI OUT (High Definition Multimedia Interface) is used with HDTVs and monitors with HDMI input. Also, HDMI-HDMI is used here.
✓ BROADCOM BCM 2835: It is otherwise defined as System on chip

.It is a 700 MHz Processor. It has a Video core IV.
✓ GPU GPIO, 40 pin interface allows us to control and interact with the real world.

2. **L293D:** A motor driver is a little current amplifier; the function of motor drivers is to take a low-current control signal and then turn it into a higher-current signal that can drive a motor. A H bridge is an electronic circuit that enables a voltage to be applied across a load in the opposite direction. These circuits are often used in robotics and other applications to allow DC motors to run forwards or backward.
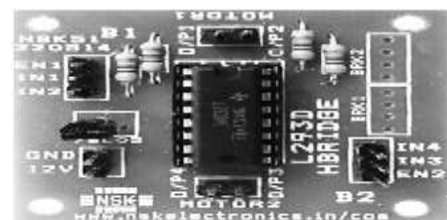

Fig. 5.3 Driver motor

3. **DHT 11:** Gas Sensor (MQ2) module is useful for gas leakage detecting (in home and industry). It can detect H2, LPG, CH4, CO, Alcohol, Smoke, and Propane Based on its fast response time. Measurements can be taken as soon as possible. Also the sensitivity can be adjusted by the potentiometer.
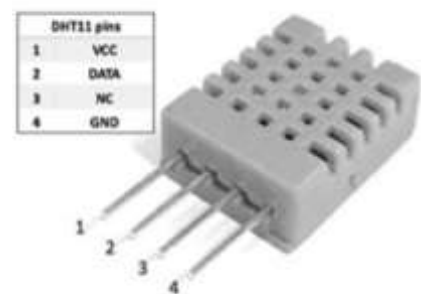

Fig.5.4 DHT11

4. **Pi-Camera:** This This 8mp camera module is capable of 1080p video and still images that connect directly to your Raspberry Pi. This is the plug-and-play-compatible latest version of the Raspbian operating system,

making it perfect for time-lapse photography, recording video, motion detection and security applications. Connect the included ribbon cable to the CSI (Camera Serial Interface) port on your Raspberry Pi board. The sensor has a native resolution of 8 megapixel, and has a fixed focus lens on board. In terms of still images, the camera is capable of 3280 x 2464 pixels static images, and also supports 1080p30, 720p60 and 640x480p90 video.

Fig.5.4 Pi camera

Result And Discussion

Our proposed method for remote controlled mobile robot

has been successfully implemented and it has shown a good

performance. The average speed raspberry pi to display a video streaming is 33fps that sufficient for surveillance.

Conclusion

Henceforth, by enhancing the capabilities of these technologies and integrating them, we hope to introduce the 'Motion system which can be controlled by android device', and contribute it to the military system. This system would be an alternative for expensive security systems being used in these days. This does not require any special modification in the infrastructure whereas installation is required. I have tested the system for 20 days and found 99% accurate notifications and result.

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