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Door Lock Security System Using Recent Technology

Sanskruti Dharme[1], Diksha Dahate[2], Sweety Kadwe[3], Rohit Bilwane[4], Rajendra B. Khule[5]
[1, 2, 3, 4, 5]*Dept. of Electronics Engineering, K. D. K. College of Engineering, Nagpur*

Abstract: ***In terms of house security, the door is pivotal. To keep the hearthstone secure, the proprietor will keep the door locked at all times. Still, owing to a rush when leaving the house, the proprietor may forget to lock the door, or they may be doubtful if they've closed the door or not. Wireless security grounded operation have fleetly increased due to the dramatic enhancement of ultramodern technologies.***
Numerous access control systems were designed and/or enforced grounded on different types of wireless communication technologies by different people. Radio Frequency identification (RFID) is a contactless technology that's extensively used in several diligences for tasks like access control system, book shadowing in libraries, tollgate system, forced chain operation, and so on. For enforcing this design, we will be using Arduino mega 2560 pro mini, a fingerprint sensor, Keypad module. ESP-32 CAM module, RFID sensor, solenoid lock and ESP8266. We have also created an application for monitoring and controlling the security features of the door lock. We can also open the door through mobile fingerprint.
Keywords: Arduino mega 2560 pro mini, ESP32-CAM, ESP8266, Fingerprint sensor, Keypad module, RFID sensor.

I. INTRODUCTION

Anyone nowadays is concerned about security, whether it is data security or the security of their own home. Bio-metrics authorization proves to be one of the best traits because the skin on our palms and soles exhibits a flow like pattern of ridges on each fingertip which is unique and immutable.
This makes fingerprint a unique identification for everyone. The popularity and reliability on fingerprint scanner can be easily guessed from its use in recent hand-held devices like mobile phones and laptops. 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 relying on Radio-Frequency Identification (RFID), fingerprint, Face ID, pins, passwords, and other methods to do so. Various door locks such as mechanical locks or electrical locks were designed to attain basic security requirements. Basically, these locks can be easily hacked by unwanted people thereby allowing unauthorized personnel into secured premises. Automatic access control system has become necessary to overcome the security threats faced by many organizations in Nigeria. By installing the system at the entrance will only allow the authorized personnel to enter the organization. The system is not restricted to main entrance installation, but can be installed at various entrances within the organization to track personnel movement thereby restricting their access to areas where they are not authorized.
Radio-Frequency Identification (RFID) is an emerging technology and one of the most rapidly growing segments of today's access control. RFID technology, offers superior performance over other automatic identification systems and is used in many areas such as public transport, ticketing, animal identification, electronic immobilization, industrial automation, access control, asset tracking, people tracking, inventory detection and many more.
Use of keys which is old method and by use of RFID technology. Password based door lock system provides security for homes through a security password which is confidential for the user alone, the user will need to enter a password to unlock the door. Using all these diverse technologies, we have design a project based on all of these technology. The project also has its own application called "Smart Door Lock" which connects the user phone to the door lock. In application there are many options for combination of locks.
The user can also open the door lock using these application through fingerprint of his\her 2 phone. If the user wants to enter, then he\she should use any of the option to unlock the door and if nothing matches the saved data then the door remains closed. While going outside the user can set the combination of any of the two features or can also use all the system together to open the lock. These increase the security of the house, if the unauthorised person wants to open the door then he\she has to enter both combinations correct to open the door.

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II. LITERATURE SURVEY

The existing systems we considered for this study, include:

A. Password Based Security Lock System
B. Face Recognition Door Lock System Using Raspberry Pi
C. Smart Door with Face Unlock The description for each one of these is given below.

1) *Password Based Security Lock System:* The Password Based Door Lock System with the 8051 Microcontroller is a simple project that uses a secure password to unlock the door. Traditional lock systems that use a mechanical lock-and-key mechanism are being phased out in favour of more modern locking mechanisms. These approaches are highly clever and combine mechanical and electronic devices. The simplicity and high efficiency of these unique lock systems are two of its most obvious advantages. An electronic control assembly controls the output load via a password in such an automatic lock system. A motor, a lamp, or any other mechanical or electrical load can be used as the output load. This system uses an 8051 microcontroller to illustrate a password-based door lock system, in which the door is unlocked and the concerned individual is granted entrance to the secured area once the correct code or password is entered. If another individual arrives, it will once again prompt you to input the password. If the password is incorrect, the door will remain closed, denying the person's access. An electronic control assembly controls the output load via a password in such an automatic lock system. A motor, a lamp, or any other mechanical or electrical load can be used as the output load.
2) *Face Recognition Door Lock System Using Raspberry Pi:* Face recognition technology has advanced significantly over the last decade, and it is currently mostly utilised for surveillance and security. There are three stages to this project. The face samples that are authorised to open the lock were obtained in the first phase. The Recognizer was trained on these face samples in the second phase, and trainer data was utilised to recognise the faces in the third phase. If the Raspberry Pi detects a face, it will unlock the door. A solenoid lock and a Raspberry Pi camera are used to create this face recognition-based door lock system.
3) *Smart Door with Face Unlock:* In this project, a standard shelf is modified to have a security system that unlocks using Face Verification. A Windows Forms Application was built in C# that can store, verify and unlock trusted faces. It uses a proprietary API for face verification and an IoT Cloud API for communicating with Wi-Fi Module and Arduino. The Wi-Fi Module is connected to an Arduino Uno, which will operate a servo motor that will lock and unlock the door.
4) *Umar et al [3] Proposed an RFID Based Security and Access Control System:* It is the design of RFID based security and access control system for use in hostels inside Punjab University promises. The system combines RFID technology and biometrics to accomplish the required task. When the RFID reader installed at the entrance of the hostel detects tag UID, the system captures the user's image and scans the database for a match. If both card UID and captured image matches a registered user, access is granted; otherwise, access is denied and the system turns on alarm to alert the security personals. The advantage of the system is that it successfully accomplished security and control task by processing information from sub-controllers like; entrance monitoring controller, exit monitoring controller and mess monitoring controller installed at entrance gate, exit gate and mess gate respectively. Although the developed system is useful in reducing security threats to the hostels, there is a room for improvement in the response time of the system. The response time can be improved by using dedicated processors instead of computer systems capable of processing the images in real time.

III.PROPOSED SYSTEM

The prototype is built using an iterative process that matches the design specifications during the development and implementation phase. We can create and test in repeating sequences by breaking down the design into little bits. New features can be developed and evaluated in each iteration until we have a fully functional system that meets the goals. The prototype have two units i.e. Outdoor unit and Indoor unit. The outdoor unit has all security features like fingerprint, password and online monitoring. The indoor unit has only child lock feature. Smart door lock with ESP32 CAM uses Internet of Things (IoT) technology to monitor front area of the door, and the system also uses the fingerprint and password protection features and improve home security. Whenever the person presses the bell switch the owner can see in their phone and can unlock the door. In password based system, the user can set a password according to their needs. The password which user will enter will saved as set password during installation of the system. In initial stage the system will get locked and if the owner or any person wants to open the door through the password he/she can enter the password. The password is then gets checked with the saved password and if the entered password matches the saved password then the solenoid lock will open, if not then the door remains closed.

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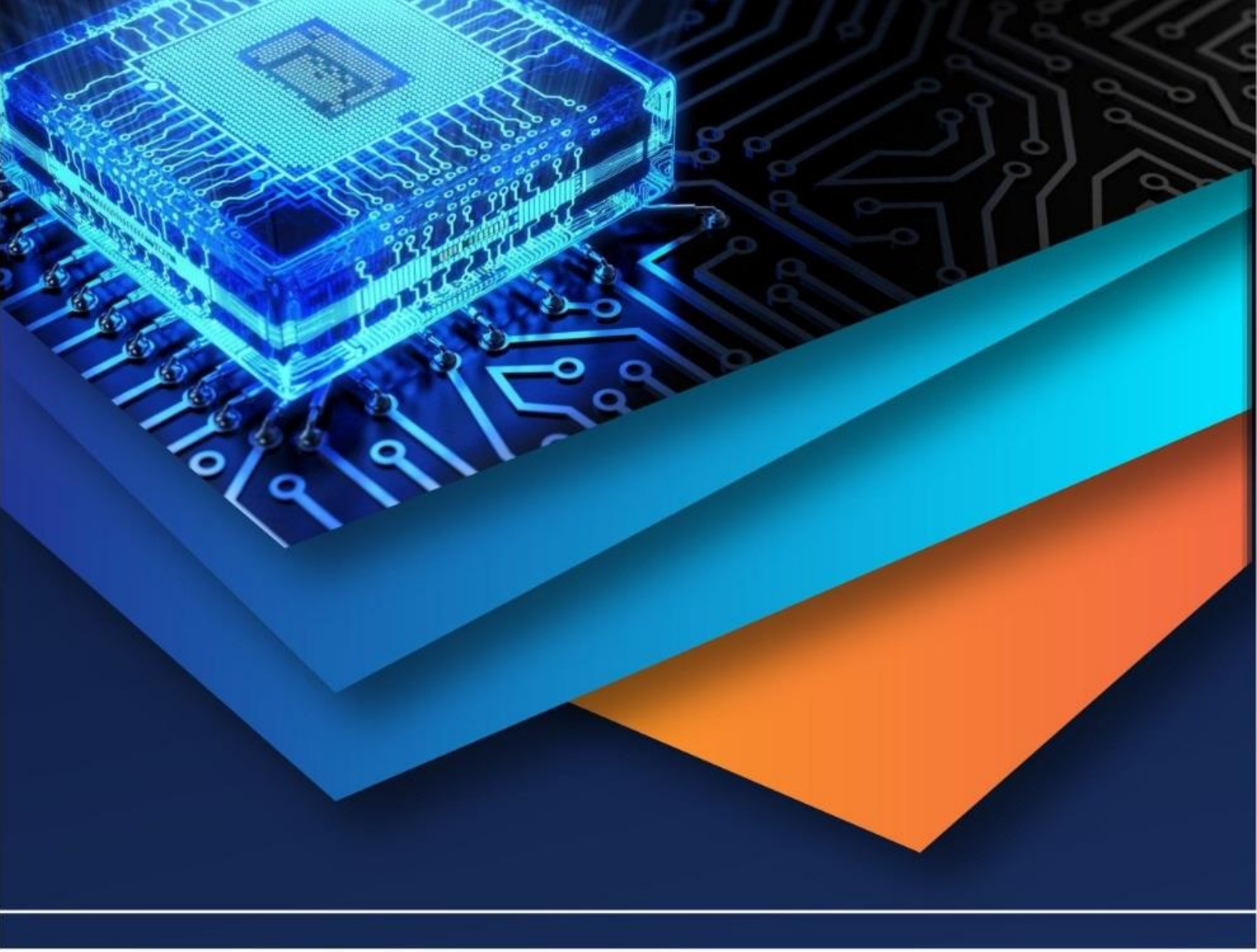
The prototype also has fingerprint based system. During the installation the owner will have to enrolled his/her fingerprint and that fingerprint will be enrolled and will get saved in the system. The owner can also enrol number of fingerprints of his/her family members so that they can also access the door. Whenever the user access the door through the fingerprint and when user scans the fingerprint the fingerprint data is then gets checked with the enrolled fingerprints and if it matches then the solenoid lock opens, if not then it remains closed. The system has child lock system in door unit. If there are children in the house and the user doesn't want them to open\access the door from indoor unit so the user can activate child lock feature so that the door cannot be open from inside unless the child lock system is disabled. The indoor has a switch to open the door directly from inside without any features as mentioned above. 24 The application of these system is used to secure the door using any combinations of the present feature to increase the security of the house. The user can also open the door using the mobile fingerprint sensor through the application or can directly open the door. The application also has child lock feature so that the children cannot open the door if the child lock is activated. The user can also see the live stream of the front area of the door in the application.

IV. CONCLUSION

The main purpose of this project is to build a door lock with many security features as possible and beneficial to each and every individual. We have built this system using Arduino and ESP-32 Cam module. The system we designed is a succeed and provides security more effectively.

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