Intelligent Home Access Control System Based on Visual Authentication

Prof. Mrs. S. S. Sankpal

Associate Professor

Dept. of Electronics & Telecommunication Engg.

P. V. P. I. T. Budhgaon, Sangli, India

Ms. Vijaya Prakash Phalle

Dept. of Electronics & Telecommunication Engg.

P. V. P. I. T. Budhgaon, Sangli, India.

Abstract — In the present age Internet of things (IOT) has entered a golden era of rapid growth. The Internet of things is a concept that aims to extend the benefits of the regular Internet—constant connectivity, remote control ability, data sharing, and so on to goods in the physical world. Everyday things are getting connected with the internet. The Internet of Things (IoT) is entering the daily operation of many industries, applications include but are not limited to smart cities, smart grids, smart homes, physical security, e-health, asset management, and logistics. This concept can be used to manage the security concerned issues in a cost effective way. In this work a system is being developed to connect any door with the internet, so that the access control system can be controlled from anywhere in the world. In a case that one is not at home and a visitor is at his door steps then the authorized person will be notified about the visitor via alert message and the person can see the visitor from the web through the camera from anywhere and the system will take a picture of the visitor and keep a record by sending an attachment through E-mail. The door lock can be controlled through the internet. With the help of this system an evidence of the visitor can be kept as a record if any emergency case or situation occurs.

Keywords- Internet of things, Raspberry-pi, Wi-Fi module, web server.

I. INTRODUCTION

Smart home security control system has become indispensable in daily life. The design and development of a home security system, based on human face recognition technology and remotely monitoring technology, to confirm visitor identity and to control door accessibility has been reported in this report. People always remain busy in their day to day work also wants to ensure their safety of their beloved things. Sometimes they forget to look after their necessary things like keys, wallet, credit cards etc. Without these, they are unable to access their home or any place they want. To prevent such incidents many scholars came into action and tried to prohibit them. Like Hyoung-Ro Lee; Chi-Ho Lin; Won-Jong Kim, sed Visitor Detection System", IEEE Conference Publications, International SoC Design Conference,2016 [1].

II. LITERATURE SURVEY

Hyoung-Ro Lee et al [1] developed an IoT-based visitor detection system using IR sensor and two ultrasonic sensors to locate the visitor. It controls the servo motor to change the director of the camera for correct recording of visitors. It can also track the moving visitor to minimize the blind spots of the camera. And the recorded video and sensor data can be checked from any remote location using web browser. Mrutyunjaya Sahani et al [2] design and implement an interactive home security system with the GSM, ZigBee communication and Web-enabled measurement and control systems. The Web based monitor and automatic control of equipment is forming a trend in automation field. Replacing PC with low-cost single chip processor which can make administrators to get parameters of different remote devices and send control information to field equipment's at any time through Internet. Rakesh V S et al [3] developed the system which proposes the design and implementation of an event based security surveillance system for an intelligent building or a smart home. A WSN, a camera an FTP server are utilized for the better security surveillance inside a building. The traditional system is modified to a new type of smart security system with SMS alerting on intruder detection and fire detection. Zigbee technology used in the WSN achieves a low-cost, low-power wireless communication network. WANG Zai-ying, CHEN Liu [4] developed the mobile phone video surveillance system based on Embedded System, integrates multiple functions of monitoring system, which meets the development trend of embedded, miniaturization, integration and intelligent. The server uses the embedded technology based on ARM, which improves the cost-effective and stability of the monitoring equipment. The user can have a real-time understanding of the monitored environment through the 3G video transmission, and take measures on the abnormal condition in the first time, which improves the monitoring efficiency. Jae Hoon Lee et al [5] design a new algorithm to track and count people is proposed, and a security door system using the proposed method to detect trespasser around entrance was developed. Multiple Laser Range Finders are employed to detect the people passing a door. Multi-target tracking technology with Kalman filter was applied to track human objects in motion and count their number in the region of interest. Motion model and geometric feature of human is also considered for detecting the walking humans. Experiments for various cases of tracking and counting people are performed to verify the availability for security application. Also, a real system is developed and installed into the real environment. Yanbo Zhao and Zhaohui Ye [6] developed the design and the implementation of a wireless home security system. PSoC devices and wireless transceiver modules are adopted. The system has a friendly user interface and employs some methods to reduce the power consumption. Communication of the system is complete wireless, which

makes the system easy to install and use. The system is low cost, low power consumption and easily operable.
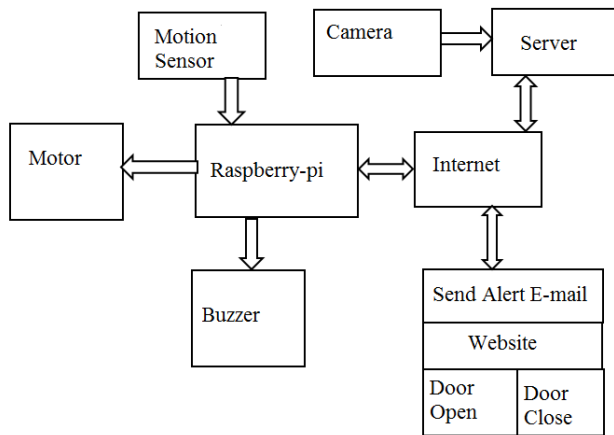
III. PRAPOSED WORK

Figure 1. Block diagram of system

System Operation

- In this system the first step is to get the image of visitor when he press the bell.
- When visitor press the bell it will generate a signal to raspberry pi indicating presence of a person. And the camera will capture the image and it will give to the raspberry pi.
- The Raspberry-pi will send email of the captured image to house owner through Raspberry-pi Wi-Fi.
- In this system magnetic switch is used.
- If any thief tries to break into the house then magnetic switch will get open and buzzer will get ON.
- After getting the alert email, owner see the captured image of visitor.
- If owner wants to open the door for visitor after getting his image, he has to click on the link which present in the email.
- Website is created to open or close the door. For that HTML, PHP language required.

1. WEB server
   - User ID and password is provided.
   - On the Email, we see details of visitors came at home.

a) Design steps
   i. Selection of main component of system Raspberry pi.
   ii.   Magnetic switch selection.
   iii. Interfacing of sensor and raspberry pi.
   iv. For capturing image, camera is used and it is connected to Raspberry pi.
   v. Algorithm developing.
   vi. On the server side, website is developed to connect system unit and web server.
   vii. All system is connected through raspberry pi.
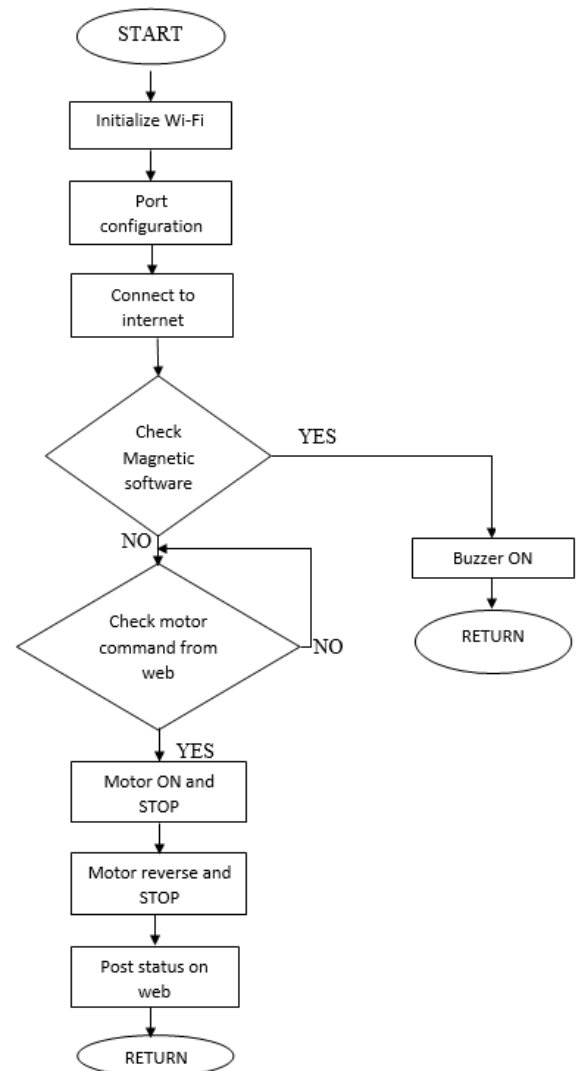
b) Flow Chart
   a) Hardware Flowchart

Figure 2. Flow chart of Hardware system

When we start the hardware first it will initialize Wi-Fi of the system. After that it will check the port configurations. Then it will connect all the components to the internet. When system connect all the components to the internet, it will check for magnetic software. If magnetic software is working correct then it will turn ON buzzer circuit. After that circuit will check for motor command which was come from owners email id. When motor command comes positively it will ON motor which means it will open the door and stop for some time. If motor command comes negatively then it will wait for motor command come. After motor get turn ON and stop, motor will drive in reverse direction which means door will close.

b) Software Flowchart

When we start the system, first it will initialize the server and then camera. After that it will initialize the Wi-Fi and then check the all connection and setup of system. If all is ok then it will go to the visual basic software inputs to check. If all is not ok, then the system will go to the first step. After checking visual basic software inputs it will turn ON camera. After camera get ON it will wait for motion. When motion is detected to the camera it will capture the image and save this image in the system. When image is saved system will check for the Wi-Fi connection and server setting. After that it will

send the captured image to the authorized email id which is already present in the system.
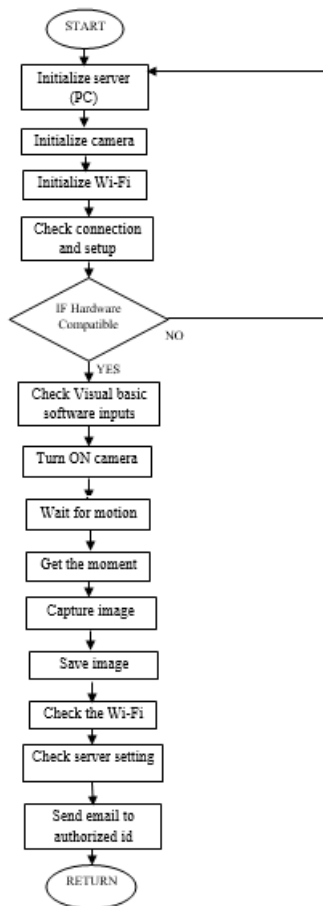
c) Component Details

i. In this system main component is Raspberry Pi Model B. This is 512Mb RAM, 2 USB ports and an Ethernet port. It has a Broadcom BCM2835system on a chip which includes an ARM1176JZF-S700 MHz processor, Video Core IV GPU, and an SD card. It has a fast 3D core accessed using the supplied OpenGL ES2.0 and Open VG libraries. The chip specifically provides HDMI and there is no VGA sup-port. The foundation provides Debian and Arch Linux ARM distributions and also Python as the main programming language, with the support for BBCBASIC, C and Perl.

ii. A relay is an electromagnetic switch operated by a relatively small electric current that can turn on or off a much larger electric current. The heart of a relay is an electromagnet (a coil of wire that becomes a temporary magnet when electricity flows through it). You can think of a relay as a kind of electric lever: switch it on with a tiny current and it switches on ("leverages") another appliance using a much bigger current. As the name suggests, many sensors are incredibly sensitive pieces of electronic equipment and produce only small electric currents. But often we need them to drive bigger pieces of apparatus that use bigger currents. Relays bridge the gap, making it possible for small currents to activate larger ones. That means relays can work either as switches (turning things on and off) or as amplifiers (converting small currents into larger ones).

iii. Geared DC motors can be defined as an extension of DC motor which already had its Insight details demystified. A geared DC Motor has a gear assembly attached to the motor. The speed of motor is counted in terms of rotations of the shaft per minute and is termed as RPM .The gear assembly helps in increasing the torque and reducing the speed. Using the correct combination of gears in a gear motor, its speed can be reduced to any desirable figure. This concept where gears reduce the speed of the vehicle but increase its torque is known as gear reduction. This Insight will explore all the minor and major details that make the gear head and hence the working of geared DC motor.

iv. IC L293D works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As you know voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction, hence H-bridge IC are ideal for driving a DC motor. In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due its size it is very much used in robotic application for controlling DC motors. Given below is the pin diagram of a L293D motor controller. There are two Enable pins on l293d. Pin 1 and pin 9, for being able to drive the motor, the pin 1 and 9 need to be high. For driving the motor with left H-bridge you need to enable pin 1 to high. And for right H-Bridge you need to make the pin 9 to high. If anyone of the either pin1 or pin9 goes low then the motor in the corresponding section will suspend working. It's like a switch.

d) Designing of website

Using PHP and .NET languages we design the website. PHP is an acronym for "PHP, Hypertext Preprocessor". PHP is a widely-used, open source scripting language. PHP scripts are executed on the server. The .Net framework applications are multi-platform applications. The framework has been designed in such a way that it can be used from any of the following languages: C#, C++, Visual Basic, Jscript, COBOL, etc. All these languages can access the framework as well as communicate with each other.
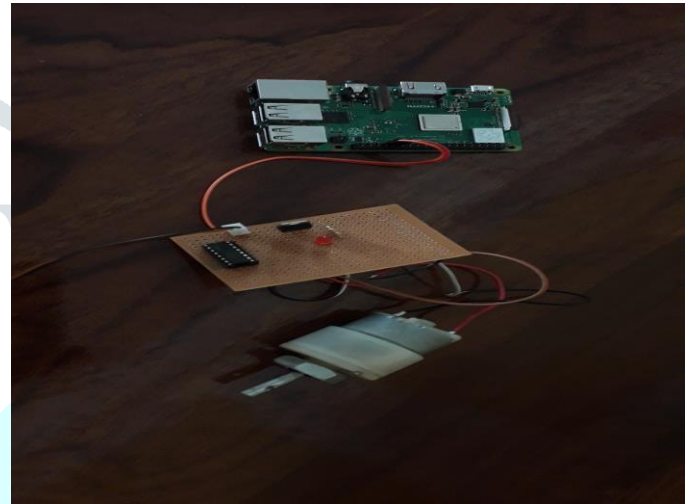
III. SYSTEM DISCRIPTION

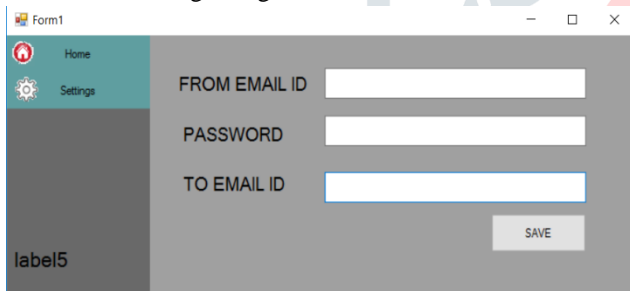#### A. Face adding and saving Module
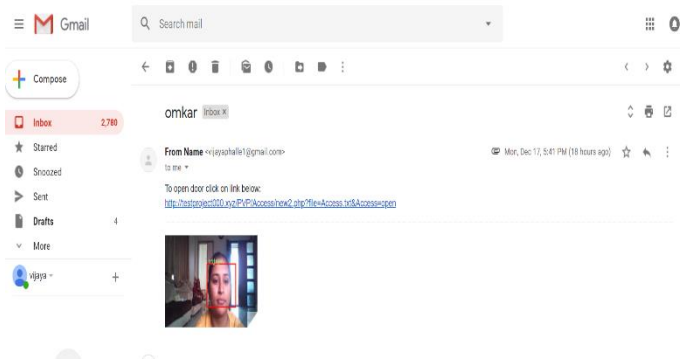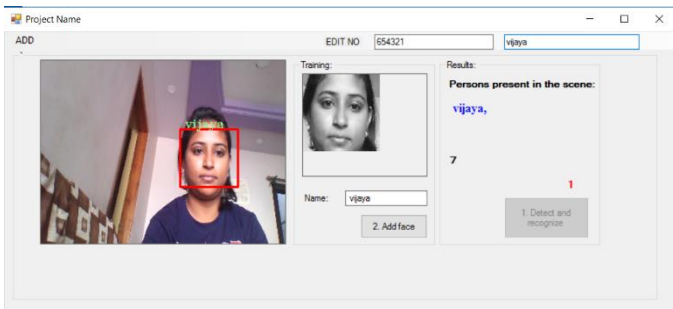
In this face adding and saving module, we can add and save the face of persons which are our family members or relatives. To add the face of person first we have to enter the password of the module. After that to add the name, enter the name of that person in the space which is given in this module. After that click on the add face button. When we click on the add face button we can see one window which show the face of that person will get added on this system. Also this module indicate the presence of the persons in the scene. Also in this system we can add the name of such persons, for which we want to open door automatically. For example, if we want to open door automatically for family members, then add the name of that persons in the name bar which is present in this module next to the edit number bar. We can add more than one name using comma.
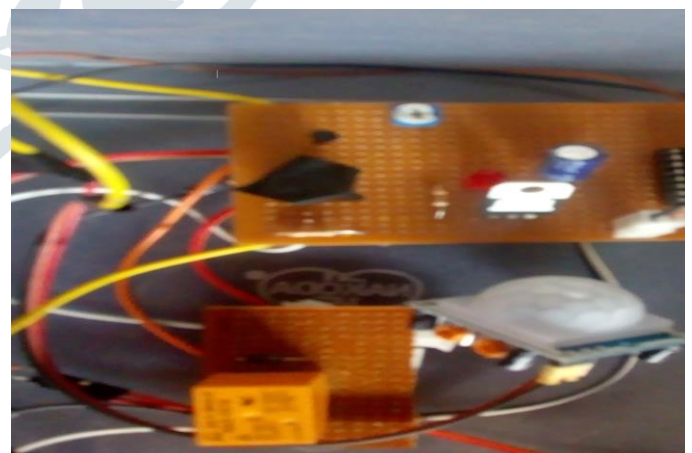
B. Login Page

This is the login page used to send the captured image. First to send image we have to enter the email id of raspberry pi and house owner. After adding email ids and password save it using save button. When camera capture the image of visitor, image will send automatically to the given owner email id. When we start to add these all email ids and password timer is start. We have 30 seconds to add all this email ids and password.

C. Sending E-mail

In this system email of captured image will send to the email id which we added in the login page. When owner got the email of visitor image, owner also get one link above the image. This is the link from which owner open door for the visitor. If owner want to open door for the visitor which is shown in email, then he has to click on that link. When owner click on this link door will get open for that visitor. Here, some timer is given for the door open and then close.

IV. Implementation of system

In the above circuit, we can see the raspberry pi, motor, and IC L293D and power supply circuit. The IC circuit is connect the raspberry pi. Here, IC is used for the motor rotate. When owner click on link to open door, then this motor will rotate to turn on door. Then motor will wait for some time and then rotate anti-clock wise direction to close door.

The above image is the buzzer circuit image. In this circuit Motion sensor is used. This motion sensor is placed inside the house for door and windows. When anyone tries to enter in the house without house owner permission then this motion sensor will sense the presence of the person and buzzer will get ON. For this buzzer circuit relay and transistor is used. Here, relay is connected to normally ON and transistor is used as a switch.

V. CONCLUSION

Intelligent home access control system based on visual authentication is useful for visitor identification. This system operate automatically. Communication of system is completely wireless, which makes the system easy to install and use. Raspberry pi used in this system is very low cost, low power consumption. In addition, raspberry pi is also enable to take video and audio rather than just take picture. As a result, the system can lightly can be expanded to other application. This system will take picture of visitor automatically when he press bell. And send this picture to the house owner email id. House owner can open door from email id by clicking on link which provided with picture on owners email id. The system is secured with a login password. We can operate this system anywhere from the world.

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