

Smart door locking system

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Abstract:

As we know, security is a defence practice to against the threats. In order to keep our valuable items safe, we use security. We also use various levels of security in our devices to protect the confidential data. Similarly, our houses, offices, hospitals also need security. A multi factor security solution is proposed which can authenticate, authorize and validate the user and open the door for the user after three types of verification. The door will be unlocked when the user passes RFID identification, filling correct passcode and face verification which will be manually approved by the home owner for strangers and will detect and match the known people from database. The main aim of proposing this solution is using the current available technology and providing a security which can really maintain the confidentiality and integrity.

Existing Solutions and Related work:

Nowadays, there are many security cameras with face detection algorithms but those devices do not prevent the robbery or breaking of confidentiality

because cameras can capture or maximum, they can inform to police or someone else but that will lead to a delay.

Systems which automatically unlock the door based on GPS location of the user are providing more comfort than the security

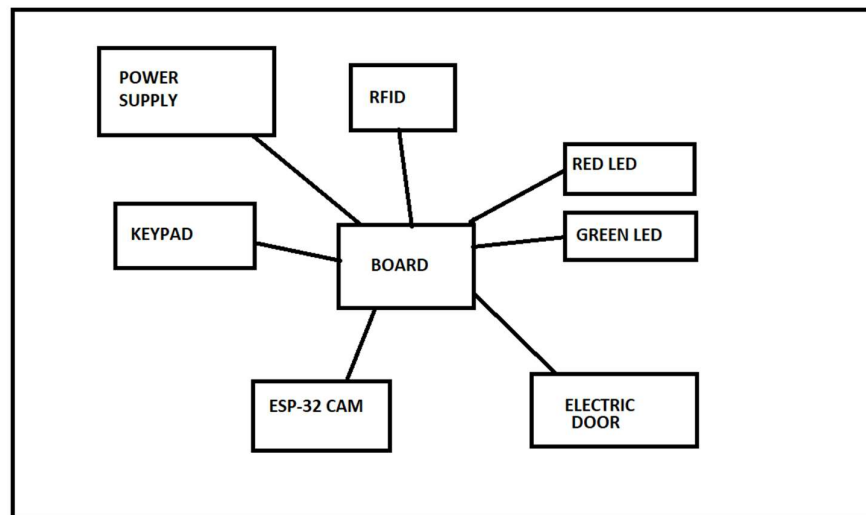
While talking about security we can't compromise in any field. A multi factor authentication device is required to provide the security. So, a device which will be verifying the identity in various ways is proposed Which on authorization will open the door and the admin will have the rights to increase and decrease the levels of authentication from the application. The user will be able to enter the building only after passing the certain levels of authentication. This is necessary in order to anticipate the vulnerabilities. The main difference of our solution, is the use of low-priced ESP modules which, in turn, significantly lowers the price of the proposed locks while increasing the level of functionality.

Proposed Work:

Proposed a security system contains door locking system using passive type of RFID. The system used hardware as well as software. In order to increase the security,

other methods can also be included like face detection and passcode. The hardware components are Processing

Board, RFID reader & tags, esp32cam, keypad, electric door lock, USB connections and connecting cables etc.



Pros:

- Multi factor authentication provides a great security
- RFID tags do not use power
- Strangers getting verified through face detection

Cons:

- Internet connectivity must be available for 24x7
- Electric power should be available for each second

Testbed, Platform and Tools:

Arduino IDE is required to compile and upload the code on the suitable board. Suitable board can be NodeMCU or Arduino with ESP8266 Wi-Fi Module. AWS IoT Core: can be used to send data for Analysis & Storage. Hardware tools include the required modules and the prototyping board and

for their connection either a customised PCB or Wires.

Dataset:

A dataset needs to be created for the storage of Face Ids, known RFIDs and the authenticating passcode details also. Another dataset can be created for the analysis in which each log will be stored

Algorithm

Step 1: The RFID reader retrieve the information contained by tag as it come in the range of reader.

Step 2: after receiving the tag information, reader send this information to database for confirmation. If it holds, the information stored for further operation.

Step 3: The central server queries to database and retrieve corresponding information after receiving the query from the reader

Step 4: The reader computes timestamp (date, time) after receiving the reply from server and create a log.

Step 5: Once the tag information is verified, the system generates a control signal through parallel port which allows to proceed for more verification or open the door

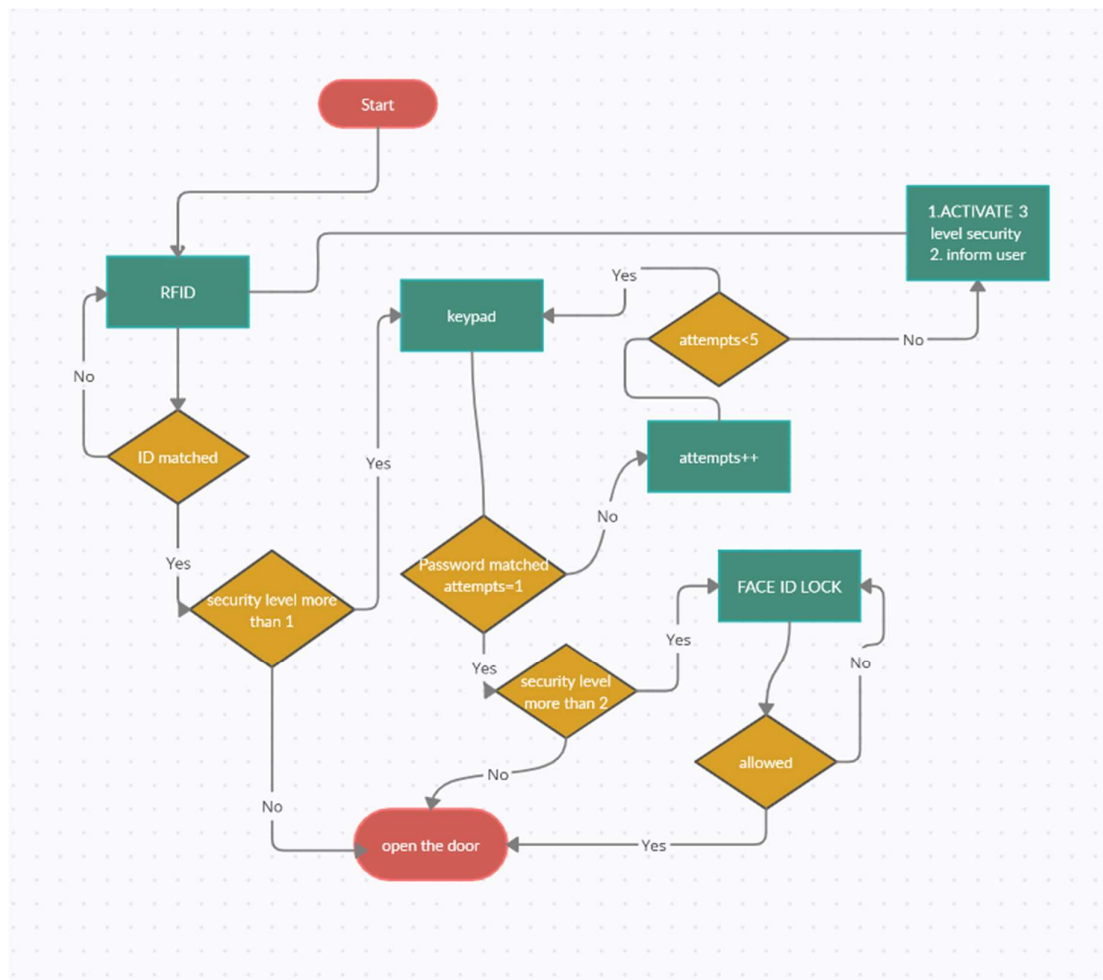
Step 6: if the system needs more verification, then user will have to enter the passcode and similarly the system will verify the entered code and also allow

reattempt for a particular number of times.

Step 7: the system will activate all levels of authentication in case the user uses all the passcode attempts and is unable to enter the correct passcode

Step 8: in case system needs more verification, it will detect the face of the user and identify and perform the action ordered by the owner.

Step 9: the system will keep a log of every activity



Cloud/Database

The system is able to maintain the record of a user such as how many times and at what time which user check-in. All the databases are stored in database server as

well as local server. Administrator can access database server remotely through internet or intranet and can see all the records.

Cloud can be used to host the webpage and remote storage. With Cloud we can perform analytics on the data collected

Database is required
to store the Valid RFIDs, Passcode and the Face IDs
to store the log of each activity
To store the Guest List

AWS IoT Core can be used

Interface:

RFID Reader: To read the information from the RFID Tag

RFID Tag: Contains a unique ID which will be used as Credentials

Keypad: To Enter the Passcode

Camera: For Face recognition and detection

LCD Display (optional): To display the Messages to User

Red LED: To show that Entry is denied

Green LED: to show that the user can enter

Results:

the super secure door lock system is developed for the critical zone which is also applicable for commercial purposes such as home, offices and various other organizations. But the difficulty is that this system is bit complex for non-critical places.

The door will not open in following cases:

1. If the RFID value doesn't match.
2. If the Passcode entered doesn't match.

3. Face ID doesn't match.

User must have RFID tag which contains the personal information of that particular user.

The RFID Reader detects tag in real-time and open door automatically and closes it again after a specific time interval. In this application, user authentication information is searched on the database first. If the user does not have any previous record registered to the database, the door will not be open thus unauthorized entries will be avoided.

And this will activate the red LED indicating the verification is unauthorized and the door will not be opened for that user.

Once the user information matched with information stored in central database system, then user only can enter within the confined place as the door will open only when the tag information match with the database. The system can be deployed in various secure places within a building.

Future work:

- Various Machine learning and artificial intelligence algorithms can be used to make face detection better
- Adding more modules for Finger print verification, OTP and Voice detection can increase the security
- As the technologies are developing daily, there can be any new

technology which can be added in the same product or some of the currently installed component can be replaced

Conclusion:

The problem has been formulated and various studies have been reviewed regarding the different electronic lock systems. RFID technology is one of the successfully incorporated in the door lock system. There by providing a three-way security mechanism with RFID, Passcode, Face ID provides security at next level.

The administrator of the central server-system can terminate the validity of any user at any time to avoid unexpected situations.

Finally, a multi-level authentication digital door access control system can be used in critical zones like Military Institute, Defence, Scientific Laboratory, etc too. which is cost effective and increase the scale of security successfully.

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