RFID-Fingerprint based Access Control Security System

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Abstract: - *In today's era, security is of utmost importance. Aim as the project to implement security system in case of medication, documents and others valuable items and mandatorily in the higher intelligence agency. The project introduces a unique two-way authentication where the person granted access only when the two of the authentication matches at the same time. If any one of the authentication fails, the access is denied. This will also prevent trespassing and tailgating in any organization or jewellery shops or Data-centres where the access is restricted.*

Key words – Raspberry Pi 3B+,RFID tag, RFID Reader, Fingerprint Module.

1. Introduction: - Automated assimilation and access control system has turned out to be important to defeat the security dangers faced by various organizations. This is a time where everything is associated with the system, where anyone can get the hold of data from anywhere around the globe. Therefore, hacking of one's information is a major issue. Because of these dangers, it is imperative to have some sort of personal identification (PID) to get to one's own particular information. Different systems are introduced at various points to trace the individual's movement and to confine their entrance to touchy zones within the secured area.

Password and ID card Methods are the most commonly used and observed methods for individual ID strategies. However, it is not very difficult to crack the secret password and recognizable ID cards may get lost, hence making these techniques very questionable. It will be an advantage to combine RFID Tag with the Fingerprint based biometric sensor to allow access to the valid person to the secured areas.

2. Design of the system: -

The proposed security access system is designed by both RFID and Fingerprint Sensor as an access control mechanism. In this, only RFID Reader and Fingerprint sensor is kept visible like a door lock system and both RFID and Fingerprint will be the key to grant access to the door.

The circuit diagram of the access control system consists of RFID Reader, Fingerprint Sensor, Raspberry Pi and a Breadboard. All these components are connected and powered up by making use of Jumper Wires. The Raspberry Pi is powered up by 5V. The circuit designed is shown in the **Figure 2** as follows: -
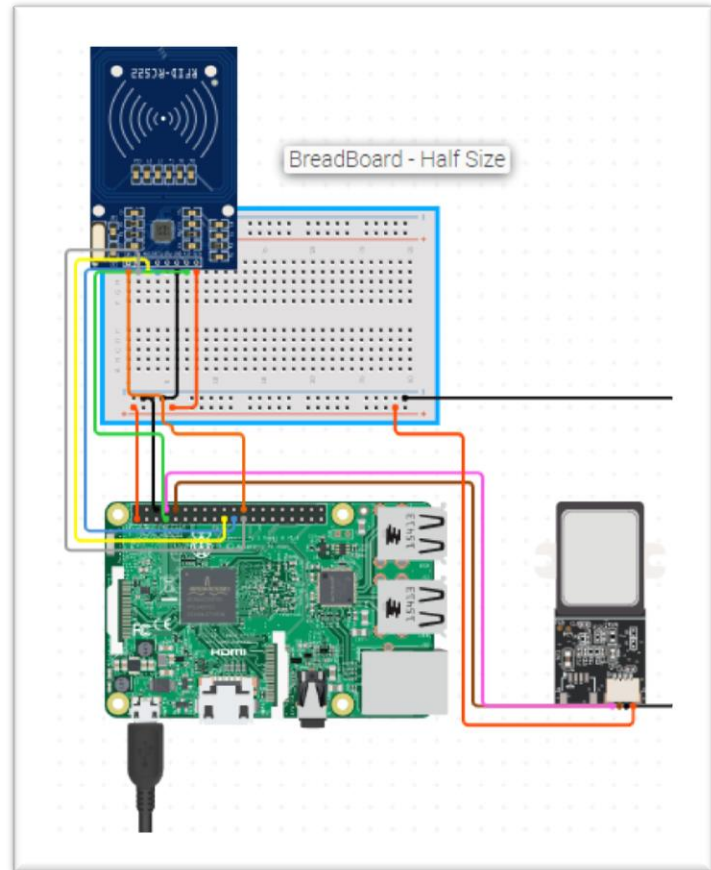

Figure 1: Circuit Diagram of RFID-Fingerprint Unit

3. System Components: -

The security access control system is divided into three parts as follows: Raspberry Pi, RFID Reader Module and Fingerprint Sensor. Each of the components used in this security system has its own importance with fine functionality.

3.1 Raspberry Pi 3B+: -

Raspberry Pi is an open source for building computerized gadgets and IoT items that can detect physical devices and control it. This version of Raspberry Pi is used as a controller device for this Access Security System.

3.2 RFID Module: -

The RFID gadget must be filtered to recover the data similar to that of a scanner tag which is scanned to retrieve the data. The data or the information retrieved

from the RFID label will then be verified at the RFID module. The data obtained by the RFID module will then be exchanged to the microcontroller framework and changed to the database framework. This kind of process is carried out to examine the validity of the person who is accessing the door. The flow diagram of the RFID Module is given below in the **Figure 3.2**
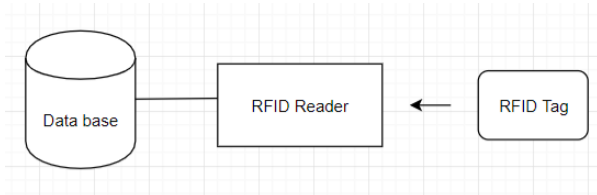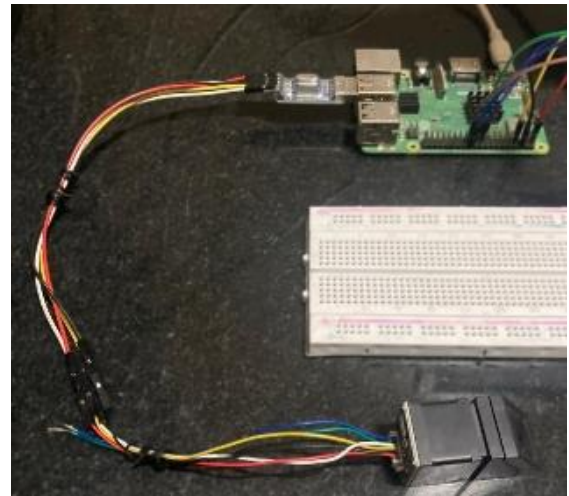

Figure 3.2

The following Figure shows the photographic view of RFID Reader connected to the Raspberry Pi 3B+: -

3.3 Fingerprint Module: -

Fingerprint authentication is the most widely used biometrics technology. The fingerprint validation suggests an automated technique for checking the match between two fingerprints. The fingerprint processing has three major essential functions: enrolment, searching and verification. Among these three major functions, enrolment of fingerprint is the most critical step, as the way the individuals place their fingerprints on a mirror can affect the outcome in searching and validation process. This technology is introduced in this system to provide two layers of protection to the system. The following Figure shows the photographic view of Fingerprint Sensor connected to the Raspberry Pi 3B+: -

4. Working Principle of the Access System: -

Working principle of access system is divided into two sections, they are as follows: -

4.1 Working of RFID Reader Module: -

RFID is a crucial and modest innovation that encourages wireless transmission of information. The RFID reader module is supplied with 5V external power supply and Raspberry Pi is powered up with 5V supply. For interfacing the RFID with Raspberry Pi, five pins of the RFID Reader is connected with five digital pins of Raspberry Pi. Both the ground pins of RFID Reader module and Raspberry Pi are connected. The RFID Reader reads the RFID Tag and the data obtained from the Tag is verified with the data in the database.

4.2 Working of Fingerprint Sensor Module: -

The fingerprint module has two fundamental requirements to make use of fingerprint sensor. The first requirement is to enrol the fingerprint which will then be identified by a unique ID so that they can be checked later. Once the process of enrolment is done, the sensor can search for the fingerprint by the assigned unique ID. This enrolment can be carried out by using the programming software's. The fingerprint is then connected to the Raspberry Pi using TTL to USB converter. Interfacing of fingerprint Sensor is shown in the **Figure 4.2**
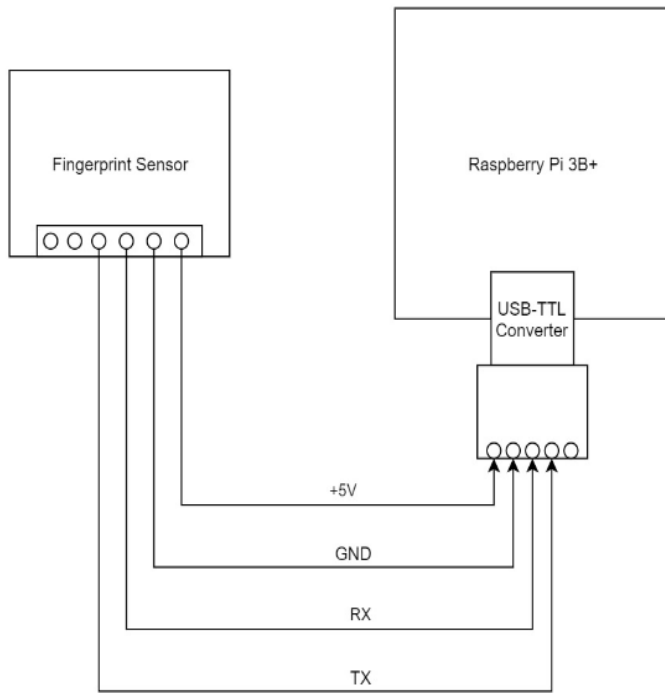
Figure 4.2

5. Construction of Access Control System:-

The system consists of electrical part which will be used for any mechanical part such as doors of server room of an organization or any other door where only restricted person will have the access. The electrical parts consists of the connection of RFID Reader, Fingerprint Sensor and Raspberry Pi connection with their total circuit connection and software programming to make these electrical components operate by requisite means. The Access control system is designed in such a way that is any of the system (RFID/Fingerprint unit) fails, other system will ensure the security of the premise. RFID unit consists of RFID Reader and a RFID Tag. When RFID reader receives the valid input, it activates the Fingerprint Unit. The Fingerprint unit allows the access to the restricted area if it receives a valid fingerprint. The person with the valid RFID Tag and the Fingerprint will be allowed access through the door. The Figure below shows the photographic view of the arrangement of the construction.
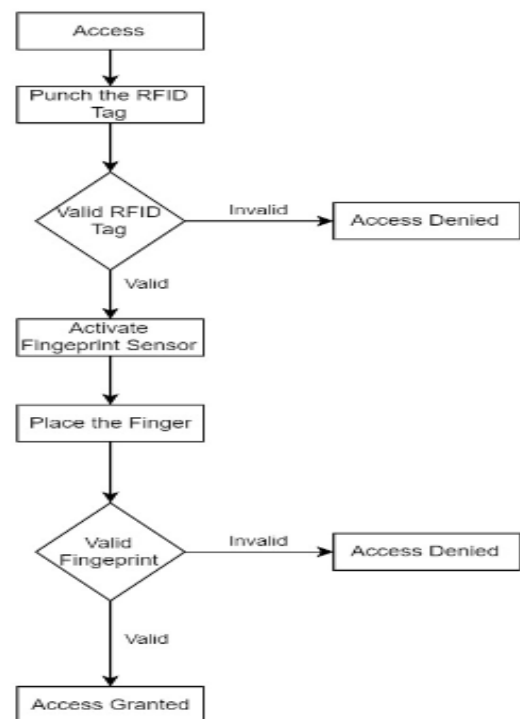

Figure 5

6. Methodology and Performance Test: -

6.1 Methodology: -

The performance test is carried out in several steps in order to check for the performance of the system. The initial step is to power on the system. After the system is powered on, the RFID tag is placed on the RFID reader. If the reader finds the valid RFID Tag, it will activate the fingerprint sensor. Fingerprint sensor will take an image and the finger and verify the fingerprint with the fingerprint that is being stored in the database against the name of the person. If the fingerprint sensor finds the valid fingerprint the access is granted. If the fingerprint received doesn't match with the data on the database, the access is denied.

6.2 Performance Test: -

To check for the performance test, the methodology system was continued four times and the observation was noted down as below: -

Sr.No	RFID Unit	Fingerprint Unit	Access Granted/Denied
1	Valid	Valid	Access Granted
2	Valid	Invalid	Access Denied
3	Invalid	Valid	Access Denied
4	Valid	Valid	Access Granted

7. Conclusion: -

This security system is very cheap, flexible and very less time consuming and does not require any code or passcode to access. This security can provide highest level of security for any kind of user. With this security mechanism, if either the RFID or Fingerprint receives an invalid data, the access is denied. This ensures 2Factor Authentication in Physical Access area.

8. Acknowledgement

9. References: -

1.https://www.researchgate.net/publication/22460244 8_Secure_Access_Control_Scheme_of_RFID_System_Appli cation

2.https://www.researchgate.net/publication/23483015 1_Access_Control_System_using_fingerprint_recognition

3.https://www.researchgate.net/

4.https://pimylifeup.com/raspberry-pi-rfid-rc522/