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SMART DOOR WITH FACE RECOGNITION PROCESS

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ABSTRACT

The Covid-19 outbreak has proven to be the deadliest in human history. Millions of people have died, causing countries to go into lockdown and economic recession. Given the lack of a specific antiviral treatment for Covid-19 infection," social distance" is likely the most successful method in preventing the virus's spread thus far.

This study proposes an IoT-based doorbell that notifies the homeowner when a guest arrives. All of the system's readings are logged in the Firebase online database, and a companion mobile app is also available. we propose a smart home security system, using IoT as well as face recognition. In our system, the web camera is used which is connected to the Arduino accompanied by a switch such as the Six legs on/off button mini. On motion detection camera captures an image of the person in front of the door then real-time face recognition is done using a local binary pattern histogram (LBPH). Face recognition is effective in multi-face recognition and stranger identification, both of which are important for home security. In the event of a power outage, this system is battery-powered. Furthermore, the house owner can utilize an android and web application connected to the Arduino through the internet to keep track of what is going on in the house.. Without physical contact, the person's identity can be determined without the use of any specific hardware. Face recognition is performed using a deep learning technique. Deep learning is one of a larger category of machine learning methods that are based on learning data representations rather than taskspecific algorithms. Learning can be supervised, semi-supervised, or unsupervised. The system is upgraded on a regular basis thanks to deep learning. As a result, the accuracy is improved. One example of an Internet of Things (IoT) application is home security. The Internet of Things (IoT) is a network of connected physical devices that can communicate and exchange data without the need for human intervention.

Introduction

Nowadays biometric systems bring in an added layer of security to networks, applications, personal computers, and physical facilities. Face recognition has swiftly made an entry into the real world and has proved to be the most successful and bang-on technology which is no more just in the world of science fiction. People can use it as a surveillance system, criminal identification, identity verification access or attendance system, home automation, etc. From 2D algorithms like PCA, Eigenfaces, Fisher faces, LDA, and IDA to SVM, CNN, and now deep learning, ML, and artificial intelligence, face recognition technology has evolved immensely. In this project, the face recognition process is initiated by a Contactless doorbell. This will turn on the integrated camera and capture images. The image captured will be compared with the one stored in the backend database. On matching, the name of the person at the doorstep will be announced. In case, the face is not present in the

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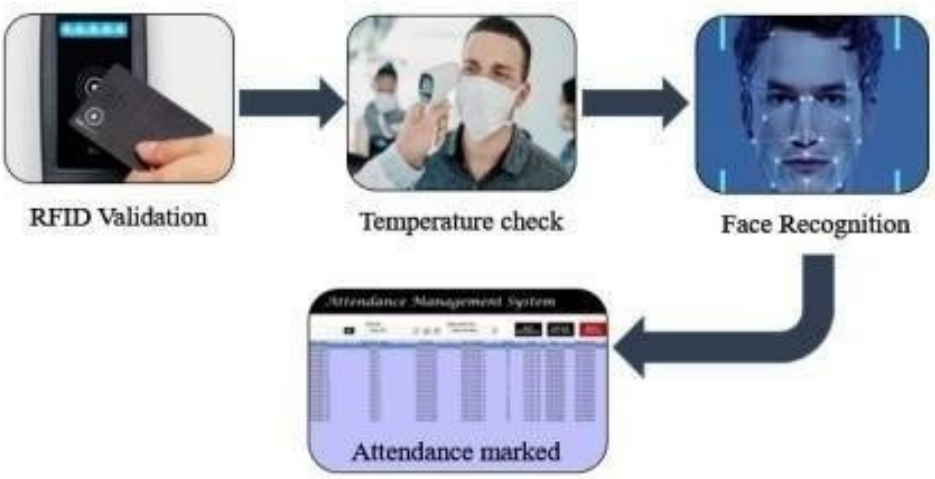
database, it will be stored newly. Compared to the old traditional doorbell, this improvised one notifies us of



the person at the door.

Figure 1.1 – Evaluation Protocol of our Proposed System

This will be helpful for persons with disabilities, particularly blind people. The created data set will be the face recognition image data of the code, the training and recognition process is done by the LBPH algorithm, and the image will store in the database by the person's name. After that whenever that authorized person will come in front of the user's door it will detect easily that person's identity and will send a notification to the user via showing the green/red light. This will turn on the

integrated camera and capture images. The image captured will be compared with the one stored in the backend database. On matching, the name of the person at the doorstep will be announced. In case, the face is not present in the database, it will be stored newly.

Block Diagram:

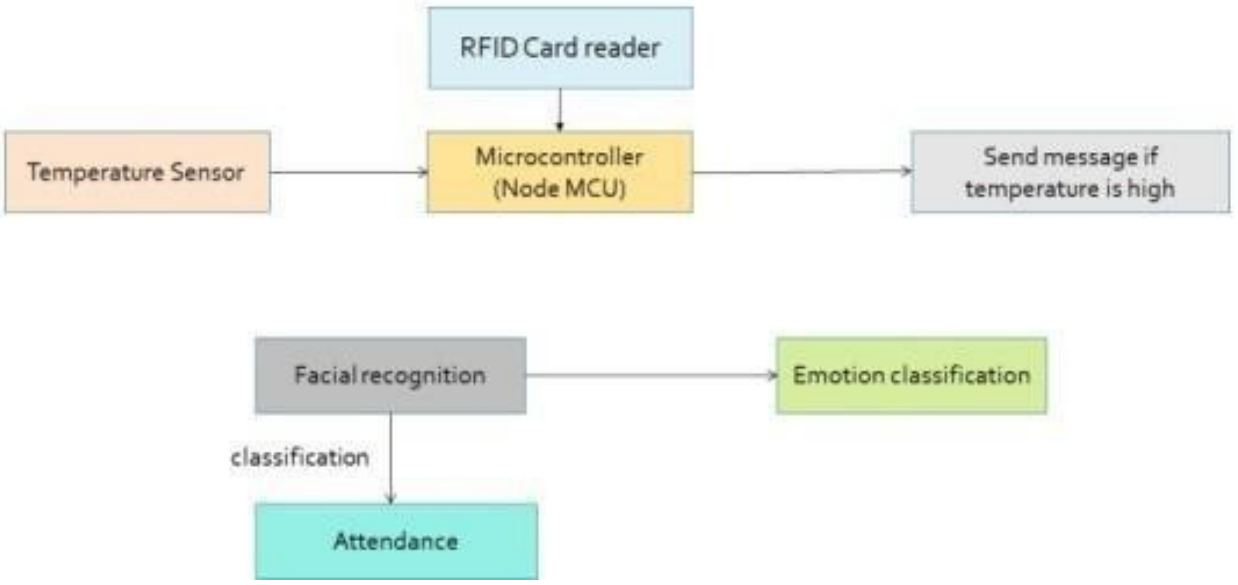


Figure 1.3 – Block Diagram of Proposed System

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Proceedings:

1. Thus, the proposed system verified the RFID card and measured the temperature of the employee, and sent a message with the corresponding employee details to the concerned authorities in case of high temperature.
2. If the temperature was normal, the access time check was carried out.
3. After the successful completion of all the above-mentioned procedures, facial recognition was implemented for the given input image of the employee.
4. If the prediction matched the name associated with the RFID tag, entry was granted to the employee.
5. Further, for improving the productivity of the employees, the emotion of the employee was captured and observed for a while based on which he/she was directed to take counseling if his/her emotion was found "Negative" for more than a threshold number of days.

Literature Survey

This chapter deals with the systematic study of papers and works from the older inventions and presentations of international journals and conferences and the data will be tabulated for a quick summary of revision. Through this, we have gained knowledge on correcting the mistakes and gained knowledge on factors that involved in future scopes

Ayman Ben Thabet and Nidhal Ben Amor, "Enhanced Smart Doorbell System Based On Face Recognition,"

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 a Raspberry pi board with ARMv7 Cortex-A7 as the core within the OpenCV library. The system is based on the criteria of low power consumption, resource optimization, and improved operation speed. This paper reviews the related work in the field of home automation systems and presents the system design, software algorithm, implementation, and results.

SYSTEM ANALYSIS

Existing System

The existing system used a touch-based bell system which will act as a smart power key feature to activate the protocol. Due to the pandemic situation, this might create a huge impact on society. Less importance on social distancing is a major flaw of existing smart doorbell systems. The main goal of this project is to use a Raspberry Pi board with an ARMv7 Cortex-A7 processor as the core and the OpenCV library to replace expensive image processing devices. This project is primarily focused on image processing, with the OpenCV library being ported to the Raspberry Pi. Existing Face Recognition Systems

Face recognition systems have been around for many years and have found numerous applications in various fields. Some of the existing face recognition systems are:

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SYSTEM DESIGN

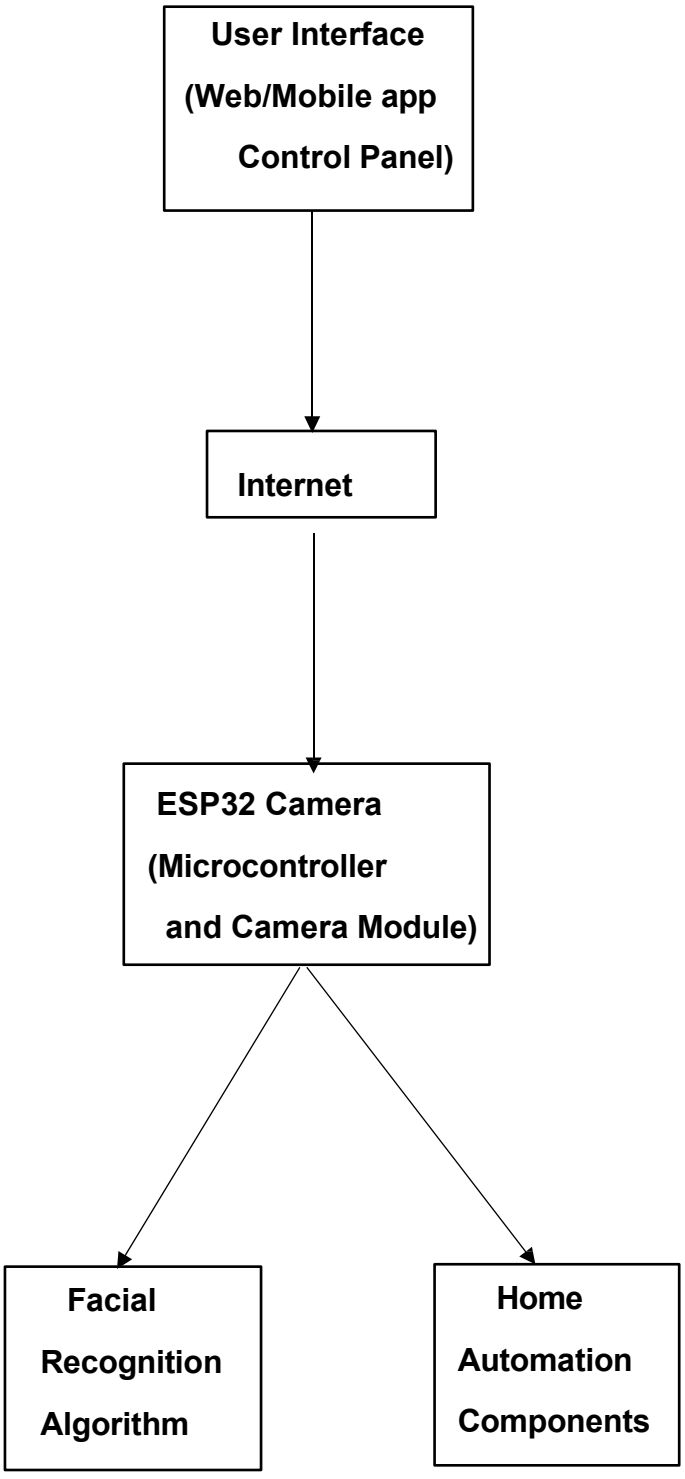

Figure 4.1 System Architecture

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Data Flow Diagram

In this data flow diagram, the User Interface component communicates with the ESP32 Camera Module and Home Automation Components to capture and process images, recognize faces, and control the home automation devices. The image capture data flow begins when the User Interface sends a command to the ESP32 Camera Module to capture an image of a person's face. The image processing data flow starts when the captured image is sent from the ESP32 Camera Module to the Facial Recognition Algorithm to analyze and detect the face. Once a face is recognized, the Facial Recognition Algorithm sends a command or status update to the User Interface. Finally, the home automation data flow begins when the User Interface sends a command to the Home Automation Components to control their behavior, and the Home Automation Components send status updates or respond to the commands.

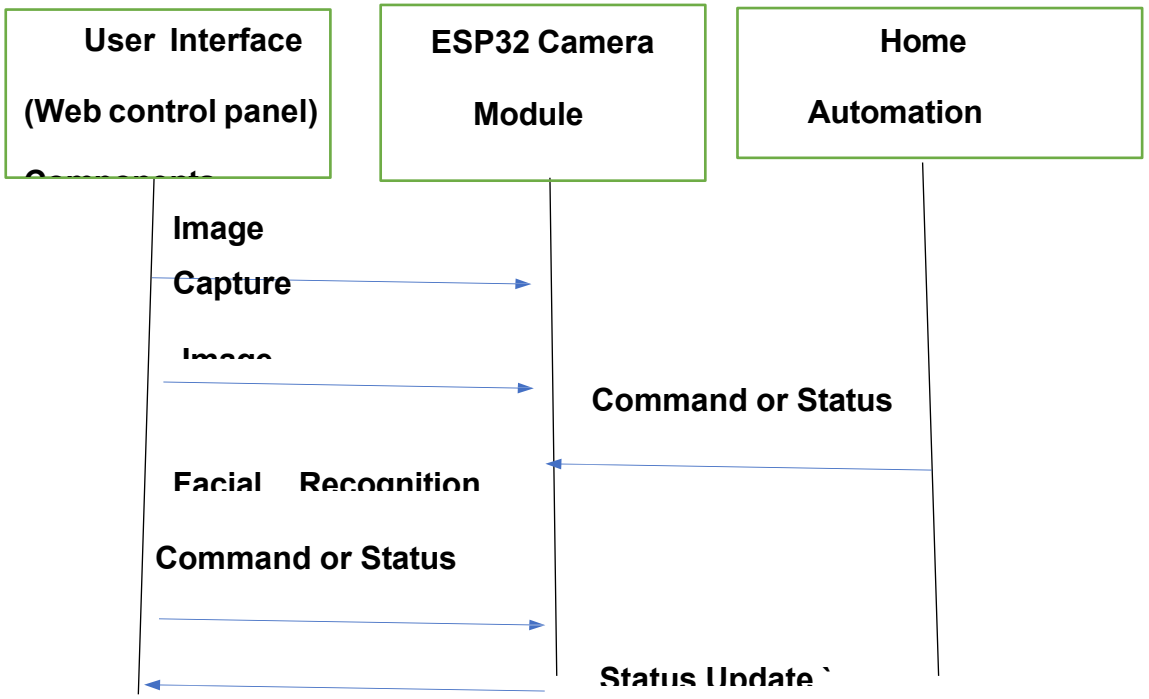

Figure 4.2 Data Flow Diagram

Implementation Details

Development and Deployment Setup:

The development and deployment setup for the "Unlocking Home Automation System by Face Detection Using ESP32 Camera" project includes the following components:

Hardware Components:

ESP32 Development Board: This board is used to interface with the camera module and control the home automation devices. It provides Wi-Fi and Bluetooth connectivity.

Camera Module: This module is used to capture images of the user's face for facial recognition.

Door Lock Mechanism: This mechanism is used to physically lock and unlock the door.

Home Automation Devices: These devices include lights, temperature sensors, and other smart devices that can be controlled through the system.

Software Components:

Arduino IDE: This is the integrated development environment used to program the ESP32 development board.

OpenCV Library: This library is used to implement the facial recognition module. Python: This programming language is used to train the machine learning algorithm used for facial recognition and to implement the data storage module. Web-based Interface or Mobile Application: This provides the user interface for the system.

Deployment:

The system can be deployed in a home or office environment.

The ESP32 development board can be powered using a USB cable or a battery. The camera module can be attached to the development board using a ribbon cable.

The door lock mechanism can be connected to the development board using a relay or a transistor.

Conclusion

Paragraph This work is aimed to build a complete system for face recognition that is easy, low power, and cost-effective. Its utility is to be set as an alert for home visitors and to provide information about the visitors for persons with disabilities. This project covers the analysis, design, development, and testing results of the face recognition doorbell. In this project, a face recognition system has been developed in order to study the potential application for home automation door security with real-time response and better recognition rate. Among the other biometric techniques, the face recognition approach offers one great advantage which is user-friendliness. There are some improvements to the system. Future work includes working on the environmental lighting conditions, training the classifier with more images, and identifying people with masked faces as well. Further by adding a solenoid, this project can be integrated with a door-lock system too so that the door can be opened directly the "Unlocking Home Automation System by Face Detection Using ESP32 Camera" project is a promising solution for enhancing home automation systems by implementing a secure and convenient way of accessing them through facial recognition technology. The system's architecture, design, and development process have been discussed, including the use of the LBP algorithm and the C/C++ programming language.The feasibility of the project was analyzed, considering technical, economic, and social aspects, and it was determined that the project is feasible and can be successfully implemented.The system's modules were described in detail, including the facial detection, facial recognition, and home automation modules. The testing phase was also discussed, which includes unit testing, integration testing, system testing, and acceptance testing, all of which are essential to ensure the system's reliability and usability.Overall, the "Unlocking Home Automation System by Face Detection Using ESP32 Camera" project offers a secure and convenient solution for accessing home automation systems, improving the user experience and increasing the security of the system. With further development and testing, this project has the potential to become a widely used and valuable addition to home automation systems.

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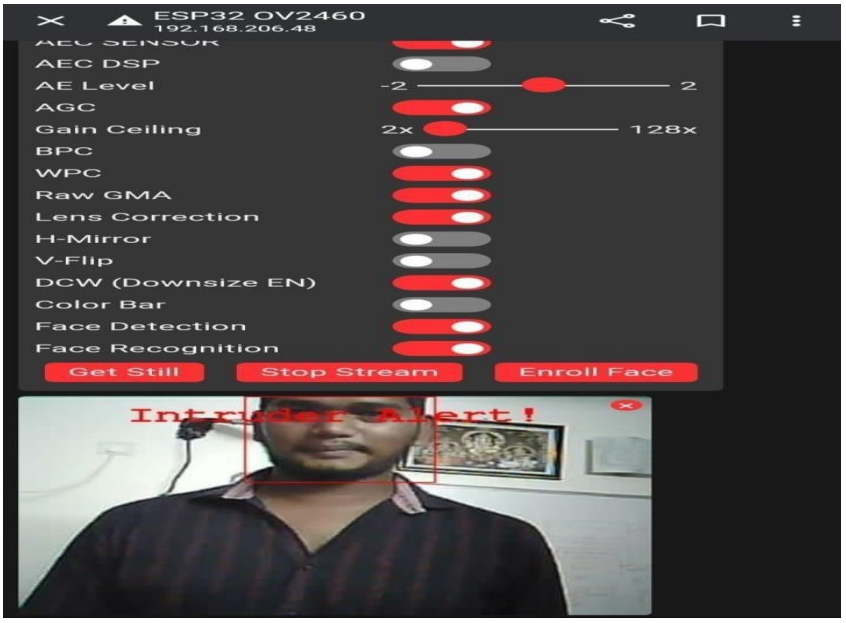

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B.OUTPUT SCREEN SHOTS

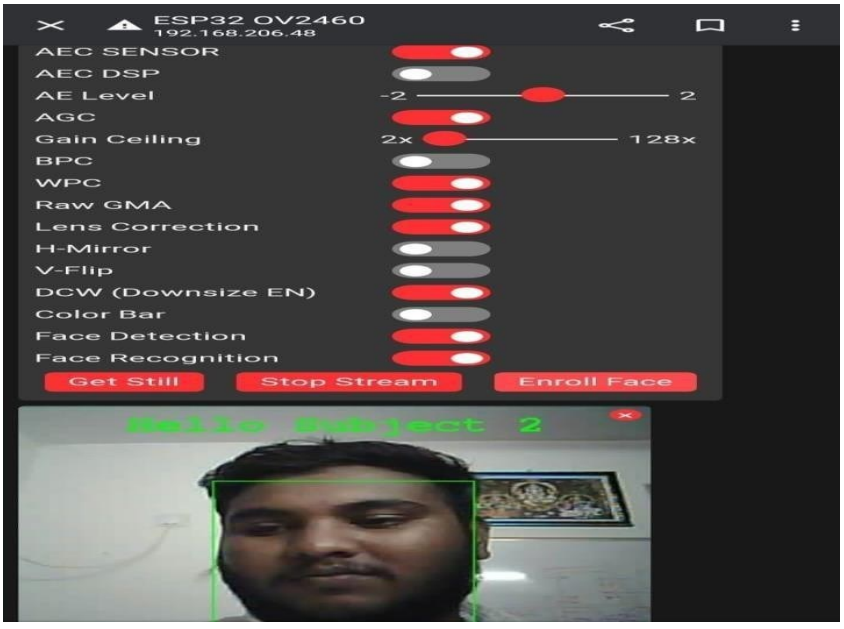

Fig7.1:Output

Fig7.2:Output

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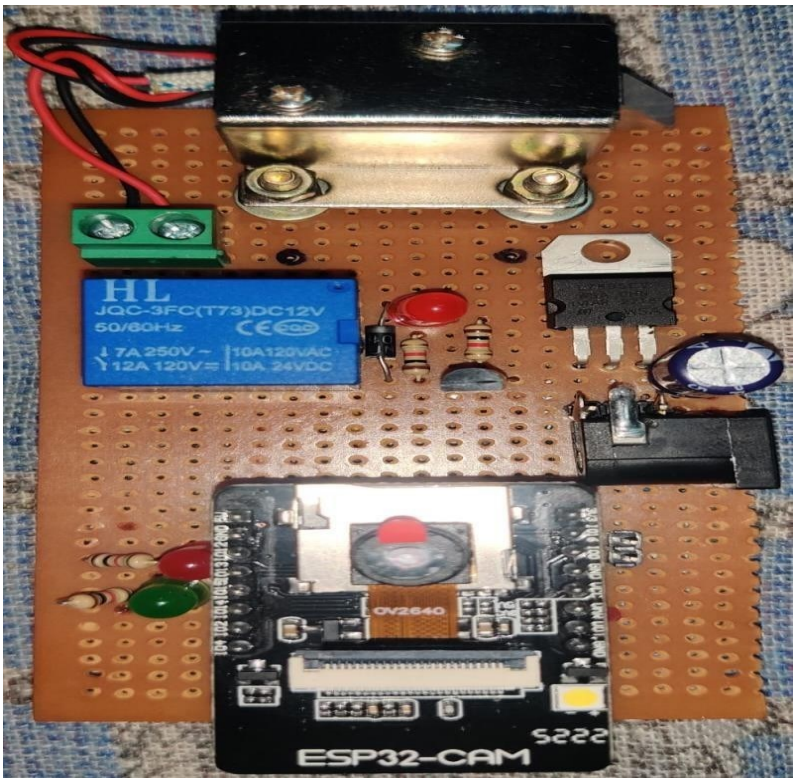

Fig7.3:Hardware of the project

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