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SMART DOOR UNLOCKING SYSTEM WITH FACE RECOGNITION

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Abstract

In today's era of automation and smart devices, there is crucial need to alter the security measures of system as privacy and security are notable issues in the information system. It is difficult to trust blindly on traditional and simple security measures of the system. In traditional system many of the doors are having mechanical lock which were restricted on the number of keys. This article proposes Smart Door Unlock System based on Face Recognition to enhance the security. In this system camera sensor is used to capture the face and image matching algorithm will be used to detect the authenticated faces. Only the person whose face is matched can be able to unlock the door. So, limitation of managing keys will be resolved. The security system is also made by means of maintaining into the eye of old age humans for whom it is hard to open the door manually. This system will not only enhance the security but also make the system keyless. Proposed system will be robust from hacking attacks as we are proposing machine learning based approach.

Introduction

Now-a-days with the extreme use of smart devices are used to automate many of the processes. Home automation is one of the aggressively developed technology use by high end society. It's far tough to consider blindly on traditional and simple security features of the device. in conventional gadget many of the doors are having mechanical lock which have been constrained on the number of keys. So, to overcome the aforementioned issues and traditional locking system one has to modify them and make them smart and automated. It works well but when we wish more secured environment and accountability of who locked and unlocked when is the major part was missing in traditional system. This

paper proposes Smart Door Unlock System based on Face Detection to enrich the security. Machine learning based approach with Haar Cascade method is proposed in the paper. In this system camera sensor will be used to capture the face and image matching algorithm will be used to detect the authenticated faces. Only the person whose face is matched can be able to unlock the door. So, limitation of dealing with keys will be resolved. This system will now not best beautify the safety however additionally make the device keyless. Many promising digital based automated solutions came in market whose detailed analysis is given in literature survey, a few are thumb based, Iris based and Face Based. Many people tried to develop the automation on door based on smart cands,thumb based, iris based but very few of them are prominent for face based solution . This system is so promising but has its own pros and cons. Certain challenges are also faced when we use face detection such as lightening, varying brightness. The main advantage of this system is acquiring the door using face detection approach and entire face is recognized. Face recognition technique involves attribute extraction from facial image with help of smart door model an intense innocence is expected in security industry and to make daily objects synergistic.

Literature survey

Door Unlock using Face Recognition (Abdul Azeem, Sathuluri Mallikarjun Rao,Kandula Rama Rao, Shaik Akbar Basha, Harsha Pedarla, Modela Gopi)

In today's era of automation and smart devices, there is crucial need to alter the security measures of system as privacy and security are notable issues in the information system. It is difficult to trust blindly on traditional and simple security measures of the system. In traditional system many of the doors are having mechanical lock which were restricted on the number of keys. This article proposes Smart Door Unlock System based on Face Recognition to enhance the security. In this system camera sensor is used to capture the face and image matching algorithm will be used to detect the authenticated faces. Only the person whose face is matched can be able to unlock the door. So, limitation of managing keys will be resolved. The security system is also made by means of maintaining into the eye of old age humans for whom it is hard to

open the door manually. This system will not only enhance the security but also make the system keyless. Proposed system will be robust from hacking attacks as we are proposing machine learning based approach. Now-a-days with the extreme use of smart devices are used to automate many of the processes.

Facial Recognition Enabled Smart Door Using Microsoft Face API (Karan Maheshwari , Nalini N)

Privacy and Security are two universal rights and, to ensure that in our daily life we are secure, a lot of research is going on in the field of home security, and IoT is the turning point for the industry, where we connect everyday objects to share data for our betterment. Facial recognition is a well-established process in which the face is detected and identified out of the image. We aim to create a smart door, which secures the gateway on the basis of who we are. In our proof of concept of a smart door we have used a live HD camera on the front side of setup attached to a display monitor connected with the camera to show who is standing in front of the door, also the whole system will be able to give voice outputs by processing text them on the Raspberry Pi ARM processor used and show the answers as output on the screen. We are using a set of electromagnets controlled by the micro controller, which will act as a lock. So a person can open the smart door with the help of facial recognition and at the same time also be able to interact with it. The facial recognition is done by Microsoft face API but our state of the art desktop application operating over Microsoft Visual Studio IDE reduces the computational time by detecting the face out of photo and giving that as the output to Microsoft Face API, which is hosted over Microsoft Azure cloud support. In today's world of connectivity and smart devices there is an urgent need to modify our existing day to day objects and make them smart, also it is not the era when we can blindly trust the old and conventional security measures, specifically speaking is our door locks.

Automated door access control system using face recognition (Tejas Saraf, Ketan Shukla, Harish Balkhande, Ajinkya Deshmukh)

Authentication is one of the significant issues in the era of the information system.

Among other things, human face recognition (HFR) is one of the known techniques which can be used for user authentication. As an important branch of biometric verification, HFR has been widely used in many applications, such as video monitoring/surveillance system, human-computer interaction. This project proposes a method for automatic door access system using face recognition technique by using python programming and from OpenCV library Haar cascade method. Object Detection using Haar feature-based cascade classifiers is an effective object detection method proposed by Paul Viola and Michael Jones. This is the standalone security device has been developed by using Raspberry Pi electronic development board and operated on Battery power supply, wireless internet connectivity by using USB modem. Automatic e-mail notification has been achieved by sending security alert mail to the user e-mail id. This proposed is more effective, reliable, and this system consumes very less data and power compared to the other existing systems.

Facial recognition enabled smart door unlock system(M Vamsi Krishna, A Bhargav Reddy, V Sandeep)

To verify that our daily life is going in a secure way. Lot of research programmers are going on in this entire society. The turning point comes through the internet of things, industry has been emerged with the lots of elements provided from IOT. We can able to connect our daily life things or objects with this had successfully evolved lots of things. This Facial recognition door unlock system is a process is which will detect the face and identifies the among people. People are having different types of face cut, in that particularly there are many unique faces which are different from each other which inspired us, from that concept this process has been established. Our main aim to create the smart door system to a house, that will secure the house and all your personal things at your home. In this concept of our system we have been used alive web camera in the front side of the door, along with the display monitor. this web camera shows the owner/particular viewer the whom the house is his control, this shows the person who stood front of the door, the system is setup the voice output is being processed by the processor that which is used to show the answers/instructions as the output on the screen. We are using a stepper motor that which is used to lock/open then the by sliding method, so that a normal person stand in front of the door and access it.

Existing system

The Smart Door Unlocking System with Face Recognition introduces a highly secure and convenient access control mechanism to

the existing security infrastructure. In the current system, traditional methods such as keys or keycards are replaced with a sophisticated face recognition system. This system typically comprises a camera or a set of cameras integrated with facial recognition algorithms. When an individual approaches the door, the camera captures their facial features and processes the data using advanced machine learning algorithms to verify their identity.

The face recognition technology employed in this system is designed to be robust and accurate, allowing for quick and reliable identification of authorized individuals. The system can be programmed to recognize specific faces based on a pre-existing database of authorized users, ensuring that only approved individuals gain access. This technology adds an extra layer of security, as facial features are unique to each person, reducing the risk of unauthorized entry.

The Smart Door Unlocking System is often integrated with a central control unit, which manages the authentication process and controls the unlocking mechanism. Upon successful face recognition, the system triggers the unlocking of the door, granting access to the individual. Additionally, some systems may incorporate supplementary authentication methods, such as PIN codes or card-based systems, for added security.

One of the key advantages of this technology lies in its user-friendly and contactless nature. Authorized users can gain access without the need for physical keys or cards, enhancing convenience and minimizing the risk of lost or stolen credentials. Moreover, the system can log entry and exit times, providing a comprehensive access history that can be useful for security monitoring and auditing purposes.

In conclusion, the Smart Door Unlocking System with Face Recognition represents a modern and secure solution for access control. By leveraging advanced facial recognition technology, this system enhances both the convenience and security of door access, making it suitable for a variety of applications, including residential, commercial, and institutional settings.

Proposed system

The proposed Smart Door Unlocking System with Face Recognition introduces a sophisticated and secure access control mechanism for residential or commercial spaces. This innovative system integrates face recognition technology to enhance traditional door locking systems. The core of this system involves the use of advanced image processing algorithms and a dedicated camera, typically mounted near the entrance, connected to a central processing unit.

Upon approaching the door, the camera captures an image of the individual's face and sends it to the processing unit, which utilizes a deep learning-based face recognition algorithm. This algorithm compares the facial features extracted from the captured image with pre-registered profiles stored in the system. If a match is

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found, indicating that the person is an authorized user, the smart door unlocks automatically, allowing seamless and hands-free access.

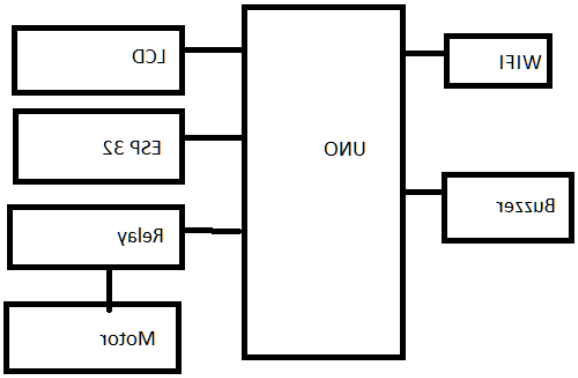
One of the key advantages of this system is its high level of security. Face recognition technology offers a reliable and non-intrusive method of user authentication. It significantly reduces the risk of unauthorized access as it is difficult to impersonate or forge facial features. Moreover, the system can be configured to recognize multiple faces, accommodating different users and ensuring flexibility in access management.

The proposed system also addresses the convenience aspect of door access. With face recognition, users do not need physical keys or access cards, eliminating the possibility of lost or stolen credentials. The hands-free operation enhances user experience, especially in situations where carrying keys or cards may be inconvenient.

To further enhance security, the system can incorporate additional features such as anti-spoofing measures to prevent unauthorized access attempts using photographs or videos. Additionally, access logs and notifications can be integrated, allowing homeowners or administrators to monitor entry activity and receive alerts in case of suspicious events.

In conclusion, the Smart Door Unlocking System with Face Recognition presents a modern and efficient solution for access control, combining the benefits of advanced security and user convenience. This system represents a step forward in smart home or office technologies, offering a seamless and secure way to manage door access through the integration of face recognition technology.

Block diagram



HARDWARE COMPONENTS

LCD (Liquid Cristal Display)

Introduction:

A liquid crystal display (LCD) is a thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector. Each pixel consists of a column of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters, the axes of polarity of which are

perpendicular to each other. Without the liquid crystals between them, light passing through one would be blocked by the other. The liquid crystal twists the polarization of light entering one filter to allow it to pass through the other.

A program must interact with the outside world using input and output devices that communicate directly with a human being. One of the most common devices attached to an controller is an LCD display. Some of the most common LCDs connected to the contollers are 16X1, 16x2 and 20x2 displays. This means 16 characters per line by 1 line 16 characters per line by 2 lines and 20 characters per line by 2 lines, respectively.

RELAY MODULE

Relay modules are simply circuit boards that house one or more relays. They come in a variety of shapes and sizes, but are most commonly rectangular with 2, 4, or 8 relays mounted on them, sometimes even up to a 16 relays.

Relay modules contain other components than the relay unit. These include indicator LEDs, protection diodes, transistors, resistors, and other parts. But what is the module relay, which makes the bulk of the device? You may ask. Here are facts to note about it:

- A relay is an electrical switch that can be used to control devices and systems that use higher voltages. In the case of module relay, the mechanism is typically an electromagnet.
- The relay module input voltage is usually DC. However, the electrical load that a relay will control can be either AC or DC, but essentially within the limit levels that the relay is designed for.
- A relay module is available in an array of input voltage ratings: It can be a 3.2V or 5V relay module for low power switching, or it can be a 12 or 24V relay module for heavy-duty systems.
- The relay module information is normally printed on the surface of the device for ready reference. This includes the input voltage rating, switch voltage, and current limit.

BUZZERS

In common parlance a Buzzer is a signaling device that is not a loudspeaker. It can be mechanical, electromechanical, or electronic (a piezo transducer). BeStar produces Buzzers in every available configuration for a wide variety of applications. A Piezo transducer can produce the sound for panel mount buzzers, household goods, medical devices and even very loud sirens. When a lower frequency is required an electromagnetic buzzer can fill the need. These are very common in automotive chimes and higher end clinical diagnostic devices. The BeStar buzzer range includes self drive units with their own drive circuitry (indicators), or external drive units, which allow the designer the flexibility to create their own sound patterns.

ESP8266

The ESP8266 is a low-cost Wi-Fi microchip, with a full TCP/IP stack and microcontroller capability, produced by EspressifSystems[1] in Shanghai, China. The chip first came to the attention of Western makers in August 2014 with the ESP-01 module, made by a third-party manufacturer Ai-Thinker. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, at first there was almost no English-language documentation on the chip and the commands it accepted.[2] The very low price and the fact that there were very few external components on the module, which suggested that it could eventually be very inexpensive in volume, attracted many hackers to explore the module, the chip, and the software on it, as well as to translate the Chinese documentation.[3] The ESP8285 is an ESP8266 with 1 MiB of built-in flash, allowing the building of single-chip devices capable of connecting to Wi-Fi.[4] The successors to these microcontroller chips is the ESP32 family of chips, including the pin-compatible ESP32-C3.

Conclusion

In this system we have implemented the Smart Door Unlock System using Face Recognition and Voice Commands. The system in able the accurately detect and recognize the face ,and informing the owner/admin about the user name and taking the voice command from the owner. The owner is able to remotely access the door

from any other location. The owner is also able to blacklist the person and get alert if the blacklisted person comes in from of the door. The implemented system is moderate cost, so that it is a affordable to the averaged salaried person.

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