Journal of Engineering Sciences

Vol 11, Issue 4 , April/2020

ISSN NO:0377-9254

BANK SAFETY LOCKER SYSTEM WITH IMAGE IDENTIFICATION BY USING E-MAIL

G.CHARITHA REDDY[1], K.AKHIL[2], CH.MEGHANATH REDDY[3]
[1,2,3]Student, Dept of ECE, AITS, Rajampet, AP, India.

Abstract— The system is about remotely managed locker Door accessibility alerting through Smart Phone and receive captured image of visitor at Locker as Email alert. This smart security control system has become indispensable in daily life. The design and development of a smart security system, based on human motion detection and remotely monitoring technology, to confirm visitor identity and to control Door accessibility has been reported in this paper. This paper describes about the implementation and deployment of wireless control system and accessibility in to a safety system for authenticated people only. A MEMS sensor and Camera module are used to detect motion and capture images respectively are dedicatedly make the security system alive as per the request. Electromagnetic door lock module operate the door accessibility, has been designed and developed.

***Keywords:** Raspberry Pi, Pi Camera module, MEMS sensor, Email alert.*

I. INTRODUCTION

The main aim of this project is to develop a device for the bank locker security purpose. Many people who may or may not known us, are accessing the personal workplace because of this there are many issues such as losing of documents and valuable possession. Even the latest technology such as fingerprint sensor lock can be unlocked with ease. So to overcome this problem, this project suggest the use of Internet of Things(IoT) to provide secure access only to authorized person. For this we shall be using Raspberry Pi for capturing image, processing it and then sending it via message and Internet to the user's Mail account. The Raspberry Pi captures the image when a person tries to access the bank locker and then process it and sends it to the user's Mail account as picture message. The user can then provide authorization to the Raspberry Pi from his/her mail account whether to open or remain it shut. This can also be used in places such as personal work place, office location such as records, server, document storage places and other places where security is of major concern. So in order to have highly secured locker we are using this proposed method. An efficient, low power consumption and low cost embedded access control system for Smart bank security and remote monitoring based on motion detection is very important for wide range of commercial and security application. Many countries are gradually adopting smart bank security control system. Today most of the bank 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.

Personal Security is one of the main concerns when it comes to office, personal workplace in bank, bank etc. So to overcome this problem, this project suggest the use of Internet of Things(IoT) to provide secure access only to authorized person via SMS and also sending image to the user's Gmail account. The Raspberry Pi captures the image when a person tries to access the bank locker and then process it and sends it to the user's Gmail account as picture message. The user can then provide authorization to the Raspberry Pi from his/her Gmail account whether to open or remain it shut. So in order to have highly secured locker we are using this proposed method.

II. PROPOSED SYSTEM

The proposed system 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 bank 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 camera. The system identifies the visitor's presence, capture and transfers the image through email automatically to bank owner to recognize the visitors. The system also generates voice output whenever a person tries to enter into the Bank. 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.

The proposed system uses controller interface system with Raspberry Pi which is low cost and consume smaller amount of power. When visitor motion detected at bank lockers, Camera module interfaced to Raspberry Pi capture images, save it on system and send it as Email alert via TCP/IP. Users can monitor visitors and control the bank lock on active SSH (Secure Shell) page designed on android platform and enhanced with JavaScript. This system finds a wide application in areas where physical presence is not possible all the time. The entire control system is built using ARM1176JZF-S microcontroller and tested for actual use in bank environment. Raspberry Pi, Pi Camera and Power supply forms the entire security system to be installed at the required place. PIR motion sensor is connected to GPIO pins of Raspberry Pi. We can use LCD monitor for setting up Raspberry web server. Loudspeaker mounted at Audio Jack of Raspberry Pi. Relay Driver circuit with IC ULN2003 is interfaced to Raspberry Pi to control Electromagnetic Door Lock. The image captured can save with time and date on SD card or USB Pen drive connected on Raspberry Pi.

Tests demonstrate that the wireless video surveillance system introduced here is accurate and stable. And with real time control it has good program prospects. The final design relies on Raspberry PI because it is a device with a credit card size that fits into a computer monitor or TV that uses a regular mouse and keyboard. It's a compact versatile computer that lets people of all ages enjoy computing. Video data is collected from a USB device, encoded into JPEG format, sent to the WIFI network under the power of the ARM11 chip; then the display client collects the encoded data frame for processing, and recomposes video files, the hardware configuration of the machine, using the IP address that we can use from everywhere.

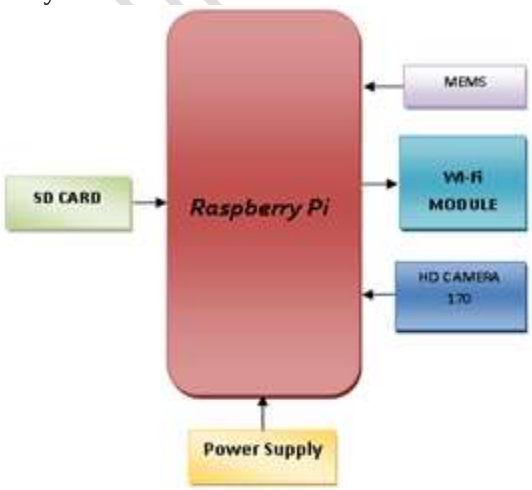

Figure-1: Block Diagram

III. SYSTEM DESCRIPTION

The remote monitoring and controlling of ECU over the Internet can be mechanized by setting up certain network architectural design strategies such as SSH and applying Internet protocol (IPV6) communication standards. If any visitors arrive, ECU capture image of visitor, save it and sends it to an appropriate email including the details of time and date of captured image. The owner can directly login and interact with the ECU. The images captured and the video recorded will be directly streamed on user pre-decided android app on Smart Phone. User can access the video directly using the Static IP address or can also stream on local domain with the help of websites.

Raspberry Pi

Raspberry Pi board is a miniature marvel, packing considerable computing power into a footprint no larger than a credit card. The processor at the heart of the Raspberry Pi system is a Broadcom BCM2835 system-on-chip (SoC) multimedia processor. This means that the vast majority of the system's components, including its central and graphics processing units along with the audio and communications hardware, are built onto that single component hidden beneath the 512 MB memory chip at the centre of the board. It's not just this SoC design that makes the BCM2835 different to the processor found in your desktop or laptop, however. It also uses a different instruction set architecture (ISA), known as ARM. The Raspberry Pi, by contrast, is designed to run an operating system called GNU/Linux Raspbian. Hereafter referred to simply as Linux. Unlike Windows or OS X, Linux is open source: it's possible to download the source code for the entire operating system and make whatever changes you desire.

Features of the Raspberry Pi

- Model B+ Raspberry Pi with Mounting Points and
- 512MB RAM.
- Broadcom BCM2835 ARM11 700 MHz
- Integrated Video core 4 Graphics GPU capable of playing
- Full 1080p HD Video.
- 4 x USB Ports (Max Output 1.2A).
- Board Power Draw: 600mA.
- HDMI Video Output.
- 10/100Mb Ethernet Port for Internet Access.
- Micro SD Flash Memory Card Slot.
- 40-pin 2.54mm Header Expansion Slot (Which allow for peripherals and expansion boards)
- Dimensions 85 x 56 x 17mm.
- The Raspberry Pi is boot by external memory card with Raspbian Jessie images

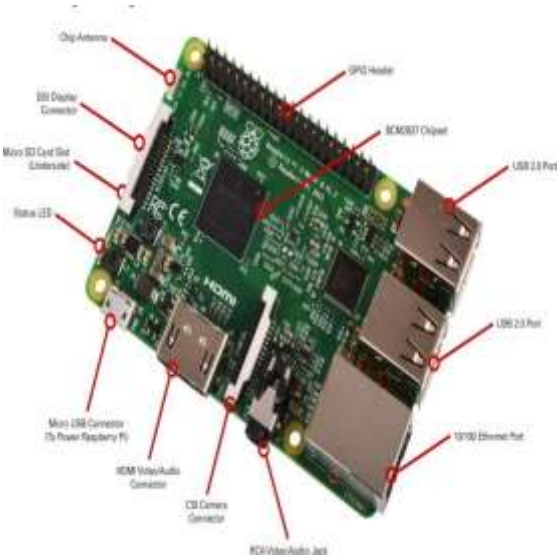

Figure-2: Raspberry Pi3

Raspberry PiCamera Module

The Raspberry Pi Camera Module is a custom designed add- on for Raspberry Pi. It attaches to Raspberry Pi by way of one of the two small sockets on the board upper surface. This interface uses the dedicated CSI interface, which was designed especially for interfacing to cameras. The CSI bus is capable of extremely high data rates, and it exclusively carries pixel data.

Figure-3: Raspberry PiCamera Module

MEMS Sensor

MEMS are low-cost, and high accuracy inertial sensors and these are used to serve an extensive range of industrial applications. This sensor uses a chip-based technology namely micro-electro-mechanical-system. These sensors are used to detect as well as measure the external stimulus like pressure, after that it responds to the pressure which is measured pressure with the help of some mechanical actions. The best examples of this mainly include revolving of a motor for compensating the pressure change.

The MEMS IC fabrication can be done with silicon, whereby slight material layers are placed otherwise fixed onto a Si substrate. After that selectively fixed away to leave microscopic 3D structures like diaphragms, beams, levers, springs, and gears. Whenever the tilt is applied to the MEMS sensor, then a balanced mass makes a difference within the electric potential. This can be measured like a change within capacitance. Then that signal can be changed to create a stable output signal in digital, 4-20mA or VDC.

Figure-4: MEMS sensor

IV.SYSTEM HARDWARE & IMPLEMENTATION

SYSTEM ARCHITECTURE

Smart bank security system consists of two components, Embedded Control Unit (ECU) is part of Smart bank where security system implemented and Remote Control Unit (RCU) is a framework implemented on Users smart phone.

EMBEDDED CONTROL UNIT (ECU)

ECU is an efficient, low power consumption and low cost embedded access control system for Smart bank security and allows user to remote monitoring and controlling. ECU consists of Raspberry Pi set up with Raspbian Operating System on installed SD card. MEMS sensor and PiCamera interfaced with Raspberry Pi to detect visitor's motion at Door and capture image respectively. Captured images with time and date are saved on SD card. Raspberry Pi configured for enabled SSH and camera.

REMOTE CONTROL UNIT (RCU)

RCU is a software tool implemented on Users Smart Phone. Provide GUI (Graphical User Interface) to send predefined Linux Terminal Commands via SSH to ECU. SSH is a secure protocol and the most commonly used to administrate and communicate with Linux servers. The System was implemented on a Raspberry pi development board in Linux environment, which supports SMTP (Simple Mail Transfer Protocol), TCP/IP, HTTP. The web server Flash File System supports dynamically generated files that can include output data from hardware resources. This type of file is called an embedded server page

(ESP).

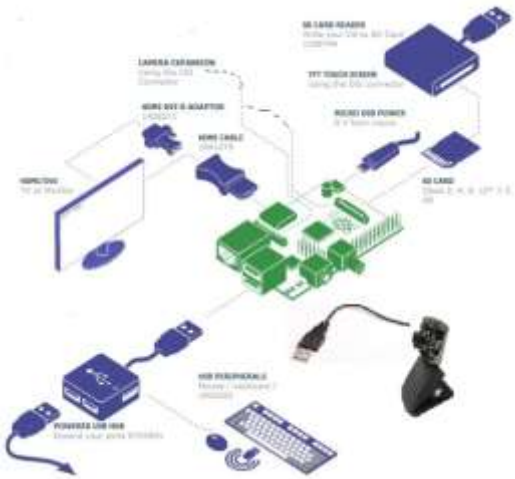

Figure-5: System Hardware Implementation

Step1:

When the kit is turned ON, initially below figure appears

Figure-6: Initialization of Raspberry Pi

Step2:

After initiating the Raspberry Pi, it will ask password. Raspberry Pi verifies the password given by the person as shown below.

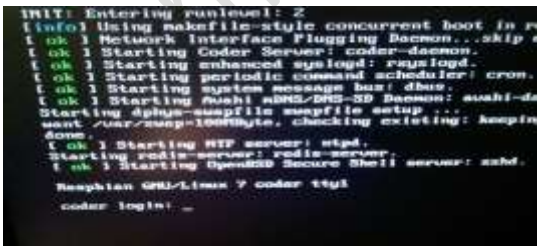

Figure-7: User login

Step 3

When Password is correct it will join the loop automatically, LED will blink in dongle (indication) to switch data, know we are ready to connect to the internet

Figure-8: Raspberry Pi accessing internet

Enter the WPA key

Figure-9: connecting to internet

Figure-10: Enter Password

V. RESULT

Now enter the IP address in browser as well as in mobile, we can directly monitor the video in any number of devices as shown in below figure.

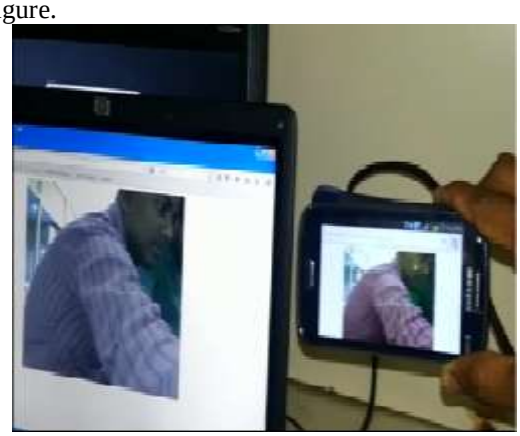

Figure-11: video monitoring

CONCLUSION

Using IoT, we have introduced a security framework for Bank lockers. In this paper we presented a device that allows the signal conditioning unit to trigger the whole circuit if a person tries to open the locker and it will send the mail via internet to the authenticated user. Therefore, the camera is held close to the locker. The person who attempts to enter the locker will be recorded by the camera and then processed in Raspberry Pi, sending it as a picture message to either the user's Gmail account. If the user knows the person in the picture he / she will allow the locker to open. Otherwise if the user is unknown to the person in the picture, he / she will render the locker in a closed system. The bank locker would therefore be strongly guarded by an anonymous person.

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