

ECE411
Product Design Specifications PDS
Facial Recognition Smart Door Lock

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Introduction

This project consists of a Facial Recognition Smart Door Lock using RFID and Facial Recognition technology. RFID is known as the radio frequency identification, using electromagnetic fields to automatically identify tags that can be placed in many things. A part of this project is to use RFID cards to grant access to users entering and exiting a door. The system can also help in tracking the number of people existing inside the place as well as updating itself as users exit a door. There will be two sets of LEDs, a pair for the entrance signifying granted access and denied access and another set for the exiting also to communicate granted or unauthorized exit. The reason we want to grant authorized and unauthorized exiting is because the system will keep track of how many people in the building remain from the RFID door lock. There will be an LCD display that will show “Authorized Access!” when the user is recognized either by the face detection mode or by using the RFID , “Unauthorized access!” only when using the wrong RFID card.

In the case of the facial recognition section a user that is unauthorized to access will not trigger the opening of the door . Another part of the project is the use of Facial recognition from the user. We will be using a camera connected to a raspberry pi with the addition of openCV. The raspberry pi will communicate with the Atmega328 board via I2C (SDA and SCL pins) allowing the Atmega328 to trigger a solenoid lock and granting access to the user. It needs to recognize your face for approval. The objective of this project is to access a door having two options RFID and Facial Recognition. This system adds a layer of security to a door lock that can be implemented in any place, that be for the ease to enter a place without a key or for the added security introduced with RFID and Facial recognition.

Needs Statement

- A Facial Recognition Smart Door Lock is needed to provide users with more secure access to their properties.

Objectives Statement

- The objective of this project is to design and prototype a device that will make accessing properties safer by providing two authentication methods to unlock a door.

Market Analysis

This is intended towards any customers. We want to ensure it is useful for any security purposes. One way it could be used would be for homeland security. Another way it could be used is Business companies or corporations. Any Revenues could use this as well.

Good ideas come with good competition. Common things facial recognition are used for are cellular phones and tablets. Currently Samsung and Iphones installed facial recognition for users and they used it as an authentication method to get permission. Same for some basic locks that follow the same methodology to provide access to a property. However, our product for the smart door will be providing much safer access to a property; it will not only scan your face, it also uses the tags scanning method as another authentication step with the potential of having it count the number of people entering and leaving with timings and push to a server to analyze it. We are planning to sell this product at \$399.99. This price covers a profit since the value has been doubled.

Requirements

MUST

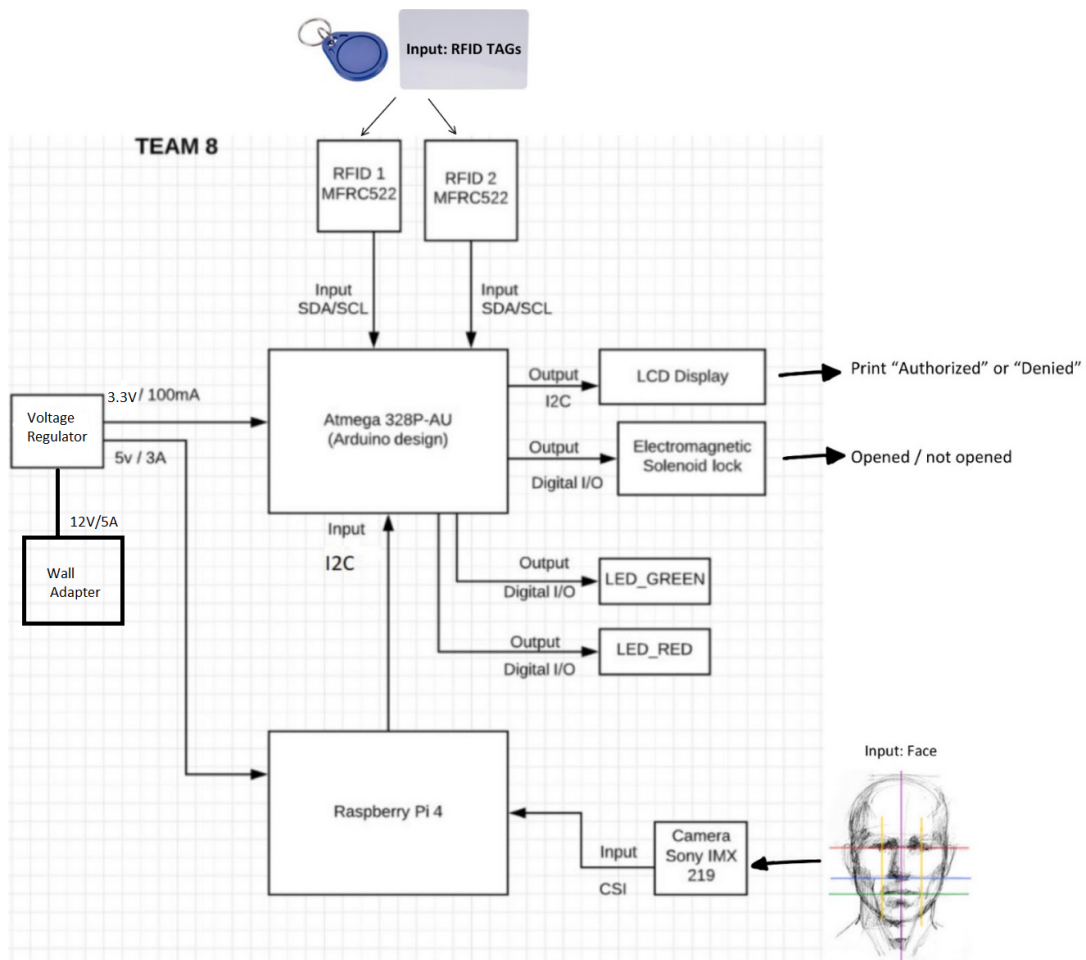
- Take a face as an input.
- Take an ID Tag as another input .
- Output for opening or not-opening the door.
- Has a visual interface for the user.
- Has at least 5 seconds between each output.
- Safe to use by non-engineers.
- Consistently recognize a face.
- Has an indicators to indicate access authorized/denied

SHOULD

- Not use batteries.
- Cost less than \$300 to design.
- Always be running.
- Has two input options for Entering.
- Has one input option for Exiting.

MAY

- Has an interface with more than one language.
- Be able to do some statistical analysis.
- Be able to push statistics to a server and analyze it.
- Be able to register new users.



Design Specifications

- Raspberry PI 4 (4 GB).
- Atmega328-Au (Arduino Design).
- Wall adapter capable of 12V 5A.
- 6v 1.5A 11.4 mm Electromagnetic Solenoid Lock Assembly.
- Step up/down buck converter.
- Two RFID RC522 Module IC Car Reader Read RF Proximity Sensor.
- Raspberry Pi Noir Camera Module V2 8MP 1080p.
- LCD display Module 5v 20x4 Character LCM Blue Backlight.
- 2xRed Led and 2xGreen Led.
- Four 1kOhm resistors for the leds.
- Level Shifter.
- SD card.
- Stemedu RFID RC522 Module IC Card Reader Read RF Proximity Sensor
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