

IOT BASED HOME ENTRANCE SECURITY

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ABSTRACT

In recent years considerable progress has been made in the area of face recognition. Through the work of computer science engineers, computers can now outperform humans in many face recognition tasks, particularly those in which large databases of faces must be searched. A system with the ability to detect and recognize faces has many potential applications including crowd and airport surveillance, private security and improved human-computer interaction. An automatic face recognition system is perfectly suited to fix security issues and offer flexibility to smart house control. This project aims to replace costly image processing boards using Raspberry pi board with ARMv7 Cortex-A7 as the core within Open CV library. This project is mainly based on image processing and fingerprint detection by porting the Open CV library to the Raspberry Pi board. Algorithm for face recognition and fingerprint detection is based on Local Binary Patterns Histograms (LBPH), is programmed and implemented on the platform. The system is based on the criteria of low power consumption, resources optimization, and improved operation speed. In this paper, we have reported an effective implementation for Internet of Things used for monitoring regular domestic conditions by means of low cost ubiquitous sensing system. The description about the integrated network architecture and the interconnecting mechanisms for the reliable measurement of parameters by smart sensors and transmission of data via internet is being presented.

KEYWORDS: Raspberry Pi 3B, Microcontroller, IR sensor, Servo motors

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I. INTRODUCTION

Traditional ways for personal identification depend on external things such as keys, passwords, etc. But such things may be lost or forgotten. One possible way to solve these problems is through biometrics, for every person has his special biometric features definitely. Biometric identification has gained increasing attention from the whole world. Biometrics features that can be used for identification include fingerprints, palm prints, handwriting, vein pattern, facial characteristics, face, and some other methods such as voice pattern, etc. The human face has a particular shape that requires complex calculations in order to recognize it. Individuals are distinguished by their faces, with which they are being identified. We can memorize many faces during

our life journey and get to know them immediately, even after years. Aging and distractions like glasses, beard or change of skin color may gradually vary face recognition rates. Face identification represents one of the most used types of biometry. It proceeds as follows: Starting with calculating and subtracting specific characteristics, then verifying them with the already existing database, in addition to obtaining a positive correspondence between the compared faces. After getting the face shape details, the system adjust them by using some algorithm models, finally face images are stored in the database and resolved using other algorithm. The face recognition embedded systems are very practical to be used in different applications such as terrorist's identification, security systems and identity verification access. In fact it is

implemented in many public and even dedicated areas. Thanks to the well-developed technologies related to computer science, we can obtain considerably good and satisfying results of face identification and reveal. The extracted details from faces will be analyzed and compared with the already existing similar face operated details in the database. For example in monitoring systems the detection of an anonymous face more than once leads to saving this face traits in the database for further identification. This strategy is very efficient in detecting criminals and thieves. In this paper, face recognition is initiated by pressing the doorbell button. Indeed, an integrated camera will capture several pictures of the visitor. The face recently scanned will be verified in the present database. In case of unknown face, a template will be generated then stored. Otherwise, in case of known face, actual template is matched with templates stored in the database. Furthermore, the owner will be notified, through his mobile phone, speakers and an administrative secured website, about all the visiting details. Comparing to old face recognition systems that are already commercialized, this project is more efficient in real time response with better recognition rate. Compared with other biometric methods, the face recognition has the following advantages: The face image acquisition requires no physical contact, so face identification system is non-invasiveness. Since the face is created in a nearly random. Morphogenetic process during the gestation, it has little probability to find two people in the world whose face textures are identical. So face recognition is the most accurate method and has the lowest false recognition rate. The face recognition has more stability than other biometric identification methods because the face has much more features than other biometrics and it won't change in people's life. With the advantages of noninvasiveness, uniqueness, stability and low false recognition rate, face recognition has been researched widely and has a broad usage, such as security, attendance, etc.

II. METHODOLOGY

Methodology Used By Previous Researcher:

Earlier we didn't have a fingerprint and face recognition module together for home entrance security, which gives thief one opportunity through which he can authenticate access to home.

Earlier we either used fingerprint module or face recognition module for authentication of owner to home. For face recognition and fingerprint recognition earlier used technologies were using Eigen face and Fisherface algorithm. This technology is excellent but it was much more descriptive and consumes more time due to large set of training set (16 or 24) which causes speed of processor low, so such kind of algorithms are used in high frequency components viz. computer (DSP processor). Eigenfaces and Fisherfaces find a mathematical description of the most dominant features of the training set as a whole. When raspberry pi captures the image and send it to the web browser, to receive that image owner has to be active on that browser 24*7.

III. PROPOSED SYSTEM

In the proposed system we have combined both biometric (fingerprint and face recognition) to improve security far much then previous proposed system. We have used 2 controllers raspberry and atmega for implementation of this system. We have used LBPH algorithm for both biometric recognition system because it analyzes each face in the training set separately and independently. Which requires minimum calculations as compared to Eigenface and Fisherface algorithm. In this system we have used training set of only 6 images for faster response and we have used twitter application for giving notification to owner if someone is just arrived at your home.

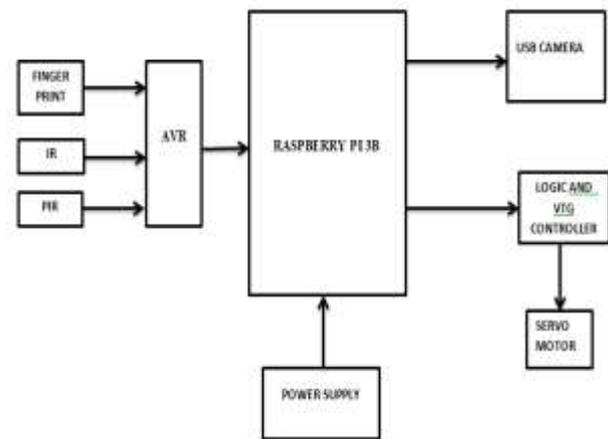


Fig 1: Block Diagram

3.1 Atmega32 MICROCONTROLLER

The Atmel® picoPower® ATmega328/P is a low-power CMOS 8-bit microcontroller based on the AVR® enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega328/P achieves throughputs close to 1MIPS per MHz. This empowers system designer to optimize the device for power consumption versus processing speed.

High Performance, Low Power Atmel® AVR® 8-Bit Microcontroller Family

- 32KBytes of In-System Self-Programmable Flash program Memory
- 1KBytes EEPROM
- 2KBytes Internal SRAM
- Write/Erase Cycles: 10,000 Flash/100,000 EEPROM
- Data Retention: 20 years at 85°C/100 years at 25°C(1)
- Optional Boot Code Section with Independent Lock Bits
- In-System Programming by On-chip Boot Program
- True Read-While-Write Operation
- Programming Lock for Software Security
- Atmel® QTouch® Library Support
- Capacitive Touch Buttons, Sliders and Wheels
- Up to 64 sense channels

3.2 RASPBERRY PI 3 B

The Raspberry Pi3 is the third generation Raspberry Pi. It replaced the Raspberry Pi2 Model B in February 2016. Compared to the Raspberry Pi2 it has:

1GB RAM
4 USB ports
Full HDMI port
Ethernet port
Combined 3.5mm audio jack and composite video
Camera interface(CSI)
Display interface(DSI)
Micro SD card slot (now push pull rather than push pull)
Video core IV 3D graphics

The Raspberry Pi3 has an identical form factor to the previous Pi2(and Pi1 model B+)and has complete compatibility with Raspberry Pi1 and 2. We recommend the Raspberry Pi3 model B for use in schools, or for any general use which are more useful for embedded projects which require very low power

3.3 POWER SUPPLY

There are many types of power supply such as SMPS, UPS. Most are designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and other devices. We are using SMPS which is high quality 5V, 1Amp SMPS

3.4 QHM495LM WEB CAMERA

Built-in mic with noise reduction Interpolated to 25 Mega Pixels 10 Level Zoom on live Motion Picture, Special Visual Effects, True Motion Picture, Night Vision 6 Bright light switch ON through switch and potentiometer Inbuilt Sensitive Microphone, Background Changeable of Live Motion Picture, UP TO 30% Better Exposure To Give better Picture Even in dark, Auto Exposure, Special Face Effects, USB 2.0

3.5 FINGERPRINT MODULE

This module interfaces with Raspberry pi with UART protocol. Image size of this module is 202*258 pixels.

The major functions are the followings.

High- accuracy and high speed fingerprint identification technology
Ultra-thin optical sensor
1:1 verification, 1:N identification
Downloading fingerprint image from the device
Reading and writing fingerprint templates from/to the device
Simple UART & USB communication protocols

3.6 IR SENSOR

IR detects any human presence outside the door and if presence is detected inside the house PIR Sensors are used. An infrared sensor is an electronic instrument which is used to sense certain characteristics of its surroundings by either emitting and/or detecting infrared radiation. This extra-long-range SHARP distance sensor bounces IR off objects to determine how far away they are. It returns an analog voltage that can be used to determine how close the nearest

object is. These sensors are good for detection between 100cm-500cm (1-5 meters / 3-15 feet).

3.7 SERVO MOTOR

A servo motor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration.^[1] It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors. Servomotors are not a specific class of motor although the term servomotor is often used to refer to a motor suitable for use in a closed-loop control system. Servomotors are used in applications such as robotics, CNC machinery or automated manufacturing. Following figure shows servo motor model.

IV. FLOW CHART

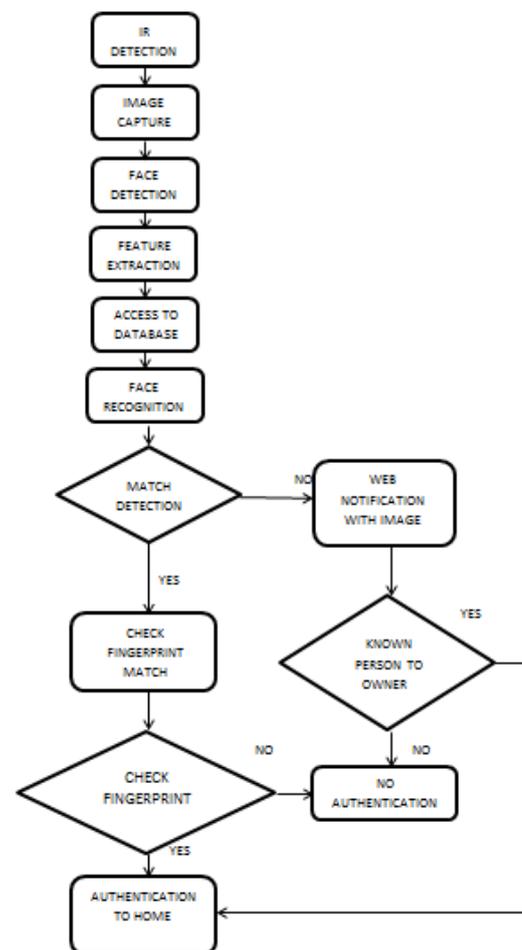


Fig 2: Flow chart

Firstly the IR sensor comes in contact to detect whether there is presence of Human Being or not.

Afterwards camera will capture the image and will do the image processing process, if the person's face matches with the databases then fingerprint will be enabled for authentication.

Else it will send that image on owners twitter account.

If the person is known to owner authentication will be provided using IOT

V. DESIGN AND WORKING

5.1 CIRCUIT DIAGRAM

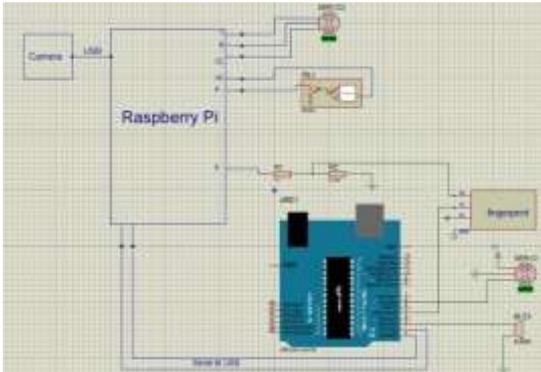


Fig 3: Main circuit diagram

WORKING OF SYSTEM



Fig 4: Working model

The fingerprint module and IR Sensor are connected to the arduino Microcontroller. The Camera and Servo motor are connected to the raspberry pi. Both raspberry pi and arduino are connected to each other using USB serial communication.

VI. RESULTS

Face and fingerprint recognition is the main part of this project. a)Firstly camera will capture image and compare with data set. If it is matching with any dataset it will find the confidence of the image and start fingerprint module. Else it will send this image to the owner through twitter.



Fig 5: Face Recognition

b)After face recognition it will check the fingerprint of the person, if matched then it will give access to the home else will enable buzzer .

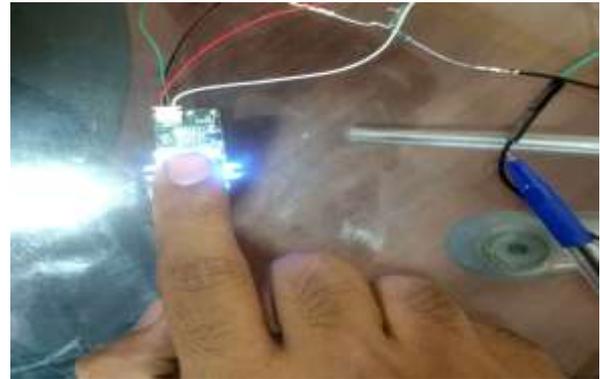


Fig 6 : Fingerprint Detection

VII.CONCLUSION

Here we will be developing a security system which will be very convenient and could be implemented at home level. Error rate in this system will be very less as compared to previous security system as we will be using both biometric condition (face ,fingerprint) in a single system. We have surveyed different components that are going to be used in the project and have studied about the components. Completion of this project will bring a new product to the world to increase speed and efficiency. In developing this project, new and innovative solution were needed. Overall the learning objective of this project provided an opportunity to research beyond the academic requirements.

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