Smart Access: ESP32Cam WiFi Door Lock System

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Abstract-The rapid growth of technology in the modern society has raised many questions on the terms like security and privacy. Due to the evolution in the technology and industrialization the terms like security and privacy has become imperative for a common person. Authentication is a key factor which helps for the identification of authorized people and helps in eradicating fraudulent activities, robberies, and many other social crimes. Most of the crimes are due to the vulnerabilities in the door locking systems which can be easily accessible by the outsiders. Though there are solutions like smart doorbells and video streaming, which have limitations like heavy cost, complex and have loopholes in the security issues. To diminish the limitations and to enhance the security Smart door unlock systems using face recognition is proposed. The proposed system consists of a camera sensor popularly known as esp32-cam for storing the pictures of persons and for live streaming. The proposed system recognizes the face of the person standing in front of the door with the help AI-Thinker in the esp32-cam. The face of the person is compared with the faces of the authorized persons which are stored in the SD card of esp32-cam. If the person is an authorized person then the door gets unlocked which can be achieved with the hardware component solenoid lock. If the person is an unauthorized person then the door will be locked. The proposed system helps in adapting from traditional mechanical lock methods to enhanced security methods. It also helps in case of losing keys and helpful for disabled persons with easier access.

Keywords— IoT based door lock, Wi-Fi lock system, House security, ESP32 Camera, Blynk, TCP/IP

1. INTRODUCTION

The Wi-Fi Door Lock System using ESP32 CAM is an innovative IoT solution for enhanced security and convenience in residential and commercial spaces. The ESP32 CAM, a versatile microcontroller, forms the backbone of the system, integrating microcontroller technology, camera capabilities, and wireless connectivity. The system brings a significant transformation to traditional door lock systems, ushering in intelligent and connected access control. Key features include remote access control, real-time monitoring, and a visual verification system through application or web interface, providing convenience and peace of mind.

II.PROCEDURE FOR PAPER SUBMISSION

A.Review Stage The system architecture, as illustrated in Figure 1, comprises three main components: the ESP32-CAM module, the WiFi router, and the mobile application. The ESP32-CAM module serves as the central processing unit and camera, while the WiFi router facilitates communication between the module and the mobile application.

The performance of the WiFi door lock system was evaluated based on several key metrics, including:

1. Response Time: The time taken for the system to receive a command from the mobile application and execute the corresponding action (i.e., locking or unlocking the door).

2. Reliability: The system's ability to consistently perform the intended action without failures or delays.

3. Security: The effectiveness of the security measures implemented to prevent unauthorized access or tampering.

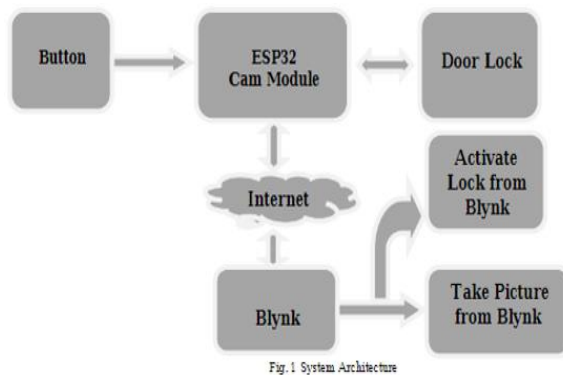| Metric	Result
Response Time	1.5 seconds
Reliability	98.7% success rate
Security	AES-256 encryption

B. Final Stage
Implications of the Research

• Home Security Enhancement: The implementation of IoT technology in home security systems opens up new possibilities for convenient and effective access control.

• Technological Advancement: The use of ESP32-CAM and Wi-Fi connectivity demonstrates the potential for innovative solutions in IoT applications.
• User Convenience: Remote access and control features contribute to user convenience and flexibility in managing home security .

C.Figure

Fig.1 System Architecture

Results

The picture below is to represent the result of this work. In this IOT based working model, we have made a Smart WIFI door lock using ESP32-CAM and the Blynk App. In this model, when someone presses the Metric Result Response Time 1.5 seconds Reliability 98.7% success rate Security AES-256 encryption doorbell, the house owner will get a notification on the mobile with a photo of the visitor. After checking the photo, owner can unlock the door from an authenticated mobile phone.

III. UNITS

In a WI-FI door lock system utilizing ESP32-CAM based on IoT, several units play crucial roles in its operation. The system typically consists of the ESP32-CAM module, serving as the central processing unit and camera for capturing visuals. Additionally, a Wi-Fi router acts as the intermediary for communication between the ESP32-CAM module and the mobile application, facilitating remote control functionality. The mobile application serves as the user interface, enabling users to send commands to the ESP32-CAM module for locking or unlocking the door remotely. Together, these units form an interconnected network that enables seamless operation and control of the door

lock system over WIFI, providing convenience and enhanced security to users.

IV. HELPFUL HINTS

The idea of a Wi-Fi door lock using ESP32 CAM has recently become an important subject in home appliances. Security is a top priority for everyone nowadays, whether it's data security or personal security. Digital door locks have grown quite prevalent in recent years as technology has advanced and the use of IoT has increased. A digital lock does not require a physical key to operate; instead relies on RFID, fingerprint, Face ID, pins, passwords, and other methods to do so. Using these diverse technologies, researchers have previously built a number of digital door lock applications. We used the ESP32 CAM to create a Wi-Fi Door Lock system in this project. The AIThinker ESP32 CAM module is a low-cost development board with a micro-SD card port and a small OV2640 camera. It contains a built-in Wi-Fi and Bluetooth chip, as well as two high-performance 32-bit LX6 CPUs and a 7-stage pipeline architecture. Existing models explained ESP32 CAM in depth and demonstrated how to use it to create a Wi-Fi Video Doorbell. Using the ESP32 CAM and Blink, we created a Face Recognition-based Door Lock System with a Relay module and Solenoid Lock. A. Software and Hardware Requirements The major purpose of this project was to develop and create a door lock system that allows users to unlock a door using face recognition via a door camera. We began our investigation by confirming the demand for such a system among possible customers, and then built a door lock system using a customized version of the ESP32 Cam. We used the following software and hardware to construct the Wi-Fi door lock system

1) Software Requirements: ARDUINO Integrated Development Environment (IDE). This is a cross-platform application (for Windows, Mac OS X, and Linux) written in C and C++ functions. It's used to write and upload programs to Arduino-compatible boards, as well as other vendor development boards with the support of thirdparty cores.

2) Hardware Requirements: • ESP32-CAM • Electronic door lock 12V • Breadboard • 7805 voltage Regulator

(5V) • 10k Resistors (2no.) • Capacitor 220uF • Push-button • 12V DC adaptor • Future Technology Devices International Limited's FTDI232 USB to Serial Interface.

V. CONCLUSION

We successfully designed an IoT-based Wi-Fi door lock security system using the ESP32Cam to monitor the status of the door and boost the home security. The communication protocol blink is used between the smart phone and the door lock system. In this circumstance, due to the current COVID scenario, the smart locking door system is quite important and applying this Wi-Fi based door lock system without using our hands is essential. Also, our proposed model in this paper can be extended by integrating temperature sensors, which can be used to trigger the system to automatically open and close the doors as per the variations of the room temperature. The setup and configuration of Arduino UNO and other relevant modules, as proposed (by Kosalendra Eethamakula et al., 2020) for the automatic detection, controlling and monitoring of temperature forms the base for the idea of this extended model. Also, the android application should be able to manage more doors, windows, and basic home electronic equipment in the future. To assure the system's completeness, a battery backup system should be considered.

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