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RASPBERRY PI BASED INTRUDER DETECTION WITH IMAGE EMAIL ALERT THOUGH IOT

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ABSTRACT

Raspberry Pi based doorbell alert system which not only alerts the house owner through e-mail but also sends the picture of Intruder. This system detects the presence of Intruder and quickly alerts the house owner by sending an e-mail alert. This mail will also contain the picture of Intruder captured by Pi camera. This system can be installed at the main door of office or home and can be monitored from anywhere in the world using email over the internet. Security is a very important need in the daily life. In most developing regions of the world, the rate of burglary especially semi-urban areas has increased in recent times. This paper presents the design and prototyping of burglary detection and reporting system. Sensors attached to doors or windows were used to detect entry. When we press the calling switch camera capture images and sent to email through IOT. The proposed system accurately detected and reported the presence of intruders in a test area which is very secure system.

Keywords: Raspberry Pi, doorbell automation, Email notification, IoT.

INTRODUCTION

The Internet of Things is an infrastructure that includes physical devices, modern vehicles, buildings, and even essential electrical devices which we use on a consistent basis inter-connected to each other over the internet so that they can accumulate and exchange data amongst themselves. These "Things" have the priority and the ability to self-organize and communicate with other things without human intervention [1]. There are more than six devices connected to the Internet per person [2]. The concept of IoT aims to present the Internet even more pervasive and even more immersive. Moreover, by enabling easy access and interaction with an extensive variety of devices such as instance for home appliances, monitoring, surveillance cameras, sensors, displays, actuators, and vehicles. The IoT will improve the development of various applications that make use of the massive amount and diversity of data produced by objects to implement further services to companies, citizens, and public administrations. IoT applications are various and brought to several areas and domains for example: home automation, healthcare via mobile, manufacturing automation, elderly assistance, medical aids, automotive, smart grids and intelligent energy control, traffic management, etc. [3]. The IoT structure is subject to smart and self-configuring objects that are combined into a universal network foundation. That will give an addition to new opportunities for the Information and Communication Technologies (ICT) sector, covering the way to different services and applications able to leverage the interconnection of physical and virtual domains. IoT can be defined as 'Objects having virtual personalities and identifications in smart areas employing intelligent interfaces to connect and communicate within medical, social, environmental and users context [4]. The influence of the IoT on the life of users can be considered as its key feature. This challenge has driven to increase of different and seldom, incompatible projects for the possible recognition of IoT systems. Accordingly, from a system prospect, the awareness of an IoT network, commonly with the required backend network services and devices, still needs an established best practice because of its novelty and

complexity. Furthermore, to the technical challenges, the IoT model adoption also limited by the lack of widely and clearly admitted business model that can attract expenses to increase the deployment of these technologies [5]. Smart cities are those that make the use of these smart things to carry out various functions such as lighting, traffic control, connecting multiple cities, energy consumption and pollution control. The main purpose of smart cities can replace the way how we look to the things. Regarding many aspects where IoT is set to rule we can say that from the most reliable day to day actions to the most complex human emotions, IoT will affect it all. Commonly, from the smart city applications and the underlying environment the citizens will benefit primarily, as illustrated in Figure 1. The IoT based Smart City applications can be a personal assistant for the daily routine of a citizen. E.g., to remind him of his next appointment to optimizing his room temperature according to outside temperature to make his coffee on time. It can recognize his health if he suffers from any problem and notify or alarm his particular doctor in case of emergency.

Security is major concern nowadays and today we have all types of surveillance and security system available in the market. But they are very expensive and sometimes create problems which we can't solve. Previously we built a surveillance camera which can stream live video on IoT cloud and today we will build a low cost Raspberry Pi based Smart Wi-Fi doorbell. This system will send the picture of visitor on email when the door bell switch is pressed. A PiCamera is attached with raspberry pi to take the picture, although a USB webcam can also be used if you don't have PiCamera. This system can be installed at the main door of your home or office and can be monitored from anywhere in the world over internet. In the world of Internet of Things (IoT) when we have all the technologies to revolutionize our life, it's a great idea to develop a system which can be controlled and monitored from anywhere. There are many types of good security systems and cameras out there for home security but they are much expensive so today we will build a low cost simple Raspberry Pi based Intruder Alert System, which not only alert you through an email but also sends the picture of Intruder when it detects any.

In this IoT based Project, we will build a Home Security System using PIR Sensor and PI Camera. This system will detect the presence of Intruder and quickly alert the user by sending him a alert mail. This mail will also contain the Picture of the Intruder, captured by Pi camera. Raspberry Pi is used to control the whole system. This system can be installed at the main door of your home or office and you can monitor it from anywhere in the world using your Email over internet. Starting from small houses to huge industries, surveillance plays very vital role to fulfill safety aspects as Burglary and theft have always been a problem. In daily life, people have the need to know, Identify of a visitor who comes to their homes, regardless of they are there at that time. Many countries are gradually adopting smart home security control system. Today most of the home and office appliances that we interact with contain microprocessors. All of these appliances have some user interface, but many users become frustrated with the difficulty of using the complex functions of their appliances, they are already carrying. Smart phones are good candidates for providing interfaces because they are common, have communication capabilities to allow connection to appliances, and are already being used for a wide range of applications. An efficient, low power consumption and low cost embedded door access control system for Smart home security and remote monitoring based on motion detection is very important for wide range of commercial and security application. Our framework includes an abstract specification language for describing appliances, a two-way communication protocol, and automatic interface generation software that allows user interfaces to be customized to users and the devices they are using. The most important part of any home doorbell is accurately detecting visitor who enter and leave through the door. An entrance guard can be managed remotely, detecting visitors at Door and alerting to user via mobile phone is the most natural way to performing security. The

system identifies the visitor's presence, capture and transfers the image through email automatically to home owner to recognize the visitors. The user can directly login and interact with the embedded device in real time without the need to maintain an additional server. It has a variety of features such as energy efficient, intelligence, low cost, portability and high performance. This system combines the functions of smart phone and home network system. It enables the user to monitor visitors in real time, remotely via the IOT-based doorbell installed near entrance door to a house. This system makes security as further autonomous by capturing the image automatically and uses mail communication to send the captured image. Two way voice communication can be established between owner and visitor.

LITERATURE SURVEY

An efficient, low power consumption and low cost embedded access control system for Smart home security and remote monitoring[3] based on motion detection is very important for wide range of commercial and security application. Many countries are gradually adopting smart home security control system. Today most of the home and office appliances that we interact with contain microprocessors. All of these appliances have some user interface, but many users become frustrated with the difficulty of using the complex functions of their appliances. We are developing a framework that allows users to interact with appliances through a separate user interface device that they are already carrying. Smart phones are good candidates for providing interfaces because they are common, have communication capabilities to allow connection to appliances, and are already being used for a wide range of different applications. Our framework includes an abstract specification language for describing appliances, a two-way communication protocol, and automatic interface generation software that allows user interfaces to be customized to users and the devices they are using [2]. The most important part of any home security system is accurately detecting visitor who enter and leave through the door. An entrance guard can be managed remotely, detecting visitors at Door and alerting to user via mobile phone is the most natural way to perform security. The proposed system have added features like view video stream through mobile phone [3]. Additionally, voice alert or siren activated to alert neighbors when intruder detected. The system identifies the visitor's presence, capture and transfers the image through email automatically to home owner to recognize the visitors. The system also generates voice output whenever a person tries to enter into the house. The user can directly login and interact with the embedded device in real time without the need to maintain an additional server. It has a variety of features such as energy efficient, intelligence, low cost, portability and high performance. In the IoT platform based home security system, the main emphasis on protecting our loved ones and our belongings at home. Today numbers of IoT based home security systems are available in market. According to the literature and market survey, the common parameters of IoT enabled home security system are 24 hours monitoring and detection of the intruder, real time, cost effective and precise notification system suggested by various researchers. Following are the contributions of various researcher done in IoT domain. Rani et al. (2018) explains the IoT based home security using Raspberry Pi which give SMS alert to authorize person through WAY2SMS and image of the unauthorized person via g-mail. Dinakar et al. (2018) proposed IoT based automated home security system using Raspberry Pi which gives intruder detection alarm and notification to the owner. Ghodke et al. (2017) explains in their paper how the IoT network based system send the information of any person image coming close to the door for home security to the owner. Anwar et al. (2016) explains the IoT based door accessibility and voice alerting through smart phone for home security system. Tanaya and Kishore (2016) explains the up-gradation of home security system with face detection technique using haar algorithm in open CV for the detection of authorized or design and build unauthorized person. Chowdhury et al. (2013) describes IoT based remote access control system for authorized person at door using raspberry Pi. The internet

connectivity, raspberry pi, pi-camera and PIR sensor, these are common components are used in the above references system. PIR sensor is used for detection of movement at the door and pi-camera is used to capture the image according to movement in all system. Few system gives the remote access for authorized person at the door step. Comparatively very less work is done on the human face and object detection algorithm. In the IoT platform based home security system, the main emphasis on protecting our loved ones and our belongings at home. Today numbers of IoT based home security systems are available in market. According to the literature and market survey, the common parameters of IoT enabled home security system are 24 hours monitoring and detection of the intruder, real time, cost effective and precise notification system suggested by various researchers. Following are the contributions of various researcher done in IoT domain Rani et al. (2018) explains the IoT based home security using Raspberry Pi which give SMS alert to authorize person through WAY2SMS and image of the unauthorized person via g-mail. Dinakar et al. (2018) proposed IoT based automated home security system using Raspberry Pi which gives intruder detection alarm and notification to the owner. Ghodke et al. (2017) explains in their paper how the IoT network based system send the information of any person image coming close to the door for home security to the owner. Anwar et al. (2016) explains the IoT based door accessibility and voice alerting through smart phone for home security system. Tanaya and Kishore (2016) explains the up-gradation of home security system with face detection technique using haar algorithm in open CV for the detection of authorized or design and build unauthorized person. Chowdhury et al. (2013) describes IoT based remote access control system for authorized person at door using raspberry Pi. The internet connectivity, raspberry pi, pi-camera and PIR sensor, these are common components are used in the above references system. PIR sensor is used for detection of movement at the door and pi-camera is used to capture the image according to movement in all system. Few system gives the remote access for authorized person at the door step. Comparatively very less work is done on the human face and object detection algorithm. Several works have been done in recent years regarding motion detection for surveillance in both residential and industrial areas. In recent years, image and video processing technique have been incorporated with modern surveillance system. In a recent research authors used absolute difference motion detection for visual surveillance [2].

PROPOSED SYSTEM

Doorbell switch is used to detect the presence of any person and a Pi Camera is used to capture the images when the presence it detected. Whenever we press the door bell switch, door switch triggers the Pi Camera through Raspberry Pi. Raspberry pi sends commands to Pi camera to click the picture and save it. After it, Raspberry Pi creates a mail and sends it to the defined mail address with recently clicked images. The mail contains a message and picture of intruder as attachment. Here we have used the message “Please find the attachment”, you can change it accordingly in the Code given at the end.

An email notifying the user about entry of any person in front of his house is sent immediately after the entry is detected. Whenever door bell switch press , it will send positive signal to the raspberry pi GPIO pin. Pi senses the signal and send the output signal to USB camera for capturing image. Temporarily image is stored in raspberry SD card along with that it will send one notification message to user’s email along with the captured image. door bell switch is interfaced with Raspberry Pi using GPIO pin 21 which is –on board pin, where as Camera is interfaced using CMSI port. The presence of an intruder is detected by the Passive Infrared Sensor. When door bell switch push to high , output goes high and it triggers the Camera. The Camera captures the image and send it to Raspberry Pi. When an intrusion is detected the owner is alerted by sending email. When face is detected in the image captured, it is sent as an attachment along with the email. Multipurpose Internet Mail Extension

(MIME) package is then called and used to generate the attachment. MIME supports characters other than ASCII, non – text attachments (audio, video and application programs) etc. It thus extends the format of an email. Simple Mail Transfer Protocol (SMTP) program was then used to deliver the email from the Raspberry Pi to the configured mailhub.

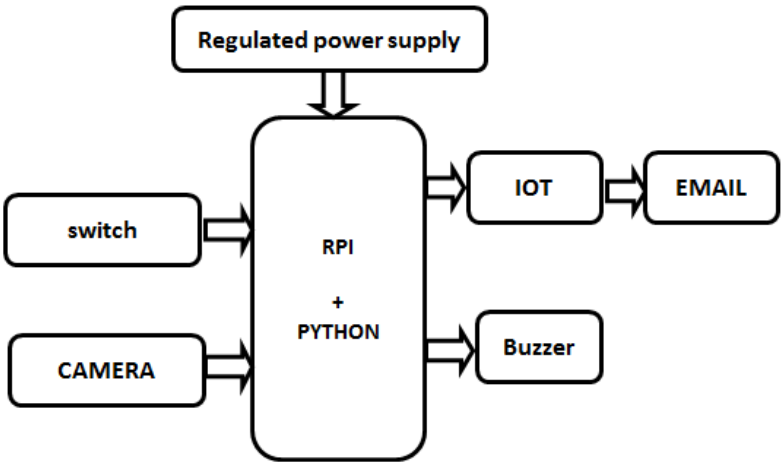

Fig. 1: Block diagram.

Raspberry-Pi Processor

The Raspberry Pi Model B is the third generation Raspberry Pi. This powerful credit-card sized single board computer can be used for many applications and supersedes the original Raspberry Pi Model ZERO WIFI and Raspberry Pi ZERO Model . Whilst maintaining the popular board format the Raspberry Pi brings you a more powerful processer, 10x faster than the first generation Raspberry Pi. Additionally it adds wireless LAN & Bluetooth connectivity making it the ideal solution for powerful connected designs.

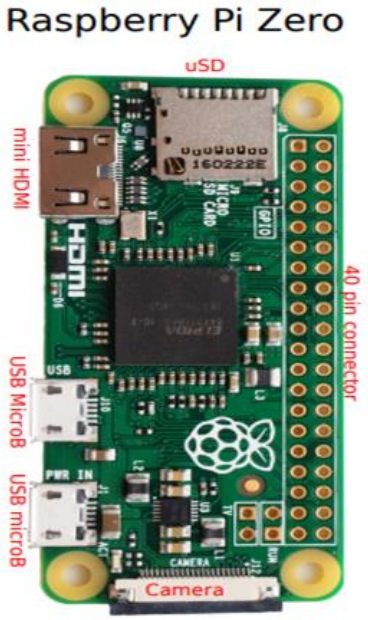

Fig. 2: Raspberry Pi module.

GPIO 0 and 1 are reserved - Do Not Connect PAL or NTSC via composite video on TV pads Run - temporarily connect pins to reset chip (or start chip after a shutdown) Camera Connector (not on Zero 1.1 or 1.2) - 22pin, 0.5mm Board Dimensions - 65mm x 30mm x 0.2mm Mounting holes M2.5

USB CAMERA

Logitech® Webcam C170. The easy way to start video calling and send photos (5MP). With simple plug-and-play setup, you'll be making video calls in exceptional VGA resolution in no time on Logitech Vid™ HD. You can take and send beautiful, high-resolution photos at up to 5MP (software enhanced), too.

Fig. 3: Logitech 5MegaPixel USB Camera

A built-in noise-reducing mike helps loved ones hear you clearly on calls. You can also record lively, colorful videos in XVGA (1024 x 768) resolution and share them with friends, family and the world. Also, the universal clip makes it easy to use with your desktop or laptop.

HARDWARE RESULTS

The presence of an intruder is detected by the Passive Infrared Sensor. When door bell switch push to high , output goes high and it triggers the Camera. The Camera captures the image and send it to Raspberry Pi. When an intrusion is detected the owner is alerted by sending email. When face is detected in the image captured, it is sent as an attachment along with the email. Multipurpose Internet Mail Extension (MIME) package is then called and used to generate the attachment. MIME supports characters other than ASCII, non – text attachments (audio, video and application programs) etc. It thus extends the format of an email. Simple Mail Transfer Protocol (SMTP) program was then used to deliver the email from the Raspberry Pi to the configured mailhub.

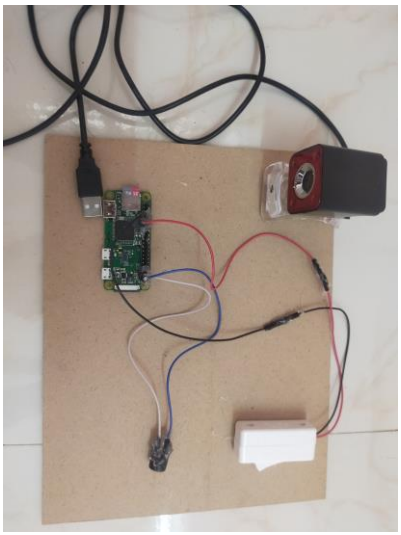

Fig. 4: Hardware setup.

CONCLUSION

We built The IoT based home security system has been designed and developed with RaspberryPi-3, Pi-camera and door switch. The user can get alerts anytime and anywhere through e-mail on smartphones or Laptop. a surveillance camera which can stream live video on IoT cloud and today we will build a low cost Raspberry Pi based Smart Wi-Fi doorbell. This system will send the picture of visitor on email when the door bell switch is pressed. A Pi Camera is attached with raspberry pi to take the picture, although a USB webcam can also be used if you don't have Pi Camera. This system can be installed at the main door of your home or office and can be monitored from anywhere in the world over internet. When we press the calling switch camera capture images and sent to email through IOT. The proposed system accurately detected and reported the presence of intruders in a test area which is very secure system.

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