

Smart Automated Surveillance System using Raspberry Pi



Rohan Namdeo, Sahil Sharma, Varun Anand, Chanchal Lohi

Abstract: *With the fast-growing world, frequent attacks and burglaries are increased. Therefore, the need for an effective and reliable surveillance security system has become an indispensable necessity to fulfill various security aspects and add quality to human life. The existing security systems use CCTV cameras and computers. It also consumes a lot of memory because of continuous recording and needed manpower to detect unauthorized activities and instant notification is also not possible in these surveillance security systems. So we researched the surveillance part and mainly on the burglary part where during the absence of the owner the camera will detect motion and will send instant notification to the user when motion is detected. Compared to existing surveillance systems, the use of Raspberry pi is effective because of its size, low power, and memory consumption, wireless features, and many more effective aspects. In this paper, we proposed an IoT based surveillance security system that can be accessed remotely with the use of the internet. This framework can be used in homes and personal offices. The framework works best in confined spaces and when the space in which it is being used has the absence of the owner. This is because the system will detect any movement occurring in the space.*

Keywords: *Smart surveillance, Raspberry Pi, Web Camera, Wireless, MotionEye.*

I. INTRODUCTION:

Anywhere from small personal space to a huge commercial area, security plays an essential role as there is no scarcity of thieves and burglars. In a standard security monitoring system, at least one guard must keep an eye on the monitors for any suspicious activity or any breach in a restricted space. And that too is not 100% efficient because it can be a tiring job to keep watch on the monitors at all times so we came up with a system in which one doesn't need to keep a watch at all times. This system uses Raspberry pi using the IoT (Internet of Things) technology in which the system sends the notification, pictures at desirable time quantum, and starts recording video when it senses motion.

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* Correspondence Author

Rohan Namdeo, Student, Department of Information Technology, in Lakshmi Narain College Of Technology, Bhopal, India.

Sahil Sharma Student, Department of Information Technology, in Lakshmi Narain College Of Technology, Bhopal, India.

Varun Anand Student, Department of Information Technology, in Lakshmi Narain College Of Technology, Bhopal, India.

Chanchal Lohi, Assistant Professor in the Department of Information Technology in Lakshmi Narain College of Technology, India.

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So we don't need to record videos at all times even when there is no suspicious activity taking place.

Now, take a scenario where there is an office space and the proposed system is enabled by the administrator while leaving the office space. So when someone breaches the office space the system will detect the breach i.e. motion. The motion made during the breach is detected and then processed by the system.

As soon as the motion is detected the proposed system starts recording video and simultaneously it will send a push notification alert of the breach to the administrator along with some images of the office space at the time of the breach. Then the administrator will take action. The recording will be saved in the memory of the raspberry pi which can be used afterward as a piece of evidence for any criminal activity. This is not the first time that someone has proposed this type of system. Similar systems have been proposed before this system.

The objective of this research is to design the System which reduces human efforts and provides security. We proposed a Raspberry Pi security surveillance camera, which is a system that runs and is controlled over Local networks and the Internet. The photographs are sent to a cloud server. At the point when the cloud isn't accessible then the information is put away on the Raspberry Pi and sent after the association is restored. These will come in handy depending on how you want to transfer your security cameras pictures. This will likewise help to Increase the use of portable innovation to give basic security to our homes and for other control applications. We present a literature review in section 2. Section 3 and 4 contain specification and implementation details respectively. The setup details are present in section 5. Finally, section 6 contains a conclusion and future work.

II. LITERATURE REVIEW:

Over the previous years, a few papers have been distributed tending to the prerequisite of a Smart surveillance checking framework worked with the assistance of Raspberry Pi for cell phones remotely just as locally. It is required to create and actualize a reasonable low-cost web-camera based observation framework for remote security checking. Many ventures are probed Raspberry pi with the Raspbian working framework ported on it. The framework has the capacity to screen an area away from the observation territory through cell phones[4]. The Internet of Things is a system of gadgets where those gadgets speak with one another with no human impedance[3]. The project aims to simplify detect motion and the interface to be user friendly, which would send a prompt notification when motion is detected. CCTV cameras are costly because of the use of personal computers.



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It requires too much space for consistent recording and expects labor to recognize the unapproved action[1]. In any case, when we contrast it and the current framework, the Raspberry pi framework is a lot less expensive with better goals and low force utilization highlights. It might likewise be conceivable that when the message shows up the client will be occupied and can't peruse the message and answer around then.

Along these lines, for this situation, the processor will stand by some ideal opportunity for the input that isn't gotten in a predefined span then it will raise the alert. Another preferred position of this framework is its little size and movability, it tends to be set in any sort of encompassing for observation[2]. This embedded smart monitoring system is designed to overcome the weak points of the traditional video surveillance systems, such as complex structure, poor stability, expensive cost and high security. The Internet of things essentially manages moving usable information without including human impedances.

III. SYSTEM SPECIFICATION:

In this system, basically a low-cost web camera captures the snap of the bounded region in the frame and whenever the motion is detected by frame difference method it notifies the user with the sequence of snaps that camera captured in certain time gaps. In the frame difference approach, we check the existing frame to the reference frame. As we get the notification signal in real-time it is definitely better than the conventional one. The machine to machine correspondence (M2M) is a bit of leeway over customary checking and should be possible without human intercession. The analysis of an image is done by the system itself. As the system becomes fully automatic the efficiency increases rapidly and error decreases drastically. The owner or the user remotely accesses the situation on a monitor or a phone with the help of the internet.

A. Advantages of our system:

1. Raspberry pi is effective in our proposed system because of its size, low power, and low memory consumption, and wireless networking.
2. The system instant notifies the user whenever a motion is detected.
3. It involves direct M2M(machine to machine communication). Hence errors are minimized.
4. Just the approved client can get to the checking framework remotely by means of the web on a PC or a cell phone.

IV. PROJECT IMPLEMENTATION:

This system's main component is the Raspberry pi 3 model B+. This system is an intelligent system based on IoT. This system will send an alert notification immediately to the owner whenever there is a motion detected in the absence of the owner and the system will take images at desired time quantum and start recording video.

Firstly, the camera detects motion and then the raspberry pi processes it. Then after processing, the raspberry pi pushes notification to the user which will then alert the user of the intrusion and the user will then take appropriate action. The system will send the notification via the internet.

Hardware used to implement our project:

- The Raspberry Pi 3, Model B+, 1GB RAM.
- A USB web camera.
- MicroSD Card.
- Display.
- Ethernet Cable.
- Power supply adapter 5V 2.0A, dual USB 10000 mAh Battery.

Software used to implement our project;

- PuTTY
- VNC Viewer
- Balena Etcher
- SD Card formatter
- MotionEye

A. USB Web camera:

A webcam is a camcorder that feeds or streams a picture or video continuously to or through a PC to a PC arranged, for example, the Internet. Webcams are normally little cameras that sit on a work area, append to a client's screen, or are incorporated with the equipment. Webcams can be utilized during a video visit meeting including at least two individuals, with discussions that incorporate live sound and video.



Fig1: USB Web Camera

B. PuTTY:

PuTTY is a free and open-source terminal emulator, sequential reassurance and system document move application. It bolsters a few system conventions, including SCP, SSH, Telnet, rlogin, and crude attachment association.

It can likewise associate with a sequential port.

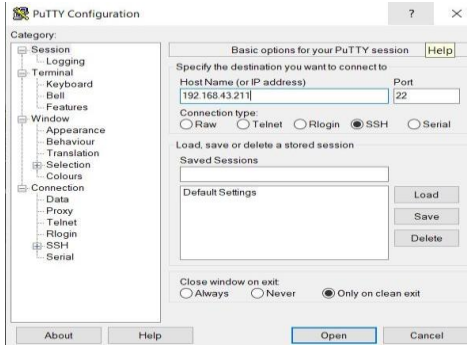


Fig 2: Setup of PuTTY

C. VNC Viewer:

VNC Viewer from Real VNC furnishes you with remote access to your picked PC; a MAC, a Windows PC or a Linux machine, from anyplace on the planet. VNC Viewer lets you see your PC's work area, and furthermore control its mouse and console as if you were sitting straightforwardly before that PC.

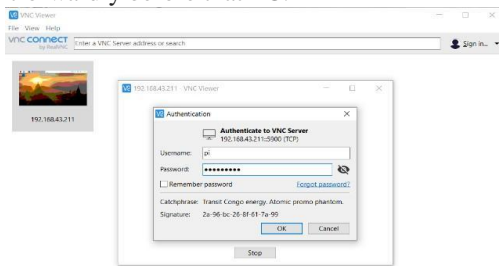


Fig 3: VNC Viewer

D. Platform of Raspberry Pi:

Raspberry Pi is the name of a single-board computer made by Raspberry Pi Foundation, a UK based charity that aims for easier access to computing education. Raspberry Pi launched in 2012 and comes in various models, the latest is Raspberry Pi 4 comes with a 4 GB RAM 1.5GHZ A72 Processor.

Raspberry Pi is a modest PC that runs Linux and furthermore gives a lot of GPIO (general purpose input/output) pins that permit you to control electronic components for physical computing and explore IoT (Internet of things).



Fig 4: Architecture of Raspberry

E. Motion Eye:

MotionEye is a Linux distribution that transforms your single-board PC into a video surveillance framework. MotionEye is the ideal answer for assembling your own surveillance framework since it is simple to install and has a web-based, user-friendly interface that is responsive in basically any browser. It underpins most Web cameras, Raspberry Pi camera modules, and IP cameras. Moreover, it brings other helpful highlights with regards to a surveillance framework:

- Motion detection with email notifications
- You can set a working schedule
- Take still images

Store your files in SD card, USB drive, or upload your files to Google Drive or Dropbox.

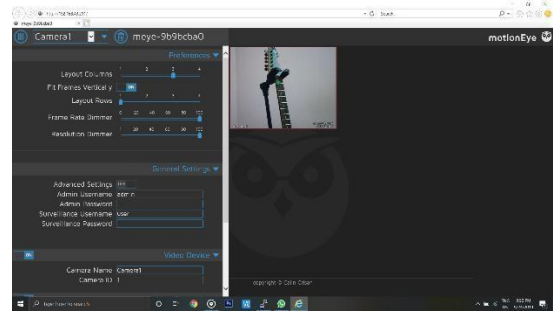


Fig 5: MotionEye interface

V. SYSTEM SETUP:

A Raspberry Pi is modest, Mastercard estimated PC board which when connected to a showcase unit and connection of a console and a mouse, can finish the elements of any standard PC. Like a PC, it has RAM, Hard Drive (SD Card), Audio and Video ports, USB port. HDMI port, an Ethernet port. Raspberry Pi is Linux based and the Operating System is put away on the SD card. So as to introduce the Operating framework onto the SD card, the crude picture must be downloaded from the Raspberry Pi's site.

When it is downloaded, the SD card must be arranged utilizing the product SD Formatter. When it is designed, the product Balena Etcher must be utilized to compose the picture onto the SD card. The SD card would then be able to be embedded into the Raspberry Pi and booted up utilizing a LCD show or a Laptop/PC. The Pi contains its own Wi-Fi association and an Ethernet port. The technique to make the security observation framework begins by downloading the correct Operating System within the SD card. When the framework is booted up the USB camera must be empowered under Raspberry pi designs. The boot technique for Graphical User Interface must be chosen. When these setups are made the framework should reboot. After reboot, the framework must have its every single important bundle introduced to ensure Motion works appropriately for that it is important to refresh and redesign. The USB camera can be utilized as a standard camera just as a movement identifying camera. It is fundamental to realize that after any changes that are made to the design document the framework ought to be rebooted.

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In the event that the framework isn't rebooted, the progressions won't be completely produced into results. Once the framework is rebooted the following stage is to begin the camera and refresh and introduce the setup record. Presently the subsequent stage is to introduce MotionEye on a clear miniaturized scale SD card. At the point when you boot MotionEye just because it will wrap up your small-scale SD card and will at that point reboot. This is really a component of the Raspbian working framework that it runs; it needs to decide the size of the small-scale SD card and make an appropriate working segment. After rebooting you'll watch various modules stacking. From that point forward, the product will attempt to set up a system association. At the point when a system association is set up, it will utilize DHCP to ask for and afterward acquire an IP address. Open an internet browser on the PC or gadget that you need to see your camera on. In your programs' location bar type in the IP address. So as to arrange the camera settings, you'll have to sign in as an Administrator. To do that click on the User Icon, which is the symbol molded like an individual right close to the Settings symbol. Subsequent to tapping on the Users symbol you get a login box, you need to login through that case.

F. System block diagram:

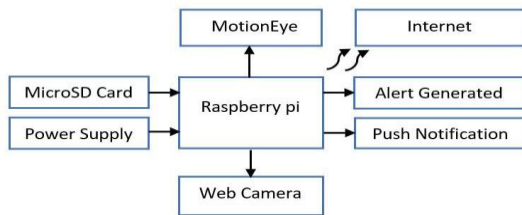


Fig 6: System Block Diagram

G. System flow diagram:

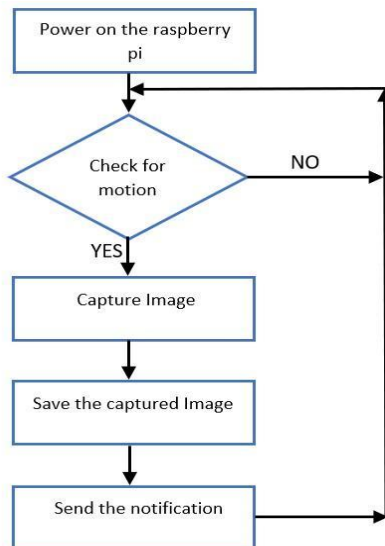


Fig 7: System Flow Diagram

VI. CONCLUSION:

The smart surveillance framework has been structured so that it can satisfy the requirements of the client for a specific surveillance territory. It has endless applications and can be utilized in various conditions and situations. In

one case it tends to be utilized by any client working in the business to know about the action being occurred at their working spots, in their nonappearance, while at another case it very well may be utilized for spy purposes at the bank, stockpiling units. Another case is to give data to the client about what's going on in the observation region by the warning. So, by improving the capacities of these advancements and integrating them, we want to present the 'Smart surveillance' framework and to add to the current security framework. This framework would be an option for costly security frameworks being utilized in the current day. This framework doesn't require any exceptional alterations to the framework where the establishment is required and can be actualized with no issue. Later on, we can include Face detection in our present framework, live video gushing can be included according to client prerequisite, power-sharing mode or a rest mode can likewise be included. Aside from that as it is a security framework, we can likewise include a gas sensor or smoke identification sensor to give extra alarms.

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AUTHORS PROFILE



Rohan Namdeo is pre final year B.Tech student of Department of Information Technology, in Lakshmi Narain College Of Technology, Bhopal, affiliated with RGPV.



Sahil Sharma is pre final year B.Tech student of Department of Information Technology, in Lakshmi Narain College Of Technology, Bhopal, affiliated with RGPV.



Varun Anand is pre final year B.Tech student of Department of Information Technology, in Lakshmi Narain College Of Technology, Bhopal, affiliated with RGPV.



Chanchal Lohi received her Bachelor of Engineering in Information Technology, from RGPV, Bhopal in 2012, and Master of Technology in 2015 in Computer Science and Engineering, from RGPV, Bhopal. She is working as an Assistant Professor in the Department of Information Technology in Lakshmi Narain College of Technology, India. She has various publications in International Journals & two patents. She has guided both UG and PG candidate's projects. Her areas of interest include IoT, Machine Learning & Ad Hoc Network.