# DOOR AUTOMATION AND VISITOR NOTIFICATION USING IOT

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**Abstract -** This proposed system is related to the home security system which is used for the doorbell notification purpose. This system could be upgraded easily to make the various functional systems like industrial automation, fire detection, and safety control. The proposed system detects the visitor outer the door. By capturing an image of visitor an email will be directly sent to the owner. For any security system authentication is the important factor. In the proposed system an Android phone is the main media for authentication and receiving the notification of visitor via email. The proposed system can be authenticated by just one click which gives access to the visitor. This system is connected to the cloud via the internet. An Android application provides authenticated information to the cloud and Raspberry retrieves it. On the basis of data, proper action of authentication takes place. The proposed system stores visitors pictures online as well as offline so the owner can get the past year history of the visitor. This system has 97 % accuracy and 3 % inaccuracy. It may occur due to the network problem. So overall system is sustainable and having good future scopefor various applications.

**Keywords -** Internet of Things, Raspberry Pi 3, Cloud, Email, Android Application, Home Automation.

## I. INTRODUCTION

It is difficult to analyze who is standing outer the door without opening the door [1]. While we are doing the work in the kitchen or doing an important work of the office, it's so time-consuming to open the door or make watch on the person who is standing outer the door. Also, if we are outside the state or country, there is a need to allow servant or known people in the home [2]. So this system permits you to identify who is at your door & whether to allow this person or not by just one click of a button. Nowadays home security plays a significant task in the society [3] so there is a requirement of the system which provides the appropriate security 24 hours [4]. There are numbers of security systems present in the market, but they are not linked to the cloud [5]. For communication, the Media is needed, which is having a large range. So internet [6] is the biggest communication media presence in the world, hence it is easy to use the technology like an Internet of Things [7]. A cloud server is used which is at the remote location. On this cloud server, data is stored and retrieved by handheld devices [8]. In our projected system, one device is storing the data to the cloud and another device is retrieving the data from the cloud [9]. So as compared to other technology this technology is fast and user-friendly. Also, the system is used for home monitoring by converting it into the CCTV [10]. Research shows that very few homes in the world have a smart doorbell system. If any burglaries occur at home, then we can directly forward mail [11] to the police station with the picture attached.

## II. METHODOLOGY

### 1. Block Diagram
The proposed System made of the various subparts like Raspberry Pi, Camera, Ultrasonic sensor, Ethernet cable, Doorbell, Speaker, Motor driver circuit, and motor. Raspberry Pi requires the 5V power supply which can be given by the adapter. Also, it has a special camera which can be of 5, 8 MP. This camera is directly attached to the camera port of Raspberry Pi. The speaker is connected to a Raspberry Pi for giving instruction to the user in audio format. Raspberry Pi has an Ethernet shield and Ethernet cable is to be connected to it for providing internet. We have used Ultrasonic Sensor for detection purpose and set it to 100 cm distance. Raspberry Pi has 40 gpio pins to which different sensors can be connected. Locking, unlocking of the door can be done by Motor. For driving this motor we have designed a motor driving circuit using L293D. This motor driver circuit connected to the pins of a Raspberry Pi. For Doorbell, the electric buzzer is to the gpio pins the Raspberry Pi.
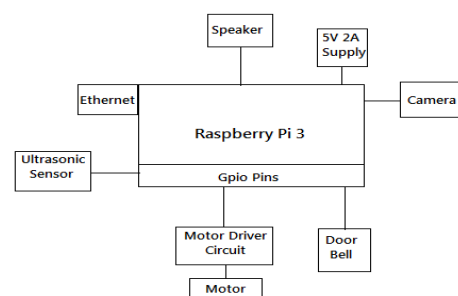


**Figure1: Block diagram of system**

### 2. Hardware Prototype
• **Raspberry Pi**



**Figure2: Raspberry Pi 3**

This Proposed system has a major component as Raspberry Pi 3. It has 4 USB ports and mouse, keyboard, pen drive can be connected to it, also it has an Ethernet compatible port to which we can connect Ethernet cable. Raspberry Pi 3 has 40 gpio pins and we can connect various sensors like ultrasonic, air, temperature, moisture, etc to it. Raspberry Pi has two special slots to which we can connect Pi camera and screen touch display. Also, for installing the OS and storing the program, we require a memory card of 8 GB. We can use Raspberry Pi as a music system. It has 3.5 mm audio jack to which we can connect headphones, home theater [12]. Raspberry Pi has power slot, we can connect 5V 2A charger to it also we can design separate power circuit for it. Raspberry Pi has HDMI port by which we can connect it to the projector, external desktop.
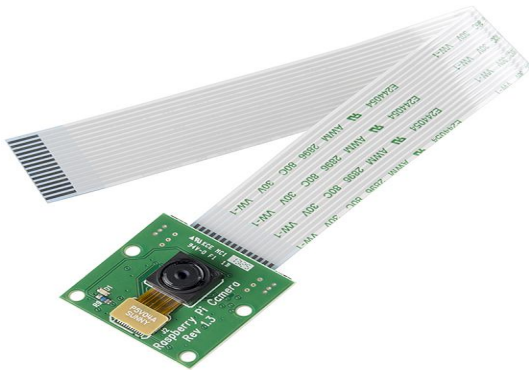
- **Pi Camera**



**Figure3: Pi Camera**

Raspberry Pi has a slot for the camera. The Pi camera is directly coupled to the camera slot of Raspberry Pi. The camera is available of 5 MP, 8 MP. In the proposed system 5 MP Camera is used. Raspberry Pi has an inbuilt command for the Pi camera so it becomes easy to capture the image using a Pi camera as compared to the web camera. For using this camera we have to enable camera from the Raspberry Pi configuration. A camera is installed above the door at the center.

- **Ultrasonic Sensor**



**Figure4: Ultrasonic Sensor**

Visitor detection can take place using HC-SR04. It has a range of 5 meters. The sensor is installed above the door in an inclined manner. This sensor works on the 40 kHz frequency. It has four purposeful pins trig, echo, Vcc, and gnd. Vcc and ground are directly connected at the Vcc and gnd of Raspberry Pi and trig and echo is connected to respected gpio pin of the Raspberry Pi. The transmitter transmits the sound wave of 40 kHz and after reflection by an obstacle, it is received at receiving section. By the program, transmitted and reflected time is calculated and converted into the distance. By setting the 100-centimeter distance we can detect the visitor standing outside the door.
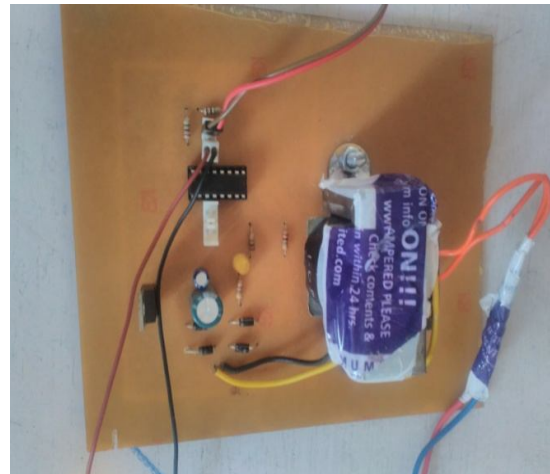
- **Motor Driver Circuit**



**Figure5: Motor Driving Circuit**

For implementing locking and unlocking mechanism, the motor is used. To the motor metallic rod is connected. When the motor rotates in clockwise at 90 degrees, then automatically the door will lock and when the motor rotates in anticlockwise at 90 degrees, then automatically the door will unlock. But for driving this motor we have to use motor driving circuit because Raspberry Pi has 5V output and motor requires 12 V. The Motor driving circuit is built with L293D. The 12V transformer is used for conversion of 230V AC to 12V DC and this is provided the rectifier circuit. The rectifier circuit has an output of 12V DC which given to the L293D. According to the output from Raspberry Pi, L293D drives the motor anticlockwise and clockwise at 12V.

**3. Flow diagram of system**
This is the flow process of the system. All actions take place sequentially. At the start, person detection takes place using the ultrasonic sensor. If a visitor is detected, then the bell will ring and the image will be captured. Then this captured image is sent to the owner's email. The Email will come with notification and sound on android mobile. The owner can authenticate visitor by use of Android app. The designed Android application has two buttons first is UNLOCK and the second is a LOCK. If the owner wants to authenticate the visitor then the owner can press the UNLOCK button and the lock will open so

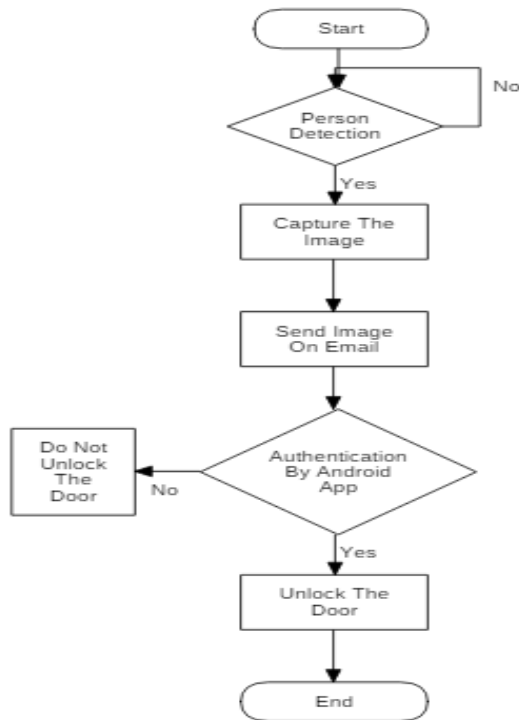visitors can enter in the home. If owner pressed a LOCK button, then the door will be locked.



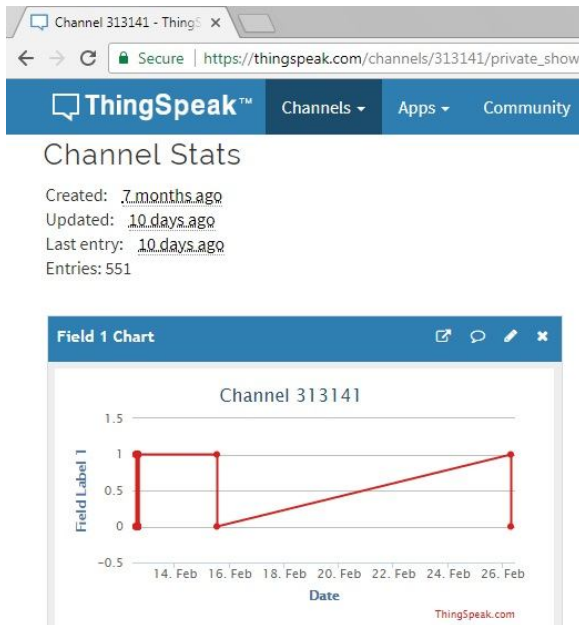**Figure6: Flow diagram of system**

## 4. Thingspeak Cloud



**Figure7: Thingspeak Cloud GUI**

The system uses the Thingspeak cloud. Data can be sent and retrieved from the cloud by android application, Raspberry Pi, and various devices. By use of android application data '1' and '0' are directed to the Thingspeak cloud and another side Raspberry Pi is used to retrieve the data from the

Thingspeak cloud for locking and unlocking function of the door. The cloud has a specific channel id and read, write API key by which the data is sentand retrieved from the cloud within few seconds.
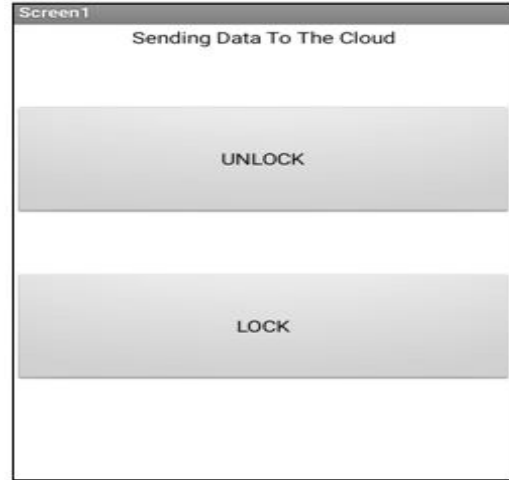
## 5. Android Application Design



**Figure8: Android Application**

This Android application is designed online using App Inventor software. This software is easy to use. It has drag and drops option for GUI creation and blocks for the backend programming. Two buttons UNLOCK and LOCK is provided with the required size. A particular action is provided for these buttons. When UNLOCK button is pressed, Web Viewer will go to the URL which contains data "1" and when the LOCK button is clicked, it will go to the URL which contains data "0". On another side, Raspberry Pi is continually retrieving the required data from the Thingspeakcloud. If '1' is detected, then the door will unlock and if '0' is detected then the door will lock.

## III. HARDWARE IMPLEMENTATION



**Figure9: Front View of Proposed Model**

The actual proposed model of the home has an operational door. At the door, the locking

functionality is provided by the motor. Raspberry Pi, Camera, Ultrasonic sensor, sound, motor driving circuit and motor are installed at their expected position. When motor moves clockwise in 90 degrees, then the door will be locked and when the motor moves anticlockwise in 90 degrees, then the door will be unlocked. The electric buzzer is connected to the Raspberry Pi. When Visitor will be detected, then the buzzer will ring. The sound is connected for providing instructions to the visitor.



**Figure10: Hardware Implementation of System**

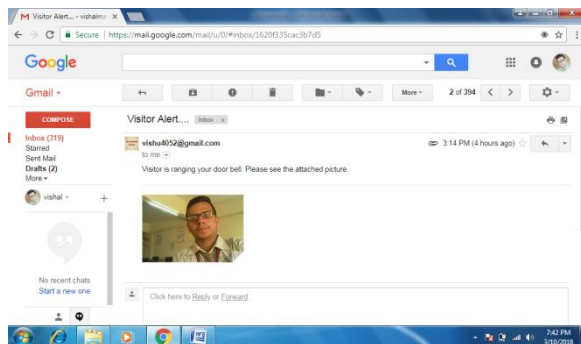## IV. OUTPUT- NOTIFICATION VIA EMAIL



**Figure11: Visitor Notification**

This is the output of our system. The notification came via email. When the visitor detected, the image will be captured and sent to the email. For sending the email we have already included owners' email inside the program with the subject. While running the email script, it will directly include the captured pictures of a visitor as an attachment and send to the owner's email. If owner authenticates the visitor then the door will open.

## V. APPLICATIONS

- Home security and surveillance
- Locker Security with face recognition
- Gate Automation with visitor count and notification
- Fire Detection with notification to the fire brigade.

## CONCLUSION

This proposed system provides security to the home by notification via email and unlocking, locking of the door by the use of cloud and android application. So the person anywhere present in the whole world can get notification of a visitor and allow or restrict visitor as per the choice of the owner. This system can be implemented at the office, industry, malls and high-security area with high sustainability.

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