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Smart Door Security Control System Using Raspberry Pi

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ABSTRACT- *In Recent, Home Automation is on horizon. Door Automation is emerging technology in Home Automation. From the last decades a number of standards have been defined for Door Lock Appliances. The main objective of Door automation is to provide Security locks for door, comfort, connivance security and energy efficiency for user with help of IOT and WSN. The aim of this Paper is to develop Door Automation application using Raspberry Pi and GSM. Raspberry Pi operates and controls motion detector and cameras for remote sensing, surveillance capture the image of the intruder and sends it to the mobile phone of the owner and finally alerts the user about the intruder. In this paper, Biometric is used as secondary for security purpose. Programming has been developed in Python environment for Raspberry Pi operation.*

Index Terms- **Internet of Things [IOT], Raspberry pi-3, Web Camera, Mobile device, Home Security.**

I. INTRODUCTION

Today security and safety is becoming more and more popular day by day and it is getting improved and used for the ease in our life. Now days, technology has become an integrated part of people's lives therefore the security of one's home must also not be left behind. The purpose of this project is to design a system which will control door by using smart phone operated by Mobile device. This system mainly consists of Web camera to detect guest, Raspberry Pi Model B3 which have in-built Wi-Fi module and a Mobile device for interfacing with system. Whenever an individual would stand in front of door then camera will detect and send image on the Mobile device. User can control the door by using smart phone. In the mobile device, specifications of appliances are given through which system can be controlled. When individual get sensed, web camera gets the signal then it captures the image of an individual and sends to user's mobile device via raspberry pi using IOT (Internet of Things). This proposed work is to send the specific person inside the house, standing in front of the door by authenticating permission to open the door via the app otherwise not. This project requires two Internet connections one at raspberry end and other at user end.

II. RELATED WORK DONE

Optimized Door Locking and Unlocking Using IOT is very secure solution for locking and unlocking the door within Wi-Fi range. This system plays a major role in helping reduce the work by using Arduino Yun Board and Android App, especially for children, old aged people and physically challenged. The proposed work is to send a signal to door from a Computer or Tablet or mobile devices by using Arduino Yun Board having Wireless system. This allows the user to lock and unlock a door from inside or outside a house with a Wi-Fi range available. Like Arduino Yun Board Raspberry pi is also interfaced with sensors to obtain related sensor reading data in an Intelligent Door System. They are using Google spreadsheet of owner's Google drive account which communicates with Amazon Web Services IOT by notifying intrusion by sending out email notification to the owner by detecting motion of Door. It logs all the intrusion data into Google spreadsheet of owner's Google drive account. Also using combination of Raspberry pi and GSM, Home Based Security Control System is designed and implemented. Due to GSM, it has very short response time and it covers wide area coverage. So the user can interact with home security system even from a very remote place far from urban areas. The Global System for Mobile communication is used to alert the user by sending and receiving the messages, which is controlled by AT command. Home security system is designed to detect burglary, the image of person is captured by camera and sends to mobile and email as well as alarm gets

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on; and leaking in harmful gas, the smoke caused by fire as such suspicious activity is also detected. Raspberry Pi-3 Model B released in February 2016 with on-board Wi-Fi, Bluetooth and USB Boot capabilities. It includes various features such as ARM compatible central processing unit (CPU) and an on-chip graphics processing unit (GPU, a video-core IV) for IOT Based Home Automation system.

III. SYSTEM ARCHITECTURE

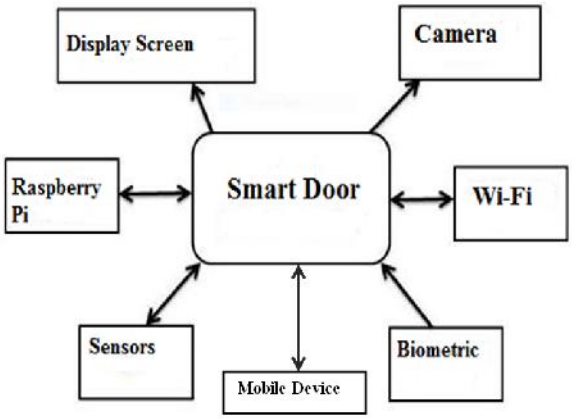

Fig.1 Proposed Architecture

As shown in fig.1, System mainly works on Door using different technologies and different components like Wireless LAN module, Motional Sensors, Raspberry Pi B-3 model, Camera (mostly pi-camera) and display Screen and mobile device. Basically System is featured for security of home implemented for door security having automation in it. Raspberry pi requires 5v DC supply which have in-build Wi-Fi module. Using PIR sensors, it senses the person who is standing in front of Door. PIR sensors sends signals to Camera. Camera captures the picture/image of that person and sends image to user's mobile device using Wi-Fi/GSM module on Raspberry pi. Then using Wi-Fi/GSM user can operate the motion of Door in the range available. These all operations are done on door using these different modules therefore door act as Smart Door. If suddenly system crashes, then Biometric is used as secondary for security purpose.

Smart Door Security System has modules like

- Raspberry Pi-3Model B
- GSM module/Android app
- Wi-Fi Module
- Camera Module

A. Raspberry Pi-3Model B: Raspberry Pi-3Model is the third generation Raspberry Pi. It replaced with Raspberry Pi 2 Model B in February 2016. As of January 2017, Raspberry Pi-3 Model B is the newest version of Raspberry Pi. It is as small as credit card size. Also it is open source therefore changes can be made to it as and when required. Compared to the Raspberry Pi 2, it has 802.11n Wireless LAN as well as Bluetooth 4.1 and Bluetooth Low Energy (BLE). For the Raspberry Pi-3 Model B, CPU speed ranges from 700 MHz to 1.2 GHz and on board memory range from 256 MB to 1 GB RAM.

Fig.2, Raspberry Pi-3Model B

Raspberry Pi-3Model B which uses system on chip (Soc) BCM2835. It does not have storage drive but one can use SD card for storing operating system as well as for booting and long term process. The Raspberry Pi-3Model B runs on Raspbian OS and it is programmed using python 2.7.6. Also one can install various different type of software's for different purposes. Four USB ports for external storage, 40 GPIO pins for interfacing with hardware and full HDMI port are available on Raspberry Pi-3Model B board. It can be also connected to an USB camera which is used as a spy camera. In our System, Raspberry pi which act as a main controller of our system.

Camera is configured with Raspberry pi to capture and store the image. Also sensors are connected directly to raspberry pi configured with motion of door.

B. GSM Module/Android App: GSM is Global System for Mobile communication is used for digital mobile telephony system. GSM module is used to establish communication between a computer and a GSM system. One can use Mobile device having GSM module or Android app for

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Smart Door Security System, it's user's choice. The Global System for Mobile communication is used to alert the user by sending and receiving the messages as controlled by sensors and Raspberry pi. GSM is in-build application in mobile device and it require SIM (Subscriber Identity Module), GSM handset and GSM network. Android app is efficient way to control the system. Using java language one has to develop android app according to system's requirement. Android app requires authorized user. By registering and log-in one can become authorized user. User must have Wi-Fi for operating Android app.

Fig.3, Operating Door lock using Android App

In this module we develop the android app which contains two toggle buttons open and close. If user presses open button, the door is unlocked and if the user presses close button, in the app the door is locked automatically which is operated by Wi-Fi.

C. Wi-Fi Module:

Wi-Fi is a technology for wireless local area networking with devices based on the IEEE 802.11 standards. Devices that can use Wi-Fi technology include personal computers, video-game consoles, phones and tablets, digital cameras, smart TVs, digital audio players and modern printers. Wi-Fi compatible devices can connect to the Internet via a WLAN and a wireless access point. Wi-Fi, or 802.11, is a wireless protocol that was built with the intent of replacing Ethernet using wireless communication over unlicensed bands. Its goal was to provide off-the-shelf, easy to implement, easy to use short-range wireless connectivity with cross-vendor interoperability. Wi-Fi is an obvious choice for IOT connectivity because in-building Wi-Fi coverage is now almost ubiquitous. This system uses Wi-Fi module on both side at user side for accessing the door from anywhere and also at Raspberry pi to control system.

D. Camera Module: According to user convince, user can use web camera or pi-camera. Web camera have minimum 16 MP interpolated resolution also plug and play USB interface which can be configured with raspberry pi which is already connected with door. The Camera Module is a great accessory for the Raspberry Pi, allowing users to take still pictures and record video in full HD.

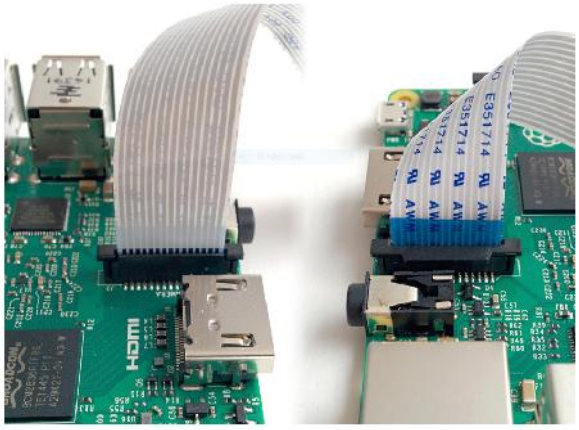
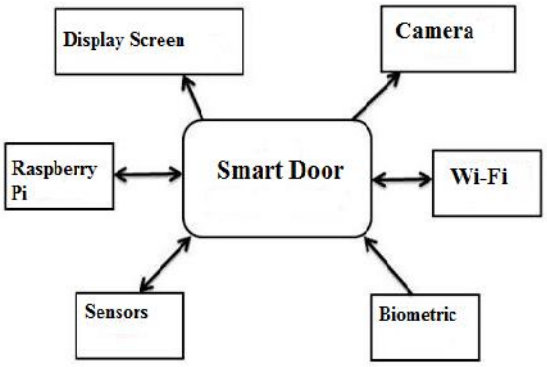


Fig.4, Locating camera port and connect the camera

Starting with Raspberry-pi camera, one need to go to settings and configure it accordingly. Raspberry Pi-3Model B has in-built Camera interface (CSI). To capture the picture, we need to save file as camera.py and need proper and correct python coding. Run the code and camera preview open for 5 seconds before capturing a picture and adjust to a different resolution momentarily as the picture is taken. As it is connected with sensors and door, it senses the person in front of door and capture the image and store it. Then captured image is send to users Android App.



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IV. FLOWCHART AND ALGORITHM

Flow of working of the system and flow of the programme are shown in these following steps:

Steps Included:

I. Start.
II. Initialization of Raspberry pi, Camera, Sensors.
III. If any person comes, camera captures the picture/image and sends to the user's mobile device.
IV. User gets notification and opens/closes door according to his/her convenience.
V. If system crashes go to step (VI).
VI. Backup plan(biometric)
VII. End.

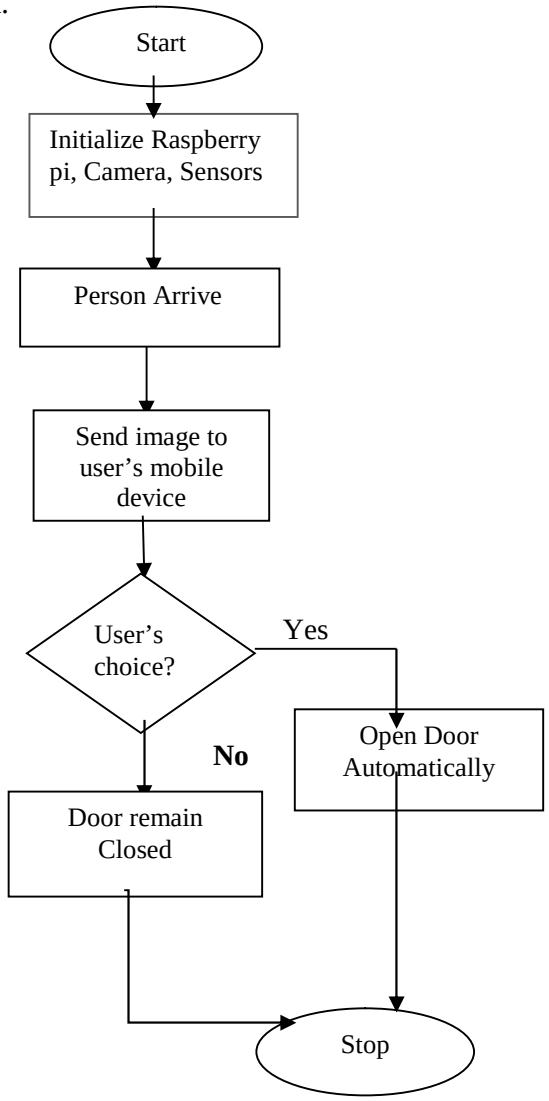

Fig.5, Flowchart

Initialize Rpi, camera, sensors. If user stands in front of door, then he has to give access to the door through his/her mobile. If guest is appeared, then by sensing person camera capture the image of person and sends to authorized users android app. If user want that person go inside the home, then by pressing one toggle button on app open the door for that person else user give some message for that person and door remain closed.

V. CONCLUSION

We designed the System which reduces human efforts and provide security. Proposed system is cheap, reliable and components are easily available. It is also portable and easily upgradable. System provides Security locks for door, comfort, connivance security and energy efficiency for user. Raspberry Pi-3Model B operates and controls motion detector and cameras for capturing the image of the guest. The security level is increased due to the usage of Raspberry Pi-3Model B which sends the images to the user. It has in built capabilities of connecting to external devices. Raspberry pi proves to be smart economic and efficient platform for implementing the home security system and for automation. Two advantages provided by the system is that, Necessary action can be taken in short span of time. Biometric is used as back-up plan. For Future Enhancement - Retina Scanner can be used instead of biometric.

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