

An Intelligent Automate Door Access Control and Home Security System Based on Face Recognition

KEERTHANA CHALLA¹, KAVITHA BODDUPALLY², MAYA LAKHA³

¹PG Scholar, Dept of ECE, SWEC, Hyderabad, TS, India.

²Assistant Professor, Dept of ECE, SWEC, Hyderabad, TS, India.

³Professor, Dept of ECE, SWEC, Hyderabad, TS, India.

Abstract: 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 paper. This paper describes about the implementation and deployment of wireless control system and accessibility in to a home environment for authenticated people only. A wireless network technique RASPBERRY PI module based and image processing technique PCA based, dedicatedly make the security system alive as per the request. RASPBERRY PI module and electromagnetic door lock module combined operate the door accessibility, has been designed and developed. Whenever PIR sensor senses USB camera will capture the image where it is placed and it will send through E-mail. Based up on that image. The user will operate the doors to access the rooms or if any unwanted people access the buzzer will rise.

Keywords: Raspberry Pi, PIR USB Camera.

I. INTRODUCTION

In the present age RASPBERRY PI has entered a golden era of rapid growth. The RASPBERRY PI 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. This concept can be used to manage the security concerned issues in a cost effective way. In this paper 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 twitter 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. If the authorized person wants to give a message the visitor it can be sent easily through the internet and it will appear in a screen on the front face of the door. The door lock can be controlled through the internet.

II. FUNCTIONAL PRINIPLE

Although these techniques are all successful in detecting objects, they are not capable of understanding the type and the intention of the objects. This calls for the need of an automatic door control system based on the detection and intention analysis of people. In door control is based on the confirmation that the detected object is indeed a human and the corresponding movement trajectory also indicates that he/she has the intention to go through the entrance.

Furthermore, an infrared function has been added to prevent people from being trapped by the door before they leave the passage. In addition, the captured images can also be saved for other applications such as customer analysis and crime investigation. Most of the doors are controlled by persons with the use of keys, security cards, password or pattern to open the door. To help users for improvement of the door security of sensitive locations by using face detection and recognition. Face is a complex multidimensional structure and needs good computing techniques for detection and recognition namely face detection, face recognition and automatic door access control. Face detection is the process of detecting the region of face in an image. If a face is recognized, it is known, else it is unknown. The door will open automatically for the known person due to the command of the microcontroller. On the other hand, alarm will ring for the unknown person. Since reduces the dimensions of face images without losing important features, facial images for many persons can be stored in the database. Although many training images are used, computational efficiency cannot be decreased significantly. Therefore, face recognition using PCA can be more useful for door security system than other face recognition schemes.

III. BLOCK DIAGRAM DESCPRTION

A. Software

The software is used to design and developed is QT creator which is used to make efficient GUI application. Qt Creator is a good example of an application that mixes different user interface technologies. In fact, it uses all of the three different

approaches described below. Qt Creator uses the traditional Qt Widgets such as menus and dialogs as a basis of the user interface, Qt Quick amongst others for the welcome screen, and Qt WebKit for presenting the Qt reference documentation. Qt Creator includes a project manager that uses a cross platform project file format (.pro). A project file can contain information such as what files are included into the project, custom build steps and settings for running the applications. Qt Creator includes a code editor and integrates Qt Designer for designing and building graphical user interfaces (GUIs) from Qt widgets. The code editor can parse code in C++ and QML languages... It is possible to compose and customize the widgets or dialogs and test those using different styles and resolutions directly in the editor as shown in Fig.1. Widgets and forms created with Qt Designer are integrated with programmed code, using the Qt signals and slots mechanism.

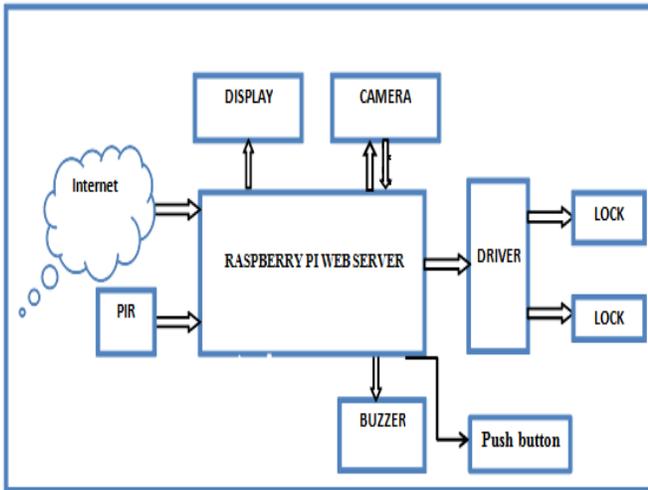


Fig. 1. Block Diagram.



Fig.2. Raspberry Pi Board.

B. Hardware

Raspberry Pi (ARM 11): The Raspberry Pi is a credit-card sized computer that plugs into your TV and keyboard. It is a capable for little projects, and for many of the things that your desktop PC does, like spreadsheets, word-processing and games. It also plays high-definition videos. We want to see it being used by kids all over the world to learn how computers

work, how to manipulate the electronic world around them and, how to program as shown in Fig.2. The original Raspberry Pi is based on the Broadcom BCM2835 system on a chip (SoC), which includes, Video Core IV GPU, RAM of 512 MB. The system has Secure Digital (SD) socket for boot media and persistent storage. A SoC consists of the hardware, described above, and the software controlling the microcontroller, microprocessor or DSP cores, peripherals and interfaces. The design flow for Soc aims to develop this hardware and software in parallel.

USB Camera: Camera plays a vital role in automation purpose. The camera is used for monitoring of a room from a remote place as shown in Fig.3. The camera used is a USB camera. Whenever the user clicks on to video button on loaded webpage, the corresponding room video will be streamed on to webpage .For this purpose we use a MJPG streamer. The below figure shows the camera that has been used for monitoring of a room.

Features of Camera:

- Hear more clearly: This microphone produces quality audio.
- See more detail: It contains a VGA video sensor for a clear image. It also adjusts for low-light condition.
- Universal attachment base: Works on your PC, desktop.
- Easy to use: Set up in minutes with plug and play.
- Resolution: motion video (0.31 mega pixel i.e. 640*480 pixel)
- Supported interface: USB
- Imaging features: fixed focus and automatic image adjustment with manual override.
- Field of view: 59 degree diagonal field of view.
- Sensor present in it is CMOS VGA technology.
- The camera also comes with integrated microphone



Fig.3. USB Camera.

L293D: A motor Driver is a device or group of devices that serves to govern in some predetermined manner the performance of an electric motor. A motor controller might include a manual or automatic means for starting and stopping the motor, selecting forward or reverse rotation, selecting and regulating the speed, regulating or limiting the torque, and protecting against overloads and faults.

DC Geared Motors: 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 as shown in Fig.4. The gear assembly helps in

An Intelligent Automate Door Access Control and Home Security System Based on Face Recognition

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.

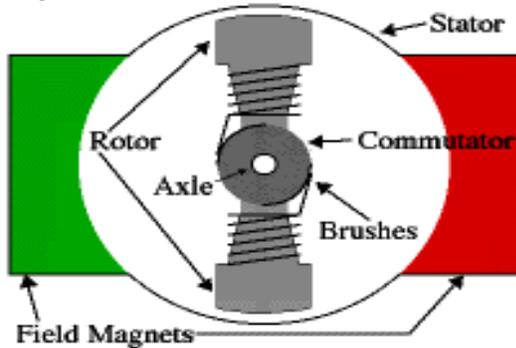


Fig.4. DC Motor.

PIR: A passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors. All objects with a temperature above absolute zero emit heat energy in the form of radiation. Usually this radiation is invisible to the human eye because it radiates at infrared wavelengths, but it can be detected by electronic devices designed for such a purpose as shown in Fig.5.

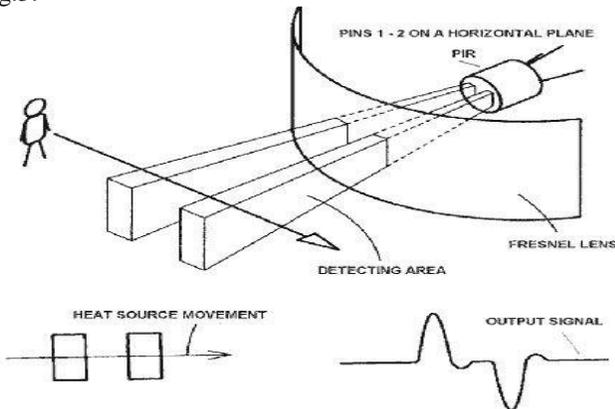


Fig.5. PIR sensor working.

Buzzer: A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke as shown in Fig.6.



Fig.6. Buzzer.

IV. IMPLEMENTATION RESULTS

When the captured image is recognized as the authenticated person, door motor is rotated with the forward direction until the activated. When the sensor 1 is activated, the door motor is stopped as shown in Fig.7. After 2 seconds, door motor is rotated with reverse direction until activated.



Fig.7. Detecting image.

After that we can see in the LCD mail sent.



Fig.8. Sending Mail.

Here we can see the raspberry pi is sending the captured image to our mail as shown in Fig.8. It is the captured image in front the door. Image sending to the mail. raberrysudo@gmail.com. to k,e,r,t,h,a,n,c,l,o,9,m,l,o Somebody waiting at the door.

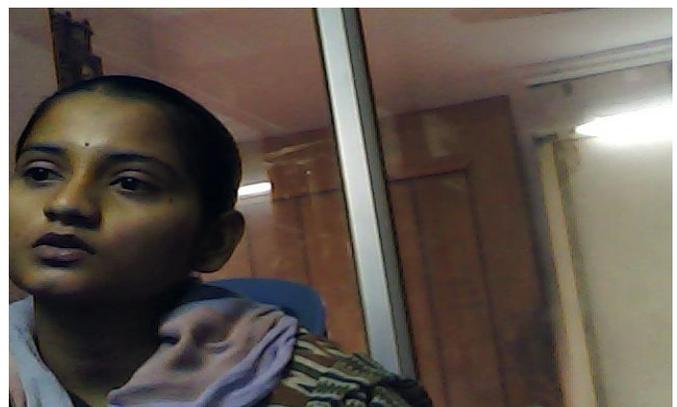


Fig.9. Captured Image.

Now we can see that after the person entered in the room as shown in Fig.9. The person is forcedly opening the door that time the push button is pressed then the buzzer will be raised. Again the msg will send to the users mail address through raspberry pi web server and internet using GPRS modem. raberrysudo@gmail.com, to k,e,r,t,h,a,n., c,l,0,9,g,m, I,o Somebody trying to open the door.

V. CONCLUSION & FUTURE SCOPE

The automatic door open system through mail fabricated and tested. The result was what we expected that is, the motor and circuit was compatible with each other with the door opening. The motor was able to move the door from one end to the other and smoothly. We learned many skills such as welding, wiring the circuit and other tools that we use for this project. In other words, we found more good than bad from this system because it is safer and more secure and it is able to keep the people who are working. This helped in reducing the cost spent in construction of automated doors. This project has lot of future scope like the same way we can construct a sliding door with a security system by attaching a keypad to enter password and then providing the access to the person into that house. In future this can be enhanced interfacing a counting arrangement for keeping a record of entry and exit of people at a particular place

- High power and faster mechanisms can be used with availability of better power supply.
- We also realized that properly organizing the work and working as a team can help in time management. This can result in more efficient and effective outputs.
- We can install solar panel for saving of electricity as well we can also install the rain sensor to opening and closing the window.
- Internet of households where we can attach other devices of house with internet.
- Automated fire exit systems can be build.
- Improvement in the security issues in highly re- strict areas.

VI. REFERENCES

- [1]Rahman, M.T.; Kehtarnavaz, N. Real-time face-priority auto focus for digital and cell-phone cameras. *IEEE Trans. Consum. Electron.* 2008, 54, 1506–1513.
- [2]Zuo, F.; With, P. Real-time embedded face recognition for smart home. *IEEE Trans. Consum. Electron.* 2005, 51, 183–190.
- [3]Zeng, C. Robust Head-Shoulder Detection by PCA-Based Multilevel HOG-LBP Detector for People Counting. In *Proceedings of the IEEE International Conference on Pattern Recognition, Beijing, China, 23–26 August 2010*; pp. 2069–2072.
- [4]Yang, M.H.; David, J.K.; Ahuja, N. Detecting faces in image: A survey. *IEEE Trans. Pattern Anal. Mach. Intell.* 2002, 24, 34–58.
- [5]Yang, G.; Huang, T.S. Human face detection in complex background. *Pattern Recognit.* 1994, 27, 53–63.
- [6]Yow, K.C.; Cipolla, R. Feature-based human face detection. *Image Vis. Comput.* 1997, 15, 713–735.

- [7]Dai, Y.; Nakano, Y. Face-texture model based on SGLD and its application in face detection in a color scene. *Pattern Recognit.* 1996, 23, 1007–1017.
- [8]Mckenna, S.; Gong, S.; Raja, Y. Modeling facial color and identity with Gaussian mixtures. *Pattern Recognit.* 1998, 31, 1883–1892.
- [9]Hsu, R.L.; Abdel-Mottaleb, M.; Jain, A.K. Face detection in color images. *IEEE Trans. Pattern Anal. Mach. Intell.* 2002, 24, 696–706.
- [10]Lanitis, A.; Yaylor, C.J.; Cootes, T.F. An automatic face identification system using flexible appearance models. *Image Vis. Comput.* 1995, 13, 393–401.
- [11]Rowley, H.A.; Baluja, S.; Kanade, T. Neural network-based face detection. *IEEE Trans. Pattern Anal. Mach. Intell.* 1998, 20, 23–38.
- [12]Viola, P.; Jones, M.J. Robust real-time face detection. *Int. J. Comput. Vis.* 2004, 57, 137–154.
- [13]Lienhart, R.; Maydt, J. An Extended Set of Haar-Like Features for Rapid Object Detection. In *Proceeding of 2002 International Conference on Image Processing, New York, NY, USA, 22–25 September 2002*; pp. 900–903.
- [14]Zhang, C.; Zhang, Z. A Survey of Recent Advances in Face Detection; MSR-TR-2010-66; Technical report of Microsoft Research: Redmond, WA, USA, June 2010.
- [15]Turk, M.; Pentland, A. Eigenfaces for recognition. *J. Cogn. Neurosci.* 1991, 3, 71–86. 16. Belhumeur, P.N.; Hespanha, J.P.; Kriegman, D.J. Eigenfaces vs. Fisherfaces: Recognition using class specific linear projection. *Comput. Vis.* 1996, 1064, 45–58.
- [16]Bartlett, M.S.; Movellan, J.R.; Sejnowski, T.J. Face recognition by independent component analysis. *IEEE Trans. Neural. Netw.* 2002, 13, 1450–1464.
- [17]Andrea, F.A.; Michele, N.; Daniel, R.; Gabriele, S. 2D and 3D face recognition: A survey. *Pattern Recognit. Lett.* 2007, 28, 1885–1906.

Author's Profile:



Keerthana Challa is an M.tech Student in Embedded System and Drives in Department of Electronics & Communication Engineering from SWEC (Hyderabad). Earlier she has completed her under graduation in the field of Electronics and Communication Engineering from TRRECW, Hyderabad



Miss. Kavitha Boddupally, current working as Assistant Professor SWEC Hyderabad (Telangana). She has completed BE degree from DVR CET in Electronics & Communication Engineering, Hyderabad and ME degree in Embedded Systems From JBREC, Hyderabad.



Smt. Maya Lakha, presently working as Professor in SWEC Hyderabad (Telangana). She has completed BE degree in Electronics and Telecommunications From JNEC(1989), Aurangabad and ME degree in Instrumentation from SGGSC&T, Nanded(1996),

An Intelligent Automate Door Access Control and Home Security System Based on Face Recognition

Pursuing PhD in JNTU Hyderabad (Telangana).She worked as lecturer in MGM (Nanded) , REC(Bhalki),GNDEC(Bidar). Associate professor in SSJ Mahaboobnagar (Telangana), SRTIST Nalgonda (Telangana), Presented fifteen national and two international papers. She is a member of ISTE. Area of interest-Reliability engineering, Image processing, Digital system design.