

Multi-Functional Surveillance System

¹Ms. Shanthalakshmi,²K.Lakshmi Priya,³A.Raveena,⁴V.Varshini, ⁵Sowmya Loganathan

¹Assistant Professor, ^{2,3,4,5} UG Scholars

Department of Computer Science

SRM Institute of Science and Technology, Chennai, India

Abstract : Intruders and thieves are perpetual threats to most organizations, so maintaining security is more important. Apart from security, monitoring is also necessary because, at large institutions it becomes a challenge. Internet technology provides us several platforms to develop such systems. The proposed system uses IoT(Internet of Things) from which a multipurpose surveillance and monitoring system can be developed. The system is very simple to handle as it uses Raspberry pi and a pi-camera. This system can be adapted in anywhere even at homes as a security camera. With small changes in the system it can be used for maintaining patient details at hospitals. It can be used for monitoring traffic. The system can gather information about live traffic, which will be useful at emergency accident situations. The biggest advantage of the system is that the user can seek surveillance from anywhere in the world and can respond according to the situations.

IndexTerms – Raspberry Pi, Internet of Things, Surveillance, Security.

INTRODUCTION

Security nowadays has reached its peak playing a vital role in securing day to day objects, valuables and belongings in a technologically challenging environment. There are various modes to ensure security, yet surveillance is highly advantageous than others. Surveillance camera ensures both security and threats priority. The security system using surveillance can be enhanced by embedding necessary sensors to it. They include raspberry pi, PIR sensor board, night vision camera module and SD card. Here we construct security surveillance system under the IoT domain which is implemented through raspberry pi.

Internet of Things is a network of physical devices, home appliances and other embedded with electronics, software, sensors, actuators and connectivity which enables these objects to connect and exchange data. Internet of Things is very useful for developing such a smart system. A security camera is possible to monitor the people, find the intruders, controlling the denial and acceptance of

access. This monitoring can also be done during the night with the usage of night vision camera.

Raspberry pi is considered as the most advanced system which can withstand any type of coding. It is a low cost device which can perform multiple functions like an ordinary computer. Raspberry pi is a single board computer which provides portability, compatibility, flexibility, clarity to the camera with extra vision.

1. EXISTING SYSTEM

In today's world security and safety are highly mattering much in all types of organizations and institutions. A system is necessary to manage and sort all these kinds of security issues of the organizations. The proposed system uses Internet of Things(IoT) to develop a surveillance system that is easy to install and handle. Before going to the proposed system, let us look into the survey on the existing systems.

CCTV is one among the most commonly used surveillance techniques. It is widely used in day to day life. However, it has its own disadvantages. It is costlier to install as the system may require many recording devices, cameras and monitors. The major limitation of CCTV cameras is that they can only monitor a limited area. The cameras can be vandalized in various ways, such as spraying something on the lens or sticking gums . Even the angle of the camera can be altered. CCTV information is very much important now a days,so they can be hacked by hackers too.

Robots controlled by WiFi is another existing system that is used for video surveillance. This uses GPS tracking system. The system also had few disadvantages like the size and weight of the robot was high. The architecture of the Robot is complex and also more components are required. GPS tracking system does not give 100% success rates at all times.

Zigbee communication is most prominently used for controlling sensor networks. It is a low-cost and low-powered network. Zigbee controlled video surveillance system also is being used. The main

disadvantage of Zigbee is that the access range is very small, ranging from 10-100 meters.

Raspberry Pi, the most advanced and latest innovation in internet technology, has several uses in the field of automation, IoT(Internet of Things) and so on. It is a credit card sized computer which can be connected to peripherals like USB keyboard, mouse, cameras and so on. In the papers referred, a Robot controlled by Raspberry Pi is developed for monitoring and surveillance. Being a robot again the same disadvantages like cost, components and complexity are common.

2. PROPOSED SYSTEM

In this paper a newly revised video surveillance system is introduced. This system uses Raspberry Pi , a Pi camera and a PIR sensor for recording the video. As the existing systems used Robots to build the system, they had many complications. The proposed system can be connected to a DC motor on which the Pi camera can be embedded. This makes the camera to rotate in all the directions. A Wi-Fi Module is used in the system, which is highly useful to access the device from anywhere. Using Wi-Fi is the best method because, data can be fetched from the device anytime and also it has a longer range of connectivity.

The objective of our project is to design a simple, cost efficient and a reliable video surveillance system that can be adapted at all places like hospitals, buildings, industries, schools, households and also for traffic surveillance, military and defence requirements etc., .

3. SYSTEM ARCHITECTURE

3.1 HARDWARE SPECIFICATIONS

3.1.1 Raspberry Pi 3, model B, 1GB RAM:

Raspberry Pi is a credit card sized computer, that is capable of doing everything a normal computer can do. It can be connected to the monitor or even TV for getting high quality video and images. Peripheral devices like keyboard, mouse can be connected via the USB ports.

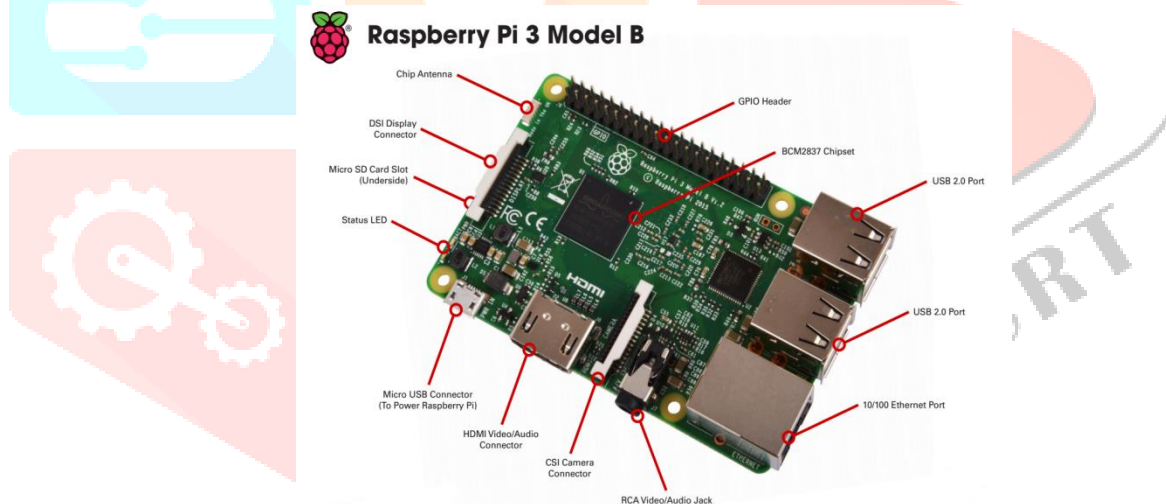


Fig 1: Raspberry Pi

The Raspbian OS is a Debian Linux based OS, that is suitable for the proper functioning of the Raspberry Pi. The OS is installed in a SD card and inserted in the slot. The figure(Fig 1) shows the parts of the Raspberry Pi. Therefore Raspberry Pi is the most important component in building up the system.

3.1.2 Camera Module (Pi Camera):

The Raspberry Pi Camera Module is an official product from the Raspberry Pi Foundation. The Pi Camera has a high resolution and high definition picture quality. It is incorporated with the Pi to run the system and capture video. The Raspbian OS has a set of applications built in for the camera module. Figure (Fig 2) shows the Raspberry pi camera module.

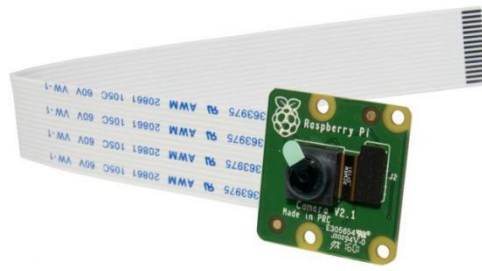


Fig 2 : Camera Module.

3.1.3 PIR Sensor

The Passive Infrared sensor(PIR) is a pyro-electric sensor, which is mainly used for motion detection. The PIR sensor measures the infrared rays emitted by the objects and detects the motion. One powerful feature of Pi is the row of GPIO pins. They are aligned along the top edge of the board.



Fig 3: Passive Infrared Sensor

The PIR sensor is connected to the GPIO pins of the Pi according to the arrangement, then it sends the positive signal to the Pi when it detects any changes in the motion(intrusion). The GPIO acts as the interface between the device and the external world. The given figures(Fig 3 and Fig 4) shows the PIR sensor and the GPIO pin arrangement of the Raspberry Pi 3, Model B.

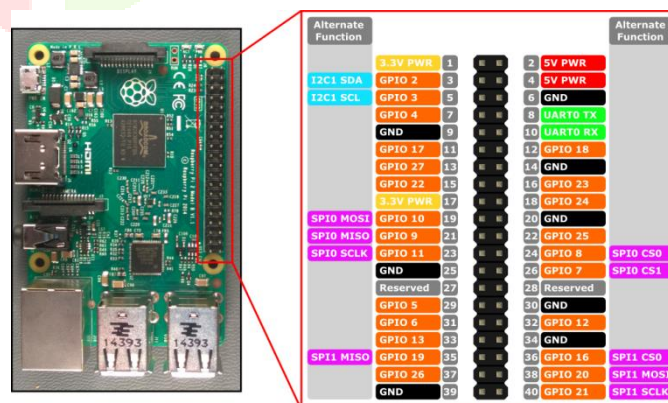


Fig 4: GPIO pin arrangement of Raspberry Pi 3, Model B

3.3 ARCHITECTURE DIAGRAM

In this paper, a revised video surveillance system is developed. The system includes a raspberry pi, camera module, wifi module , PIR sensor and other peripherals. The architecture of the system developed is given in the figure(Fig 5). The Raspberry Pi model 3 needs a power supply of 5 Volts, it is provided using a 2 way USB port from a 13000mAh battery. Then the Raspbian OS is installed in the SD card and it is mounted on the PI.

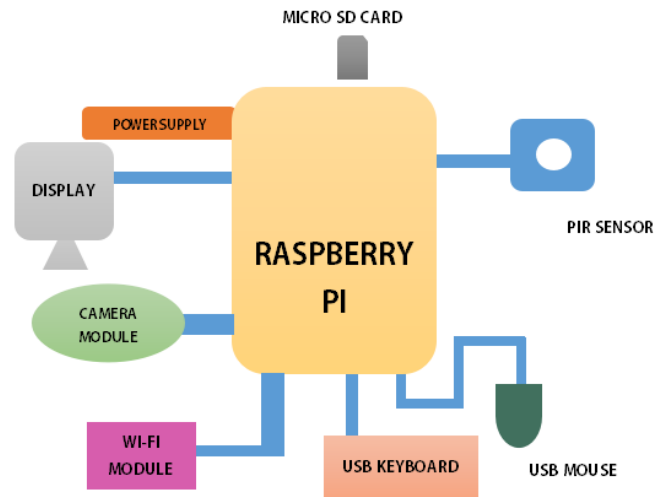


Fig 5: System Architecture

The board is then enabled, the peripherals are connected to the board. It is connected to internet by using the Wi-Fi module. After, that the camera is attached to the Pi and the code is given and then it is enabled. PIR sensor is connected to the GPIO pins. So, the entire architecture is thus setup.

4. IMPLEMENTATION

The project model consists of a raspberry pi, night vision camera, a PIR sensor board, wifi module, sd card. The surveillance camera is controlled and coordinated by utilizing the wifi module.

Step 1: Attach the PIR sensor to the raspberry pi exactly at the rightful pins utilizing three jumper cables.

Step 2: To transfer power to the PIR sensor. This can be achieved by connecting the one specifying VCC on the PIR sensor to the 5v pin on the raspberry pi.

Step 3: Join the one labelled GND on the PIR sensor to a Ground pin on the Raspberry Pi. This completes the circuit.

Step 4: Connect the one labelled OUT to GPIO pin 4. This pin will produce an output in voltage when motion is detected, which can then be acquired by the Raspberry Pi.

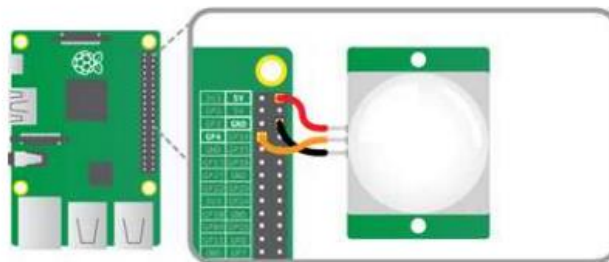


Fig 6: PIR and GPIO connection.

Step 5: The setting up of raspberry pi. The os is called the Raspbian OS, which is installed using NOOBs installer, which is an installation platform designed for Raspberry Pi. The raspberry pi is connected to all the components.

Step 6: Connecting the wifi to the raspberry pi using the wifi module. IP address can be found using the ifconfig command.

Step 7: Inserting the sd card onto the raspberry pi.

Step 8: Power supply to the pi. The pi is turned ON when there is a Green led light blinking. Succeedingly, opening the browser and writing down the link:IP address/filename.

Step 9: Enabling the camera access using the open-source motion detection software. Here the camera is a night vision camera where the video is monitored even in the dark.

Step 10: The streamed video is displayed in the mobile device or the computer screen.

Now, being present in our rooms we can keep track of the video continuously which is streamed even during the night and monitor the camera.

SOFTWARE SETUP

Initial step in making the Raspberry PI is to install and configure the Raspbian os software.

1. The raspberry pi and the camera are joined together and the software is uploaded inside the sd card.
2. This sd card is then put into the raspberry pi for further use according to the instructions.
3. The raspberry pi is connected to the display, usb mouse and keyboard, power supply and the LAN with internet connection.
4. Before configuring anything, boot the raspberry pi.
5. Configuring raspberry pi will start automatically.
6. Enabling the camera and the update is done in the command line by typing
 - \$ sudo apt-get install rpi-update
 - \$ sudo rpi-update
7. And for updation:-
 - \$ sudo apt-get update
 - \$ sudo apt-get upgrade
8. Enabling camera access by going to Pi Software Config Tool menu from a terminal-
 - \$ sudo raspi-config
9. Installing the motion detection algorithm by the free open source software and typing in command line:-
 - \$ sudo apt-get install motion

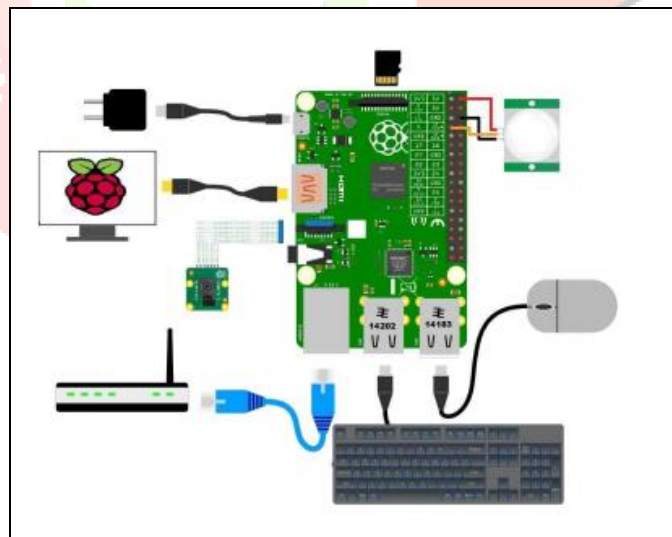


Fig 7 : Simulation of Experimental setup of the proposed system.

6. CONCLUSION

The main purpose of our multi-functional surveillance system is to serve as a tool to be applied in various places for maximised monitoring. Not only does it monitor but it also administers to other capabilities such as taking videos and pictures at the right moments which it has been programmed to pick up. These moments refer to instances such as intruder detection, theft occurrences and dangerous exposures. The footage which is saved also prompts the sending of some appropriate details in the form of a notification to the user's mobile device. In addition, the night vision facility ensures extra protection and safety for activities such as burglary and break-ins tend to happen after hours

more often. Moreover, this system is suited for overseeing in different venues such as hospitals, houses, industries, banks, army vicinity, etc.

7. FUTURE ENHANCEMENTS

The applications of this system in the military field can be expanded upon by incorporating more suitable sensors. With respect to various other areas, the system can become more specific and less generalised with the improvement of algorithms and upgraded sensors. Along with this, the practicality of the system can be boosted by enforcing more cost-effective measures without setting back the efficiency of the system. Certain discrepancies in the functioning of the system can be bettered by addressing technical challenges such as minimising the time delay which occurs between the detecting and informing phases. Furthermore, the system can be worked upon to enable more functions such as enabling the detection of objects and pets and accommodating the algorithms pertaining to facial recognition for increased productivity.

REFERENCES

- [1] *International Conference on Signal Processing, Informatics, Communication and Energy Systems (SPICES)*, Sruthy S, Sudhish N George, *IEEE 2017*, "WiFi Enabled Home Security Surveillance System using Raspberry Pi and IoT Module".
- [2] *International Conference on Innovations in Power and Advanced Computing Technologies (i-PACT)*, Rickin Patel, Vipul K. Dabhi, Harshadkumar B. Prajapati, *IEEE 2017*, "A Survey on IoT based Road Traffic Surveillance and Accident Detection System".
- [3] *International Conference on Intelligent Computing and Control Systems (ICICCS)*, Syed Ali Imran Quadri, P.Sathish, *IEEE 2017*, "IoT based Home Automation and Surveillance System".
- [4] *International Journal of Research in Advent Technology (IJRAT)*, I.Y. Sheikh, Harshal C. Chavan, Jaya S. Vyawahare, Sampada B. Mahajan, Rahul S. Raut, "CONVERGENCE 2016", 06th-07th April 2016, "Wi-Fi Surveillance Robot Using Raspberry Pi".
- [5] *International Conference on Communication and Signal Processing*, Ashish U. Bokade and V. R. Ratnaparkhe, *IEEE 2016*, "Video Surveillance Robot Control using Smartphone and Raspberry Pi".
- [6] *International Smart Cities Conference*, Mohammed A. AlGhamdi, Murtaza A. Khan, Sultan H. AlMotiri, *IEEE 2015*, "Automatic Motion Tracking of a Human in a Surveillance Video".
- [7] *International Journal of Emerging Technology and Advanced Engineering*, Volume 5, Issue 2, V. Meenakshi, Ch. Lakshmi Saketh, K. KalyanKumar, *IJETA 2015*, "Secured Spy IP Control Robot Using Raspberry Pi".
- [8] *International Journal of Scientific Engineering and Technology*, Volume 2, Issue 5, Md Athiq UR Raza Ahamed M., Wajid Ahamed, *IJSET 2013*, "A Domestic Robot for Security Systems by Video Surveillance Using Zigbee Technology".
- [9] *International Journal of Scientific & Engineering Research* Volume 3, Issue 8, Pavan.C, Dr. B. Sivakumar, *IJSET August-2012*, "Wi-Fi Robot For Video Monitoring & Surveillance System".