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Design and Implementation of Face Reorganization Based Smart Home Automation and Security System

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Abstract: In reality, security is one of the significant issues. As technology is getting progressed numerous security issues are emerging. The existed created security techniques have a few blemishes and they can be hacked. The proposed framework for settling the security issue depends on face location and acknowledgment utilizing Raspberry pi camera. The substance of an individual is caught by the camera and contrasted and the procured data set. On account of obscure/unapproved access, the face picture of the individual will be caught and advised to the concerned specialists through SMS utilizing GSM module and alert will be produced on account of unapproved access. This venture delivered precise outcomes in the two cases: approved and unapproved access. The presented framework gives a minimal effort answer for checking and controlling the houses, various associations like banks, colleges.

Keywords: Raspberry pi, embedded systems, Raspberry pi camera, GSM, Open CV, face detection, face recongnization, home automation

1. Introduction

Home automation is only a framework that controls all electrical apparatuses present in a home or office. Home mechanization for the more established and handicapped will offer raised personal satisfaction for people. Client can screen and deal with their home entryway, different machines and turn on/off the T.V with no human mediation. Notwithstanding these benefits, home mechanization has anyway gotten broad endorsement and a consideration inferable from its high importance and intricacy. Indeed, one of the serious issues around there is that these various frameworks are neither interoperable nor interconnected. The framework can be use in a few spots like banks, labs and other modern robotized framework, which decreased the dangers of unapproved passage. Face discovery requires the distinguishing proof of the relating pixels to such reference, which for this situation comprises of a little red circle. The location framework depends on Python programming, which runs on an installed Raspberry pi framework, which has a camera to catch pictures. The raspberry has an installed Linux working framework called raspbian. It has introduced the machine vision library created by Intel and called OpenCV. The significant motivation to build up this framework is to save time and labor alongside keeping up security and comfort. . Raspberry pi camera detecting and triggers framework when unapproved face identification, face location module has great execution in certain conditions, for example, distance between the individual and the camera ought to be under 240 cm. a camera will perceive the face and contrasts and the appearances put away in the home part data set put away in raspberry pi. In the event that the face matches discovered, home machines will ON/OFF dependent on face in information base if unapproved/interloper identifies bell will on and SMS shipping off approved individual

2. Literature Review

Home robotization can be portrayed as presentation of science and innovation inside the home climate to give accommodation, solace and security to its clients. It can likewise be expressed as the authority over the apparatuses either distantly or naturally. There are a few factors that should be tended to while making a diagram of a keen home framework. The framework is imagined to be less expensive and versatile with the goal that new gadgets can be essentially incorporated into the framework. It ought to likewise be easy to use. An assortment of keen frameworks have been viewed as where the control is through Bluetooth[3], web, android[4], short message administration (SMS), shrewd cards, Wi-Fi and so forth With the presentation and wide acknowledgment of the Internet of Things (IOT) in the specialized local area, the examination and execution of home robotization has created more extensive acknowledgment [5]. Different remote advances that can uphold some type of far off information move, detecting and control by means of gadgets utilizing Bluetooth, Wi-Fi, RFID, and Cellular organizations have been used to implant different degrees of knowledge and halfway power over home frameworks [6]. Studies have likewise been introduced about Bluetooth controlled home

mechanization frameworks that utilization the Android stage [7] however without Internet controllability. The gadgets have been actually associated with a Bluetooth sub-regulator which is then gotten to and managed by the Smart telephone utilizing worked in Bluetooth network. Since Bluetooth has a restricted reach over which it can give streamlined execution, such a framework can't be utilized on a huge scalebasis. Home controlling and observing frameworks like [8] have utilized RESTful based Web administrations which comprise of a miniature Web-worker dependent on Arduino Ethernet, equipment interface modules and the Android viable Smart telephone App have additionally been examined upon by the examination local area. A keen home plan application that permits mortgage holders to control their home related exercises through the web had likewise been proposed [9]. It needs a Personal Computer to coordinate the data through the web. A Personal Computer is consequently utilized as a worker that expands the cost and force utilization. Additionally website page facilitating abilities are required which enhances the general expense. In his paper, it is said that the utilization of Personal Computer can require considerable expense that can be decreased radically by utilizing a miniature regulator. In [10]'s examination the association between the android gadget stage and the home gadgets have been set up utilizing wired associations. It has been more effective to help different wired just as remote advances like Bluetooth, Zigbee, Wi-Fi, and the World Wide Web itself

All investigates which are referenced above have enlivened us to explore about a gadget that would give a bona fide, tough, dependable and proficient answer for controlling home computerization and security with negligible human intercession.

3. Face detection and reorganization methodology

3.1 Face detection using HAAR cascades

Object Detection utilizing Haar featured- based course classifiers is a compelling technique which was proposed by Paul Viola and Michael Jones. It is a versatile AI based methodology in which a course work is prepared from a few positive and negative pictures. This is then used to distinguish objects in different pictures. At first, this calculation requires a lot of positive (pictures of appearances) and negative (pictures without faces) to prepare the classifier. At that point Features are extricated from it. Each component is a solitary worth acquired by deducting amount of pixels under white square shape from amount of pixels under dark square shape. At that point every single imaginable size and areas of each portion are utilized to ascertain a lot of highlights.

3.2 Face Recognition utilizing Eigen Face Approach

The face acknowledgment calculations utilized here is Principal Component Analysis (PCA). It includes a numerical system that changes various potentially associated factors into various uncorrelated factors called head parts, identified with the first factors by a symmetrical change. The Eigen face approach helps lessening the size of the data set needed for acknowledgment of a test picture. The Eigen esteems determined from the Eigen Vector covariance lattice are dismissed or put away relying on the limit hence making a face space [4, 5]. Ascertaining the loads and the Euclidean distance a correlation is held and match is found. This regular Eigen face Approach is consolidated in the ARM Cortex of Raspberry Pi for face acknowledgment utilizing face acknowledgment modules in python code.

4. Proposed framework

4.1 Methodology

The Functionality of this framework is basically sorted in after advances. To enlist and recognize faces utilizing camera associated with the ARM Cortex of Raspberry Pi board. b. To show the match status on the terminal running on the VGA (Video designs exhibit) screen to program for a similar utilizing python language. The code imports certain modules that empower capacities, for example, face acknowledgment, GPIO modules to drive the engine clockwise and anticlockwise way after getting a current status. The distinguishing proof and verification innovation work utilizing the accompanying four phases: [6]

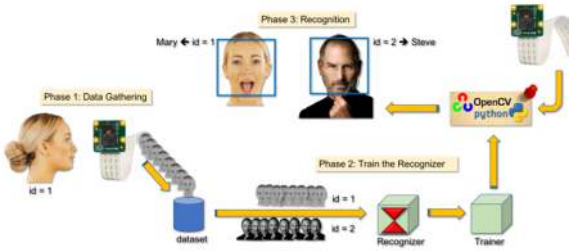

Fig 1: flow of operation

Capture: A physical or conduct test is caught by the framework during enrolment and furthermore in recognizable proof or check measure b. Extraction:

Unique information is separated from the example and a format is made. c. Correlation: The layout is then contrasted and a current example.

Match/non match: The framework chooses if the highlights extricated from the new examples are a match or a non match and appropriately acknowledge/reject.

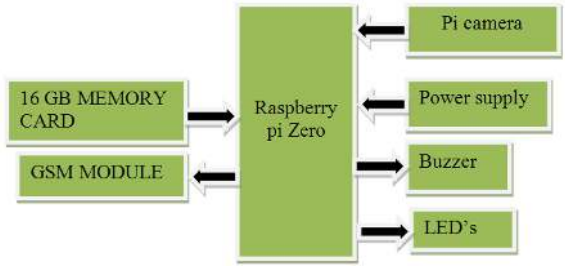

Fig 2: Block Diagram of proposed system

The info/yield modules are interfaced to the Raspberry Pi 2. The info part, the console and mouse are utilized to pass orders to the Raspberry pi and Webcam to catch picture which are put away in Secure Digital Card and is likewise used to analyze a picture from those put away in information base. Then again the yield part comprise of LCD, DC engine followed by its driver L293D.The engine utilized here has a reach up to 10,000 RPM. The fundamental strides to instate the framework incorporate making an information base and afterward utilizing that data set as a kind of perspective for looking at the live test focuses. As we boot the raspberry pi following things should be thought about like associating the screen to check the picture caught by the webcam which will be utilized for recognizing the element. Linux based orders are given as a contribution to the Raspberry Pi2 to save pictures in the outside SD card. Two separate catalogs are kept up for the picture which are caught as a source of perspective for example Positive and Negative, Positive index holds the reference picture which has been caught with no blunder. While those with negligible to greatest faulty pictures are put away in the negative registry.

5. System Design

5.1 Hardware Requirements

- Raspberry pi B+
- 16Gb class 10 memory card
- Raspberry pi camera
- GSM module
- LED's

5.2 Software Requirements

- Raspbian OS
- Python3 IDE
- Python programming

5.1.1. Raspberry pi

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Raspberry pi The Broadcom SoC utilized in the Raspberry Pi is identical to a chip utilized in an old PDA (Android or iPhone). While working at 700 MHz of course, the Raspberry Pi gives a genuine presentation generally comparable to the 0.041 GFLOPS On the CPU level the exhibition is like a 300 MHz Pentium II of 1997-1999. The GPU gives 1 Gpixel/s or 1.5 of illustrations preparing or 24 GFLOPS of broadly useful registering execution. The designs capacities of the Raspberry Pi are generally identical to the degree of execution of the Xbox of 2001. The Raspberry Pi chip, working at 700 MHz naturally, won't get adequately hot to require a warmth sink or unique cooling. The SoC is stacked under the RAM chip, so just its edge is noticeable. On the more seasoned beta model B loads up, 128 MB was distributed naturally to the GPU, leaving 128 MB for the CPU. On the initial 256 MB discharge model B (and Model A), three distinct parts were conceivable.

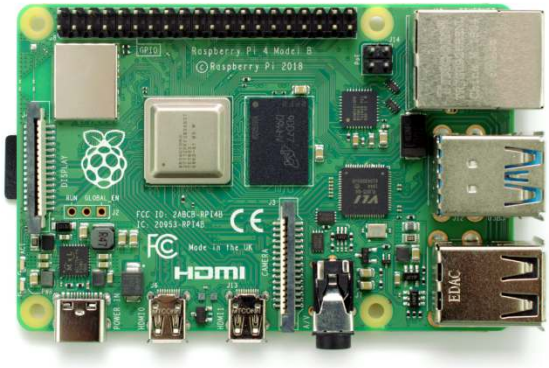

Fig2. Raspberry Pi

5.1.2. Raspberry pi camera

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The camera comprises of a little (25mm by 20mm by 9mm) circuit board, which associates with the Raspberry Pi's Camera Serial Interface (CSI) transport connector by means of an adaptable lace link. The camera's picture sensor has a local goal of five megapixels and has a fixed center focal point. The product for the camera upholds full goal actually pictures up to 2592x1944 and video goals of 1080p30, 720p60 and 640x480p60/90. The camera module is appeared underneath in figure 3

Fig3: Raspberry pi camera

5.1.3 GSM module

A GSM modem or GSM module is a hardware device that uses GSM mobile telephone technology to provide a data link to a remote network. From the view of the mobile phone network, they are essentially identical to an ordinary mobile phone, including the need for a SIM to identify themselves to the network. GSM modems typically provide TTL-level serial interfaces to their host. They are usually used as part of an embedded system.

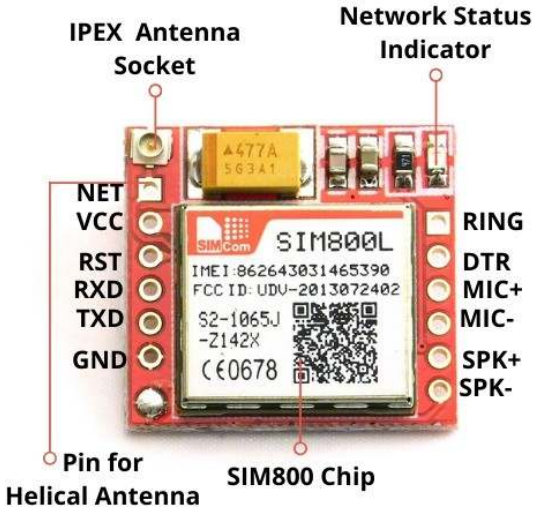

Fig 4: GSM module

5.2.1 Software setup: Raspbian OS

The Raspberry Pi basically utilizes Linux portion based working frameworks. The ARM11 chip at the core of the Pi depends on adaptation 6 of the ARM. The current arrivals of a few mainstream variants of Linux, including Ubuntu. won't run on the ARM11. It is absurd to expect to run Windows on the Raspberry Pi. Raspbian (suggested) – Maintained autonomously of the Foundation; in view of the ARM hard-drift (armhf) Debian 7 'Wheezy' engineering port initially intended for ARMv7 and later processors (with Jazelle RCT/ThumbEE,VFPv3, and NEON SIMD augmentations), accumulated for the more restricted ARMv6 guidance set of the Raspberry Pi. A base size of 4 GB SD card is required. There is a Pi Store for trading programs. Raspbian is a free working framework dependent on Debian streamlined for the Raspberry Pi equipment. A working framework is the arrangement of essential projects and utilities that make your Raspberry Pi run. Nonetheless, Raspbian gives in excess of an unadulterated OS: it accompanies more than 35,000 bundles, precompiled programming packaged in a decent configuration for simple establishment on your Raspberry PiThe introductory form of more than 35,000 Raspbian bundles, advanced for best execution on the Raspberry Pi, was finished in June of 2012. Nonetheless, Raspbian is as yet under dynamic advancement with an accentuation on improving the security and execution of however many Debian bundles as could be expected under the circumstances

5.2.2 Python programming

Python writing computer programs is a deciphered, significant level and universally useful programming language. Python's plan reasoning underscores code intelligibility with its prominent utilization of critical space. Its language builds and article situated methodology plan to assist developers with composing, coherent code for little and enormous scope projects. Python is powerfully composed and trash gathered. It upholds numerous programming paradigms,including organized (especially, procedural), object-situated and practical programming. Python is regularly portrayed as a "batteries included" language because of its far reaching standard library. Guido van Rossum started dealing with Python in the last part of the 1980's, as a replacement to the ABC programming language, and first delivered it in 1991 as Python 0.9.0. Python 2.0 was delivered in 2000 and presented new highlights, for example, list understandings and a trash assortment framework utilizing reference checking and was suspended with adaptation 2.7.18 in 2020. Python 3.0 was delivered in 2008 and was a significant correction of the language that isn't totally in reverse viable and much Python 2 code doesn't run unmodified on Python 3. Python reliably positions as quite possibly the most well known programming dialects

6. Experimental arrangement

To code for the Hardware arrangement, python language is used[8]. To get to the manager Linux terminal is required. The face identification and acknowledgment part is completed by certain Linux orders which are as per the following:

sudo su # To change to root client.

python face detection.py # To createdatabase of pictures. ctrl+c # To give console hinder and stop the picture catching after wanted number of pictures are taken for a face.

python face train.py # To prepare the caught

pictures and concentrate highlights from it, by isolating the face (positive pictures) from the foundation or non-face picture (negative pictures) and consequently making a .xml document.

python main.py # To distinguish and perceive which face is available before the web cam. It computes the certainty worth and matches the banner status. Assuming a face compares to certain banner multiple times, it perceives the separate face and shows a current status on the whenever approved individual recognizes lights will on in any case SMS ship off house proprietor

Fig5. Circuit diagram of proposed system

5. Result Analysis

To recognize correct face it must match at least 10 times with an existing flag.

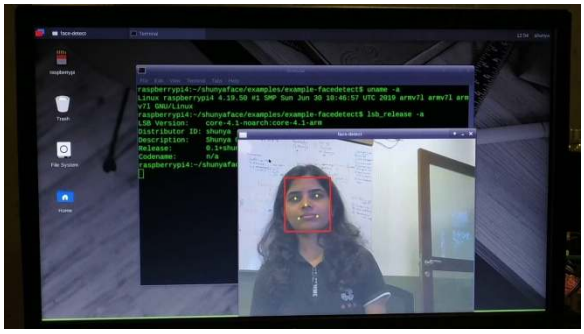

Fig 6: Identification of Face

When face images are captured and trained several positive and negative images are created. Capture.pgm, positive.png, negative.png and mean.png files are created in the first instance after obtaining the confidence value. If the face is recognized correctly then the LCD glows and reads the name of the person detected and a “Present” status. Similarly at the terminal on the Personal computer the name and a “present Ok” status are obtained.

CONCLUSION

Security is consistently a significant factor in our family as we desire to ensure all our basic items

safely and secretly. This may incorporate our storage spaces, individual protection and family limits. Presently, the focal control from the client telephone App gives selective admittance to the administrations, given the client crosses all security firewalls including secret word insurance, face location calculations and example locking-opening office. This framework reclassifies straightforwardness in advancement. In future we might want to improve our framework and furthermore grow it to workplaces and other business spaces where Security and observing will be widely engaged upon. Likewise the framework would be tried in far off mechanical regions where human work is less and a significant degree of computerization exists

References

[1] B. Murali Krishna, 1V. NarasimahaNayak, 2K. Ravi Kishore Reddy, B.Rakesh, P.Manoj Kumar, N.Sandhya, "Bluetooth Based Wireless Home Automation System Using FPGA", Journal ofTheoretical and Applied Information Technology, Vol.77, No.3, 2015.

[2] Ming Yan, Hao Shi, "Smart Living Using Bluetooth Based Android Smartphone", International Journal of Wireless & Mobile Networks (IJWMN) Vol. 5, No. 1, 2013.

[3] Nupur K. Sonawane, PayalD.Waghchavare, KajalA.Patel. "Bluetooth Based Device Automation System Using Cellphone", International Journal of Computer Applications & Information Technology. Vol. 7, 2014.

[4] Sharon Panth, Mahesh Jivani, "Home Automation System Using Android for Mobile phone", International Journal of Electronics and Computer Science Engineering (IJECSE), Vol .3, No.1.

[5] Liu Y, "Study on smart home system based on Internet of things technology" ,In Informatics and Management Science IV. vol. 207, W. Du, Ed., ed: Springer London,pp.73-81, 2013.

[6] Al-Qutayri, M.A., Jeedella, and J.S.: "Integrated Wireless Technologies for Smart Homes Applications", In Smart Home Systems, M. A. AlQutayri, Ed., ed: InTech, 2010.

[7] Yan, M., Shi, H.: "Smart Living Using BluetoothBased Android Smartphone", International Journal of Wireless & Mobile Networks (IJWMN), Vol. 5, No.5, pp. 65-72, 2013.

[8] Rajeev Piyare, Seong Ro Lee, "Smart HomeControl and Monitoring System Using Smart Phone", ICCA 2013, ASTL Vol. 24, pp. 83-86,2013.

[9] S. Kumar, "Ubiquitous Smart Home System Using Android Application", International Journal of Computer Networks and Communications (IJCNC). 6, pp.33-43, 2014.

[10] D. Javale, M. Mohsin, S. Nandanwar, and M. Shingate, "Home Automation and Security System Using Android ADK", International Journal of Electronics Communication and Computer Technology (IJECCT). 3, pp.382-385, 2013.

[11] M. Patil and S.R.N. Reddy, "Comparative Analysis of RFID and Wireless Home/Office Automation.", International Journal of Soft Computing and Engineering (IJSCE) .3: pp.151-154,2013.

[12] R.Piyare, M.Tazil, "Bluetooth Based Home Automation System Using Cell Phone", IEEE 15th International Symposium on Consumer Electronics, 2011.

[13] Xamarin:https://www.xamarin.com/