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FACE RECOGNITION DOOR LOCK USING IOT

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Abstract - *Security and safety have always become a basic necessity for every house. So, we have developed a system that performs the work of Receptionist. The main objective of our system is to provide Security locks for door, comfort, connivance security with the help of IoT.*

The system uses Raspberry Pi for sending as well as receiving data from IoT website, whenever any person arrives at the door and rings the bell the system automatically takes the picture through the camera and sends the data(picture) directly over the IoT site. On the other side, the user or owner can see who has arrived at the door from any part of the world and confirm whether he/she is trusted person or not, and thereafter, decide whether person will be allowed inside or not by sending the data through IoT

Key Words: **Raspberry Pi, Face Recognition, Camera, Embedded system.**

1. PROBLEM STATEMENT

Security and safety are becoming more and more popular day by day. Hence, it is getting improved and used for the ease in our life. Nowadays, technology has become an integrated part of people's lives therefore the security of one's home, office or organization must not be left behind. Our goal is to design a system with minimum human intervention. Smart Receptionist with smart lock system is mainly designed and developed for security and safety purposes. This smart security system is used to see a visitor when the main door of the office or organization is closed. The purpose of this system is to control the door lock using IOT gecko website and Raspberry Pi. In this system, whenever a person rings the bell, image of the person is captured by the camera. If person's image is present in database, he/she will be allowed in else if image is not present in the database then the smart lock system will send the image to iotgecko website. Once the image is uploaded on the iotgecko website, option will be available with user of either locking or unlocking the door. If the user clicks on unlock button the door will open and person standing on the door will be allowed in and if the user clicks on lock button the door will remain locked and person will not be allowed in. door and the system will display as well as speak out a message "Access Denied".

1.1 INTRODUCTION

An Embedded System is a combination of computer hardware and software, perhaps additional mechanical or other parts, designed to perform a specific function. An embedded system is a micro-controller-based, software driven, reliable, real-time control system, autonomous, or human or network interactive, operating on diverse physical variables and in diverse environments and sold into a competitive and cost-conscious market.

An embedded system is not a computer system that is used primarily for processing, not a software system on PC or UNIX, not a traditional business or scientific application. High-end embedded & lower end embedded systems. High-end embedded system - Generally 32, 64 Bit Controllers used with OS. Example: Personal Digital Assistant and Mobile phones etc. Lower end embedded systems - Generally 8,16 Bit Controllers used with a minimal operating systems and hardware layout designed for the specific purpose. Example: Small controllers and devices in our everyday life like Washing Machine, Microwave Ovens, where they are embedded in.

➢ Some of the characteristics of the embedded system are as follows:

- An embedded system is any computer system hidden inside a product other than a computer.
- They will encounter a number of difficulties when writing embedded system software in addition to those we encounter when write applications.

1. Throughput - Our system may need to handle a lot of data in a short period of time.
2. Response – Our system may need to react to event quickly.
3. Testability – Setting up equipment to test embedded software is doing wrong is a troublesome.
4. Reliability – Embedded systems must be able to handle any situation without human intervention.
5. Memory space – Memory is limited on embedded systems and the data fit into whatever memory exists.
6. Power consumption – Portable systems must run on battery power and software in these systems must conserve power.

7. Processor hogs – Computing that require large amount of CPU time can complicate the response problem.
8. Cost – Reducing the cost of the hardware is a concern in many embedded system projects. Software is often operated on hardware that is barely adequate for the job.

Embedded systems have microprocessor and memory. Some have a serial port or a network connection. They usually do not have a keyboard, screens or disk driver

1.2 RELATED WORK

Face Recognition is now-a-days really booming technology and hence a lot of research work has been conducted by experts on this topic. So, we first tried to analyze those research work to find out best possible ways to implement our system. In research we found that this topic can be implemented with various algorithms and different algorithms have different accuracy levels.

In reference article [1] studies by Hteik Htar Lwin, Aung Soe Khaing, Hla Myo Tun proposed "Automatic Door Access System Using Face Recognition". In this system, automatic face recognition and detection is done by MATLAB program on PC. Microcontroller is used to control the door access system depending on incoming data sent from PC. Door is opened immediately after confirming that the person is authenticated. After 2 seconds, door is closed automatically. However, 2 seconds are not enough time for a person to enter. So, longer time should be set for real-time conditions. Viola Jones algorithm is used for face detection. Since, this algorithm can only detect frontal view of the face correctly, this system has limitations.

In reference article [2] studies by Sandesh Kulkarni, Minakshee Bagul, Akansha Dukare, Prof. Archana Gaikwad proposed "Face Recognition System Using IoT". The system developed was cost and power efficient. In this system, Viola Jones Algorithm is used for face detection that eliminates face candidates using a cascade of stages but the structural information captured by it is limited.

In the reference article [3] Paul Viola proposed an efficient face detection algorithm. This paper introduces concept of integral image, Adaboost classifier resulting in efficient and fast face detection.

From reference paper [4] we understood that LBPH (Local Binary Pattern Histogram) is better than Viola Jones when it comes to discriminative power. Hence, a person can be identified not only from frontal view but also from different pose and illumination

The most commonly used detection algorithms namely Fisher faces, Eigen faces and LBP is compared in [5] and it was found that LBP is the best amongst three in terms of recognition accuracy, operating time and recognition accuracy for different distances from the camera.

In reference article [6], [7] we came to know more about LBPH and Haar cascade algorithm and found out that haar reduces the likelihood of computing huge amount of data but it is time consuming.

From reference article [8] we found that recognition of stored images in the database after recognizing the face the door will get open. If any other person comes whose image is not present in the database then this image will be mailed to the authorized email address and then the owner will send command like "ON" through telegram app if he/she wants to unlock door for person standing outside the door.

2. SYSTEM ANALYSIS

Irjet Face recognition door lock system uses camera to capture image which is connected to the Raspberry Pi module for face recognition. If the image is known door will open and if the image is unknown then it will send the image to the website where owner of the house will decide based on the image whether to open the door or not.

Figure 1 shows the block diagram of the system.

If the bell is pressed, it activates the camera which captures the image. The image captured is checked against images in the database. If the image matches then the door will be opened and if the image is not recognized then the image of the person is sent to the website http://iotgecko.com/.

Figure 2 shows the image of the website

From where owner of the house can lock or unlock the door. Login credentials are provided to the owner of the house by which he/she has to login and get complete access to the door lock mechanism.

Figure 3 shows the image of the flowchart of the system.

Ones we system is turned on for the first time. LCD display will show you three options:

1. Registration
2. Start
3. clear data

For the first time, we have to select first option i.e. Registration.

When we click on the Registration, camera will open and it will capture images of owner and save it in database.

Now, as the owner images are stored in database, we can start the system by selecting second option i.e. Start

When we click on start, system will boot up and now if owner presses the bell, camera will recognize the face of the owner and it will open the door without any human intervention.

And if the unknown person comes in front of door and he/she presses the bell then the image will be sent to the website where we provided the facility to the user of locking and unlocking the door.

We used Haar cascade Frontal Face to Detect object in video stream and we have created Local Binary Patterns Histograms for face recognition.

Proteus is the software we used to generate the PCB design of this model.

Figure 4 shows the image of embedded system.

It consists of following components:

1. LM2576: It is used to convert 12V to 5V. Raspberry Pi accept 5V supply but adapter we are using generating output of 12V.
2. 2W005G: Adapter is generating output of AC current. But Raspberry Pi accepts DC current.
3. Capacitors (1000 μF): It is used to eliminate noise from input and output of LM2576
4. LM293D: It is used to control motor i.e. door. It is a motor driver IC and we are controlling door with the help of this IC.
5. Resisters (330 Ω and 10 KΩ): It is used to limit the current. It is used for safety of devices.
6. Potentiometer: This component is used for LCD. It is used to adjust bias level of the LCD.
7. Transistor: It is used to control the flow of electricity in circuit.

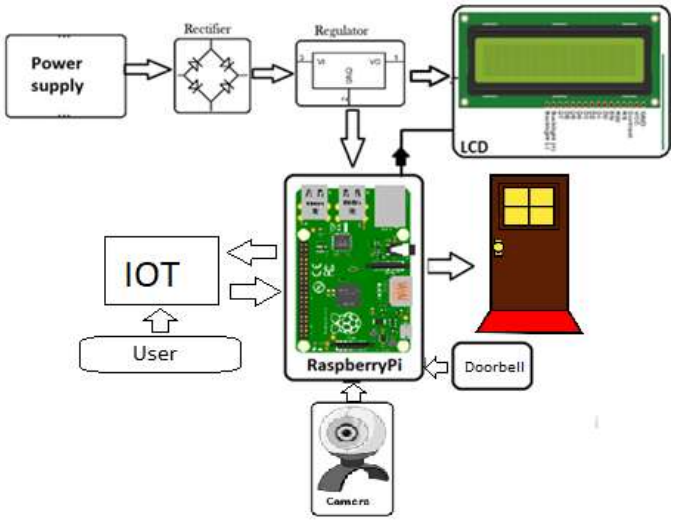

Figure 1: Block Diagram

Figure 2: IoTGecko Website

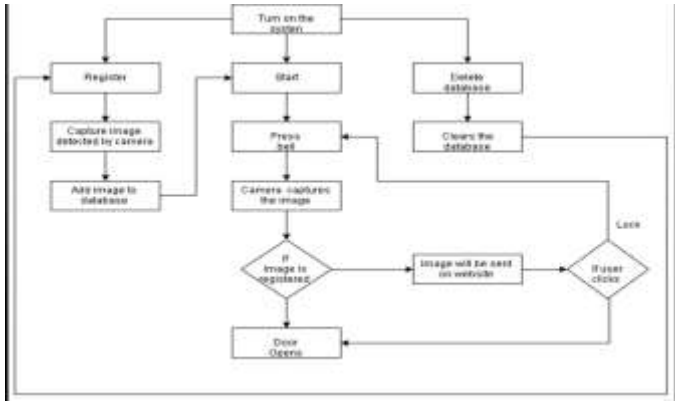

Figure 3: Flowchart of the system

Figure 4: Embedded circuit

3. CONCLUSIONS

The system developed is a great way of ensuring security. It goals at creating minimal human intervention and it has been achieved. It combines two modern technologies face recognition and IoT. It is low cost and power efficient system

4. FUTURE SCOPE

The In future, this system can be changed into double verification mechanism such as retina scanner, fingerprint scanner, OTP, PIN Code, etc. This system will first recognize the face and if face is found in the database then it will ask for second verification mechanism will may be any one of the above and if the person passes both the verification test then only door will open and if face is not found in the database the image will be sent to website. This system will provide excellent security. The face recognition mechanism can be combined with any other.

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