IOT Based Smart Security System

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***Abstract:* - The aim of this paper is to design and implement affordable, flexible and fast monitoring system using Raspberry pi. In recent years, there has been an increase in video surveillance systems in public and private environments due to a heightened sense of security like CCTV and RFID. There are several defects in the video surveillance systems such as picture is indistinct, complex structure, poor stability and lot of storage is needed to save information and surveillance and prices remain relatively high. The system design has motion and camera control. Due to live streaming there is a decrease in data storage and save investment cost.**

***Keywords*:- Internet of things, Raspberry pi, pi camera**

I. INTRODUCTION

The concept of Internet of Things (IOT) started with things which identify communication devices. The devices could be tracked, controlled or monitored using remote computersconnected through Internet. IOT extends the use of Internet providing the communication, and thus inter-network of the devices and physical objects, or „Things‟. The two prominent words in IOT are “internet” and “things”. Internet means a vast global network of connected servers, computers, tablets and mobiles using the internationally used protocols and connecting systems. Internet enables sending, receiving, or communicating of information. Thing in English has number of uses and meanings. Dictionary meaning of “Thing” is a term used to reference to a physical object, an action or idea, situation or activity, in case when we do not wish to be precise IOT.

The demand on video surveillance systems are rapidly increasing in the present day. One of the first things people will want to know about their surveillance system is whether or not they have the ability to connect to it over the internet for remote viewing. In the past, security systems had to be monitored by a guard who was locked away in a room all day watching the monitors to make sure that nothing would happen. The other option was to come back and review the footage but damage could have happened. Therefore, researchers and scientists had to come up with ways of overcoming that and thus improving security at large. Commercial spaces, universities, hospitals, casinos and ware houses require video capturing systems that have the ability to alert and record desired live video streaming of the intruder. The advancements in video surveillance technology have made it possible to view your remote security camera from any internet-enabled PC or smart phone from anywhere in the world. This encompasses the use of CCTV systems and IP cameras. This technology is awesome but its cost of implementation has proven to be an impediment especially for a small home application. Therefore, new innovative technology revolves around affordability of a product in terms of its cost and ease of implementation. The Raspberry Pi crosses both criteria in that it is a cheap, effective computer which can be interfaced with other modules to realize systems with immense functionality.

The Raspberry Pi microcomputer is capable of implementing a cost effective security system for various applications. This new arising technology related to security provides a comfortable and safe environment for small homes. The system to be designed cannot wholly replace the role of CCTV and IP surveillance cameras especially in large commercial set ups but will make it easy for low income home owners to monitor their homes at a very affordable price. In addition to the fact that the Raspberry Pi board is cheap, the camera to be used in this case is relatively cheap compared to the others. The whole security system circuitry is simple and easy to implement.

The need to develop a cost effective surveillance system through innovative technology immensely influenced the development of this project. This project will design and implement the security system based on Raspberry Pi microcomputer. The system should be able to detect motion (intruder), activate a camera to take frames of video after motion is sensed. The cost of installation of any security system depends on several factors. First, the type of camera being used is of great consideration.

This project is focussed on developing a surveillance system that detects motion and to respond speedily by capturing an image and relaying it to an administrator device through the internet platform. The system will require Raspberry Pi module, camera and internet connection. It will come up with an implementation of a surveillance system which presents the idea of monitoring to particular place in remote areas. The system can be monitored by the user from anywhere in the world.

II. EXISTING SYSTEMS

In existing systems, closed circuit television (CCTV) system is the use of video Cameras to transmit a signal to a specific space, on a set of monitors. It needs a command and control centre to monitor all the activities using cameras. In these types of surveillance systems, the person who is stationary and is located in that particular area can only view what is

happening in that place. But it is costly for normal residents to set up such kinds of system and it does not inform the user immediately when the burglary happens. Radio frequency identification (RFID) use radio waves to automatically identify person or objects. An RFID system consists of a reader and one or more tags to transmit radio frequency energy. These systems are not covering more surveillance area. And also which are very expensive.

PIR sensor based systems is designed to identify the slowly changing conditions that would happen normally as the daily progresses and the environmental condition changes, but it responds by making its output when sudden changes occur, such as when there is a motion. This device is designed mainly for indoor use. Which are not used for some condition like rapid environmental changes and strong shock or vibration and also not working in direct sun light or direct wind from a heater or in air condition.

PIR sensor detects a human being moving around within approximately 10m from the sensor. This is an average value, as the actual detection range is between 5m and 12m. PIR are fundamentally made of pyro electric sensor, which can detect levels of infrared radiation. Most PIR sensors have a 3-pin connection at the side or bottom. One pin will be ground, another will be signal and the last pin will be power. Power is usually up to 5V. Sometimes bigger modules do not have direct output and instead just operate a relay which case there is ground, power and the two switch associations. Interfacing PIR with microcontroller is very easy and simple. The PIR acts as a digital outputs so all you need to do is listening for the pin to flip high or low. The motion can be detected by checking for a high signal on a single I/O pin. Once the sensor warms up the output will remain low until there is motion, at which time the output will swing high for a couple of seconds, then return low. If motion continues the output will cycle in this manner until the sensors line of sight of still again.

Somewhat ironically, one of the strengths of infrared scanning technology also causes a weakness. Because they do not use visible light, infrared scanners cannot produce an image that shows colour (other than the colours chosen to represent different heats). Similarly, this technology cannot distinguish between objects that are near to or obscuring each other when they are of similar heats.

Radio-frequency identification (RFID) based access-control system allows only authorised people to enter a particular area of an establishment. Authorised people are provided with unique tags, using which they can access that area. This RFID based security system is based on micro controller AT89C52 and comprises a RFID module, a LCD module for displaying the status and a relay for opening the door. When a person put his RFID tag to RFID reader then RFID reads tags data and send it to 8051 microcontroller and then microcontroller compares this data with pre-defined data and then microcontroller ask for password and after entering password, microcontroller compares password with predefined password. If password matches gate will open otherwise LCD show access denied and buzzer start beeping for some time.

Closed Circuit Television (CCTV) is a system where the circuit in which the video is transmitted is closed and all the elements (camera, display monitors, recording devices) are directly connected. This is unlike broadcast television where any receiver that is correctly tuned can pick up and display or store the signal. Such specialized systems are not subjected to regulation by the Federal Communication Commission (FCC); however, security cameras using scrambled radio waver are in fact subject to common carrier tariffs and FCC conditions of service. In the past, there signals would be transmitted to a monitor equipped with a video cassette recorder, but these have been all but totally replaced by digital video recorder(DVR) systems that can store far more video and backup data automatically.

The most common use of CCTV is in security camera systems. They have been found for years in areas like large retail shops, banks and government institutions.

A CCTV system has four major components namely: the camera, lens, monitor, and video tape/recorder.Among these components, the camera is the most important because it is the one that collects the images. The camera works the same way that an ordinary cameras does only that it can be left to operate on it on own. The camera comes with a motor that helps it to move the zoom parts. Once an image has been picked by the camera, it is taken to the monitor and then recorded on video tape or DVR. The ability of the camera to zoom in and out is determined by the type of lens it has.

A major disadvantage for CCTV cameras is that they can only monitor a limited area. Criminals can vandalize the cameras in various ways, such as sticking gum or spraying something on lens. They may even be able to change the angle of the camera. Criticism from the general public is usually about the lack of privacy and high cost to install for personal use.Wireless systems need a specialized frequency for the camera to send signals to the receiving and recording station. Other electric motored products, such as air conditioning, fluorescent lighting and cordless telephones can cause interruptions in the frequencies, affecting the picture quality. Wireless systems are subject to distortion in image quality, and need experts in wireless technology to identify and repair system breakdowns. Some systems may not be completely wireless, as they require an electric power cable.

Wired CCTV systems have the disadvantage of being fixed to a particular area, meaning the camera cannot simply change location. The installation and cabling of these cameras is a difficult task that demands the assistance of professionals.

The value of CCTV information has increased, resulting in a higher risk from hackers. Hacking CCTV footage has led to privacy issues. It is not possible to

completely protect public security system from hackers. As the system connects to a network, hackers can hack into the system virtually from outside locations.

III. PROPOSED MODEL

In this system, we use the Raspberry Pi chip as the microprocessor and Pi camera used for captures the image of an object in the surveillance area. it records video that is happening in the surveillance area which is directly uploaded to the cloud server (you tube). When cloud is not available then the data stored locally on the raspberry pi and sent when the connection restarts. We can access the live streaming video from camera on any web browser with the internet enabled device. The movement of the camera at the surveillance area is controlled trough IoT platform to increase coverage area.

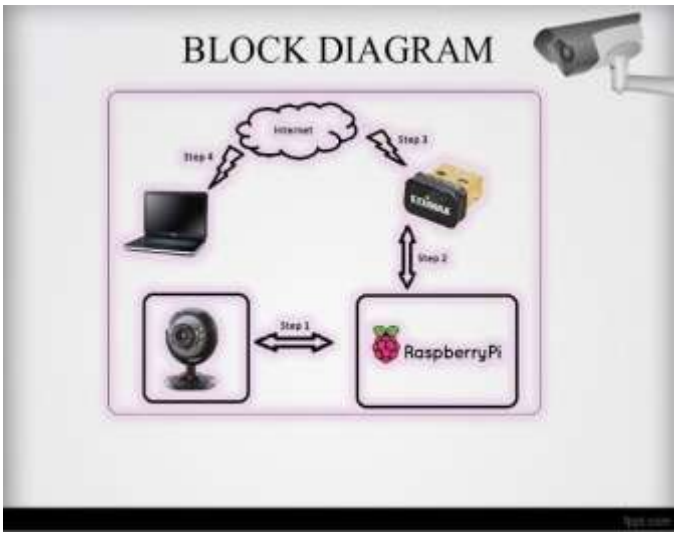

Fig 1 Block Diagram

The main aim of this system is to provide security to our homes and other control applications. The hardware module includes Raspberry Pi, Pi Camera, DC motor. Pi camera module is connected to the Raspberry pi board directly through the CSI (camera serial interface). That can be used to take high definition videos, as well as stills photographs.

Generally, we can't drive a DC motor directly with a microcontroller, as DC motor because it requires high current and high voltage than a microcontroller. Micro controller usually operates at +5V or 3.3 V supply and it I/O pin can provide only up to 25mA current. Commonly used DC motor requires 12V supply and 300mA current, moreover interfacing DC motor directly with microcontroller may affect the working of microcontroller due to the back emf of the DC motor. For this reason, we use L293D H-bridge circuit. It is a special circuit, by using the 4 transistors we can control the direction of DC motor. If we give logic bits 1,0 then current flow from VCC to motor positive after motor positive to motor negative and then flows to ground. Then motor rotates one direction. We may change the logic bit 0,1 then current flows from VCC to motor negative after motor negative to motor positive and then flows to ground.

The Raspberry Pi microcomputer is capable of implementing a cost effective security system for various applications. This new arising technology related to security provides a comfortable and safe environment for small homes. The system to be designed cannot wholly replace the role of CCTV and IP surveillance cameras especially in large commercial set ups but will make it easy for lowincome home owners to monitor their homes at a very affordable price. In addition to the fact that the Raspberry Pi board is cheap, the camera to be used in this case is relatively cheap compared to the others. The whole security system circuitry is simple and easy to implement.

IV. IMPLEMENTATION AND WORKING

Live video streaming is to transmit or receive real time video and audio coverage of an event over the internet. The proposed system uses VLC media player, its serves as the source or medium for live streaming from the raspberry pi set up at the remote location which can be accessed from a host device through virtual network computing over LAN or WLAN. A code is written in python for broadcasting live video stream on to VLC media player on the host machine. For this, VLC media player is downloaded on both Raspberry Pi as well as the host. Raspberry Pi's IP address is fed into VLC's network stream bar to initiate the stream. Once the Raspbian Operating System is installed, the initial boot completes. The Raspberry Pi is then connected to the internet over LAN or WLAN and Pi's IP address is fetched; camera interface, as well as VNC server is enabled. In order to establish the remote connections over VNC server, the user needs to sign up for the service by providing working Email address and secure password for authentication.

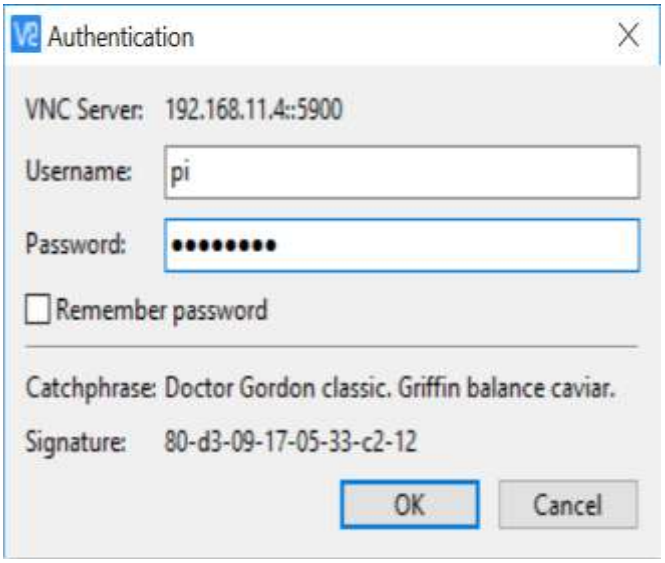

Fig 2 VNC Viewer authentication page

The VNC viewer is downloaded on the host device for accessing the Raspberry Pi's desktop remotely. The VNC server creates a virtual desktop on the VNC Viewer which only exists in Raspberry Pi's memory. Now VLC media player which is the streaming medium for the live video broadcasted over local area network is downloaded on both Raspberry Pi as well as host device. The host device can be any PC or smart phone connected to LAN/WLAN on which Raspberry Pi is connected. The Raspberry Pi can now be connected without being plugged into a monitor. In order to access the Raspberry Pi's desktop on a host device, user needs to log in to the VNC viewer by providing the previously set password. The device authenticated is listed by the name 'Raspberry Pi' by default; clicking on it and providing the password establishes the connection between Raspberry Pi and the host device. Once the connection is established, the Raspberry Pi's GUI's interface appears on a window on the host machine.

V. RESULT

Theraspberry Pi board is interfaced with the camera module, powered up using the batter pack is set in the location for remote surveillance over WLAN. It is then connected to the host machine through VNC server. Raspberry Pi's desktop is then accessed on the host running with VNC server. The code for initiating the live stream on to the VNC media player is entered in Raspberry Pi terminal. Once the code is run, Raspberry Pi's 'vid' command is used to start using the camera for video capture with zero delay. Then its output is sent to the VLC media player commanding it to start streaming the data coming in, into the port on Raspberry Pi's IP address; and the output is encoded in the format used high definition video files. Finally, VLC media player is opened on the host device and the Raspberry Pi's IP address along with HTTP protocol is fed into the network's stream bar; then hitting 'play' starts live stream.

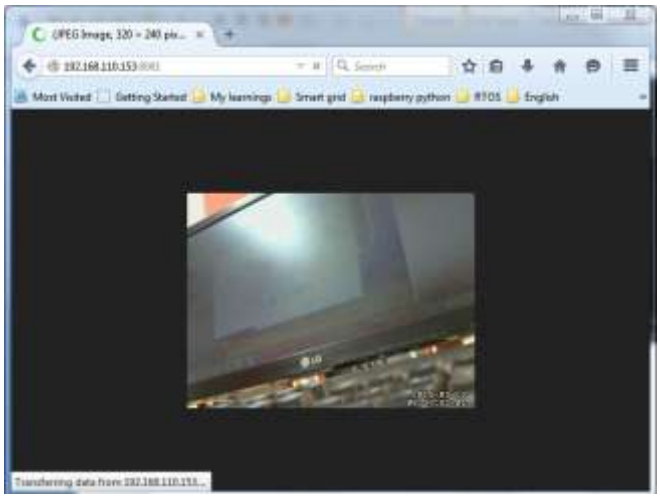

Fig 3 Live video streaming

Two advantages provided by the system is that, necessary action can be taken in short span of time in the case of emergency condition and design of a PCB board which is also small in size. Reduced size makes it more applicable for commercial manufacturing and distribution.

The proposed system is implemented and the results have been reported. The results have been verified on both PC.

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