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Secured Smart Door Lock System

Dr. G.V. Patil, Associate Professor,
Aditya Bagadi, Smita S. Patil, Sidhant L.Buchade, Snehal A. Patil, Gayatri M.Patole, DYPCET Kolhapur

Abstract

In last few years the technologies have been improved and equipment and supplies are mostly automatic. Now a day's rapid emergence of automated systems results in replacement of manual systems. In recent era of computation, IoT is emerging trend of technology in which users can control the hardware through internet, cloud which makes easy access to remote devices. IoT Technology is widely used to create intelligence in the construction of cities, houses as well as in business and agriculture. In recent events, people are faced with tight virtual connection through the use of internet and technology. There is a desire to remotely most content from the smartphones or the internet because they will be more effective and efficient. These buildings moved from traditional switched to remote controls that can be operated using a smartphone. Automation will be able to provide better protection and luxury. The need for smart machines has led to widespread growth in technology.

Main objectives of proposed research project work are to provide a smart secured door lock using Arduino UNO and Wi-Fi technology. Current research also continues to look at the use of eye-recognition devices such as iris scanner and their effectiveness in the developments of smart gadgets. This feature provides better protection for users and can help software perform better. This tool can have included with other reward widgets for better results.

Keywords – Arduino UNO, Wi-Fi Technology, Security, Smart Phone, Iris Scanner, IOT

I. Introduction

The Internet of Things (IoT) consist two parts usually hardware and software/program, to achieve the goal of connecting and exchanging information of other devices and systems on the internet. IoT is used to bridge the gap between the virtual and physical world. Everyone lives a busy life and wants to be comfortable in every aspect of life. The Internet of Things (IoT) is a very large and widely used field, and the first thing that comes in mind when people say for their convenience in automation.

Automation is term used to describe all home appliances working together with android smartphones, tablets or computer with internet connection to control things. The popularity of automation has grown rapidly in the last years. People love the convenience of using a remote control to manage and change the status of

equipment's from anywhere in the world. It ended the way everyone wanted.

Smart door lock is and electronic device designed to lock and unlock the door when notification is received from a mobile phone, biometric sensor, card access, Bluetooth or Wi-Fi. Normal door locks can be easily opened by force, and a smart door must be present to prevent attacks from intruders.

Table 1. Comparison of Automated and Manual locking system

Feature	Automated System	Manual System
Convenience	Automatic locks are more convenient because they can be opened and closed with the push of a button or through a remote control. This eliminates the need to physically unlock and lock the door.	Manual locks require the user to physically unlock and lock the door, which can be inconvenient, especially if the user is carrying heavy items.
Security	Automatic locks are typically more secure because they are controlled electronically and can be equipped with additional security features, such as encryption and password protection.	Manual locks can be picked or forced open, making them less secure than automatic locks.
Maintenance	Automatic locks require regular maintenance and may need to be serviced by a professional if they malfunction.	Manual locks require minimal maintenance and can be easily repaired or replaced if they become damaged.
Cost	Automatic locks are typically more expensive than manual locks because of their advanced technology and additional security features.	Manual locks are generally less expensive than automatic locks.

The Table 1 shows advantages of automated locking system over the manual one.

The idea of smart homes is very popular in recent year. The main topics of smart home are smart decision making, security verification and authentication of IoT devices, persistent connectivity, data security and privacy issues.

In this proposed system we are trying to develop Secured Smart Door Lock System that provides door-lock system using Iris-Scanner, Password, Mobile App to unlock the door.

II. Literature Survey

Many commercial products based on smart security are available in a market. In this section we have mentioned the remarkable advancements in each product.

The concept of biometric lock is implemented in **Smart Door Lock System using IoT [1]**. Biometric locks are becoming more popular due to risk of keys being lost or stolen. our project is Arduino nano based adaptive work device that uses biometric sensors on smartphones to provide physical security. biometric security guarantees a good way to identify the user and cannot be lost, copied or stolen. Smart locking systems have the ability to make users forgot their traditional keys and use their mobile devices only to access desired areas.

In Smart Door Lock and Lighting System using IoT [2] the door is opened and closed with digital codes and allows the user to control the door lock and lighting of the building. It is a affordable, flexible and easy to install without careful planning, wiring and construction overhead. it also increases safety and enables users to save energy.

IOT Based Smart Door Locks [3] The security door lock system based on IoT technology and mobile communication is designed to send the door opening and closing status. The goal is to avoid security problem by using the wrong physical keys and sending message to hosts.

The concept of **Smart Door Lock Mechanism [4]** is to design and implement a smart door lock that can only be accessed by authorized personnel, which can be used in rental buildings/houses/bank lockers. The system requires owner to set the code each time a new case is rented, who only needs a one-time password(OTP) and a text message to unlock the door. These creates a secure and easy-to-use smart door lock for hostels and commercial establishment.

Smart homes have become to foundation of the Internet of Things(IoT). In IoT, the development of **smart door locks [5]** addresses the security issue in smart home devices, which is the door lock. It allows home owners to monitor buildings using and Arduino UNO with Bluetooth connectivity controlled by a smart phone. Users can unlock or closed the door by installing the Android App by providing their login credentials. If the credentials are incorrect, a

beep will sound and an SMS notification will be send to owner. This approach can be extended to commercial areas such as ATM's, Vending Machines.

Because of its reliability **[6],** iris technology entered the control industry. Security has become a priority in the iris biometric Door Access Control System, a security system that restrict access to certain people. These article describe part of design and construction of iris biometric access control that works by securing doors and restricting access. The document is created with connect that allows access and is designed to work with interest.

Security improvement and energy efficiency improvement of IoT Based Digital Door Lock System [7] proposes a door lock that can work with IoT environment to improve security and convenience. It has better security that send the recorded image to the user's mobile phone when the user is not trying to do something illegal, and sends a warning message if the door lock is broken. It also allows users to check their access information and operate door lock remotely.

Security is most important thing in today's life and biometric locking systems are the safest. However due to the recent outbreak of the COVID-19 virus, the government has banned all biometric systems and in some place, the face, retina, etc. encouraged non-security measures, such as the closed system using special symbols to overcome this problems, the contact-less remote sensing has been developed in collaboration with IoT and Machine Learning. **Neural Network Based Smart Door Lock [8]** is part of IoT and Machine Learning

developed by raspberry pi and pi camera. Trend using a convolutional neural network(CNN) approach, the system only recognizes the face of authorized persons and reports unauthorized persons.

III. Need of Work

Table 2 shows the comparison of Technologies that are used in current proposed work and referenced research papers: -

Table 2. Comparison of existing system with proposed system

SYSTEMS/ FEATURES	PROPOSED SYSTEM	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
1)Keypad	✓	×	✓	×	×	×	×	✓	×
2)Mobile App	✓	✓	×	✓	✓	✓	×	✓	×
3)Iris Scanner	✓	×	×	×	×	×	✓	×	×
4)Face Recognition	×	×	×	×	×	×	×	×	✓
5)Finger Print	×	✓	×	×	×	×	×	×	×
6)One Time Password(OTP)	×	×	×	×	✓	×	×	×	×
7)Bluetooth	×	✓	×	×	×	✓	×	✓	×
8)Wi-Fi	✓	×	×	×	✓	×	×	×	×
9)GPRS	×	×	✓	×	×	×	×	×	×
10)GSM	×	×	×	✓	×	×	×	×	×

Note: [1] to [8] are reference papers.

The security of residential area is becoming a major concern. In this regard proposed system provides effective, IoT based solution.

IV. Objectives

The basic objectives of proposed research work are as follows,

• To provide home security, which will be based on mobile phone to unlock the door.

• To develop a door-lock system that uses an iris-scanner for extra security.

• To develop door-lock system that uses a pattern instead of a key.

V. System Architecture

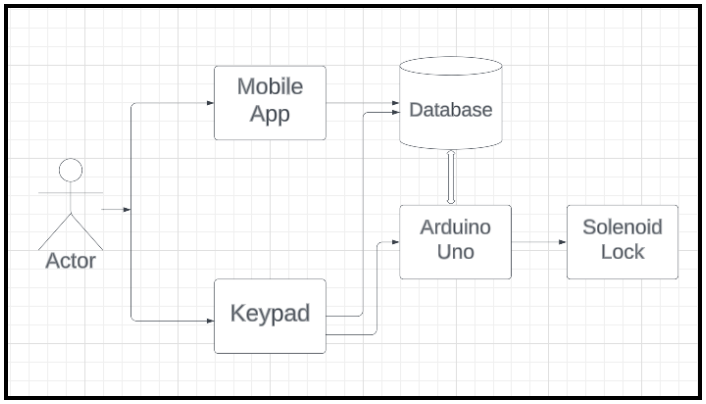


Fig 1. System Architecture

Figure 1 shows the system architecture of proposed work. Figure 2 provides the detailed flow of data inside the proposed architecture.

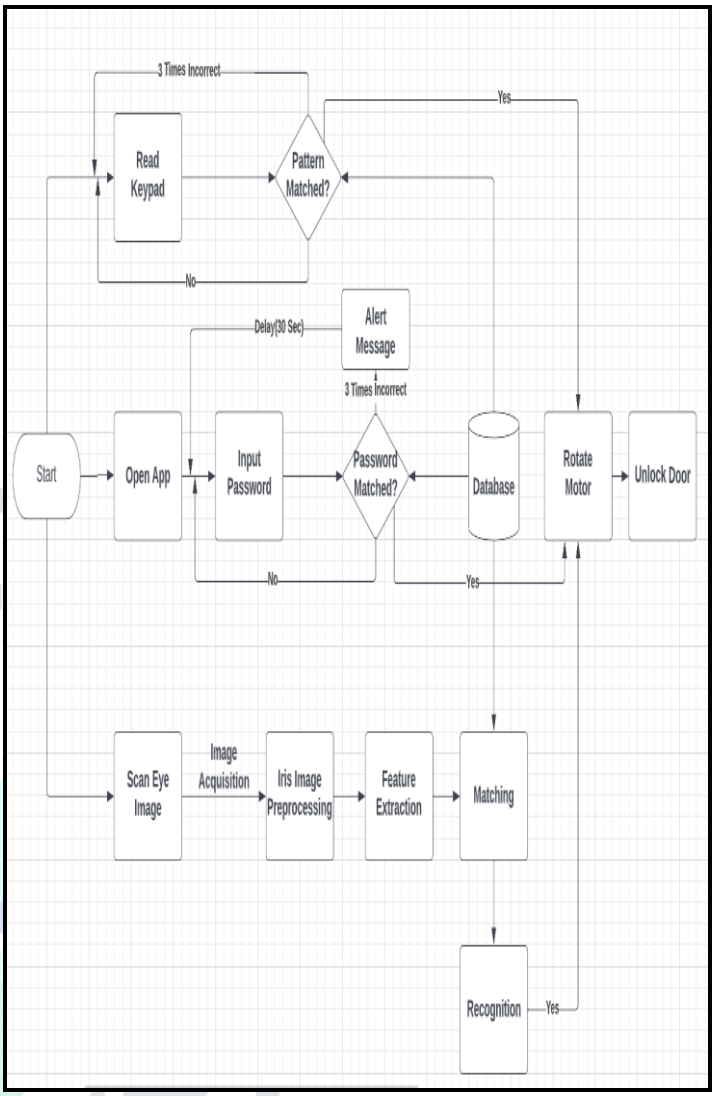


Fig 2. Detailed Data Flow Diagram

Figure 2 shows detailed data flow diagram of secured smart door lock system that consists of following modules.

1) Pattern Keypad:

The user will enter password from the door-mounted keypad, it will match the entered password and the door will open when the pattern matches.

2) App lock:

We are developing a Mobile application that will take input as password and compare that password with stored in database if password is incorrect 3 Times it will give Alert Message and delay will display for 30 Seconds, once password Matched it will Unlock Door.

3) Iris Scanner:

System will take Eye Image as Input, then it will process the Image by involving the Segmentation and Normalization, then Feature Extraction uses texture

analysis to extract features from Normalized Image in form of Binary codes and it will compare with all stored templates in database.

VI. Experimental Details and Setup

The owner or member of house can unlock the door via mobile app through remote places.

• Family members also can unlock door via keypad assembled on door.

• User can change the password using mobile app.

• Using Iris scanner, the user can unlock the door.

A. Basic concepts/technologies used-

Hardware module-

The hardware components used for proposed research work comprises Microcontroller, Keypad, components required for power supply and door lock. The Wi-Fi enabled controller required to connect to the server and allows sharing the data through internet.

Arduino Uno:

As shown in Figure Arduino UNO is an ATmega328P based micro-controller board with 14 inputs/output pins(6 of which can be used as PWM outputs) 6 analog inputs, 16 MHz ceramic resonator, USB connection, Power inputs, ICPS header and reset buttons. The need to support microcontroller; connect it to your computer with a USB cable or Power it with AC-DC Adapter or battery and you're ready [1].

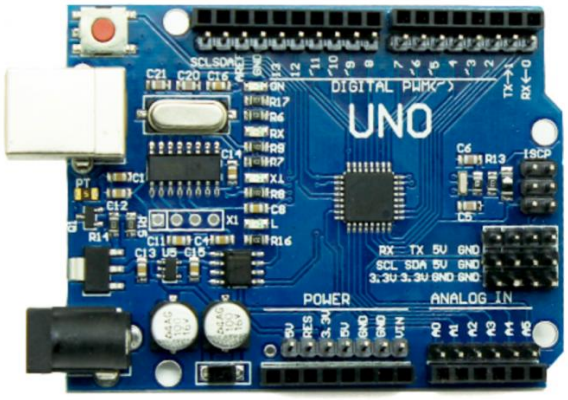


Fig 3. Matrix Keypad Membrane

4x4 Matrix Keypad Membrane:

The Keyboard shown in is used as an input device that reads and operate the keys pressed by the user. It has 4 rows and 4 columns. The keys are between lines and lines.

Fig 4. Matrix Keypad Membrane

Single channel relay module:

The single channel relay module is a simple circuit board that can be used to control high voltage and current components such as motors, solenoid, valves, lamps and AC loads.

Fig 5. Matrix Keypad Membrane

ESP8086-01 Wi-Fi module:

ESP-01 Serial Wi-Fi wireless transceiver module is a standalone SOC with integration with TCP/IP protocol that allows any microcontroller to access your Wi-Fi network.

Fig 6. Matrix Keypad Membrane

B. **Software Module**

In this Software Module we link Firebase Database server and link Mobile app to the Server that will update or enter the password to unlock the door.

1. **Firebase Realtime Database:**

Firebase Real Time Database is a Cloud -hosted No-SQL Database that allows you to store and synchronize real-time user data. Real-time sync makes it easy for your users to access the information from any device: Web or Mobile, and helps your users collaborate. Real time database integrates with Firebase Authentication to provide developer with simple and reliable authentication. You can use our advanced security standards to access data based on user IDs or matching standards[5].

2. **Massachusetts Institute of Technology (MIT), APP Inventor:**

MIT App Inventor is a great, visual experience that allows anyone-even kids to create app for phones, iPhone and android/iOS tablets. With the MIT app inventor, beginners can have a simple first app up and running is less than 30 minutes. In addition, our blockchain technology helps to build complex application with less time spend in traditional office. The MIT application inventor project aims to encourage software development by enabling everyone, especially young people, to advance in technology to create it[4].

Initial release date: 15 December 2010

Operating system: Android

Available in: 19 languages

3. **Resources and consumables required Hardware requirement**:

The hardware parts which are required are as follows:

1. Arduino Uno

2. Robodo 4x4 Matrix Keypad Membrane Switch Arduino

3. Electric lock Solenoid Cabinet

4. Jumper wires

5. Robotbanao 5V Single Channel Relay Module

6. Surface for Mounting

7. ESP 8266-01 wi-fi module

4. **Software requirements:**

The software which is required are as follows:

1. Arduino IDE

2. Firebase Database

3. MIT App Inventor

5. Pin Connection:

Below tables shows the pin connection between Arduino, Relay, ESP8266-01,Solenoid:

Table 3. Pin Connection Details 1

Arduino	Relay	ESP 8266-01	Solenoid
5V	VCC		
GND	GND	GPIO0	
13	In	GPIO2	
Vin	1st pin holder		
	2nd pin holder		Positive
GND of 13 pin			Negative
TX		RX	
RX		TX	
GND		GND	
3.3v		VCC	
3.3v		CH_PD	
GND		RST	

Table 4. Pin Connection Details 2

Arduino	Keypad
2	8
3	7
4	6
5	5
6	4
7	3
8	2
9	1

Figure 7shows the pin connection according to table 3 and 4.

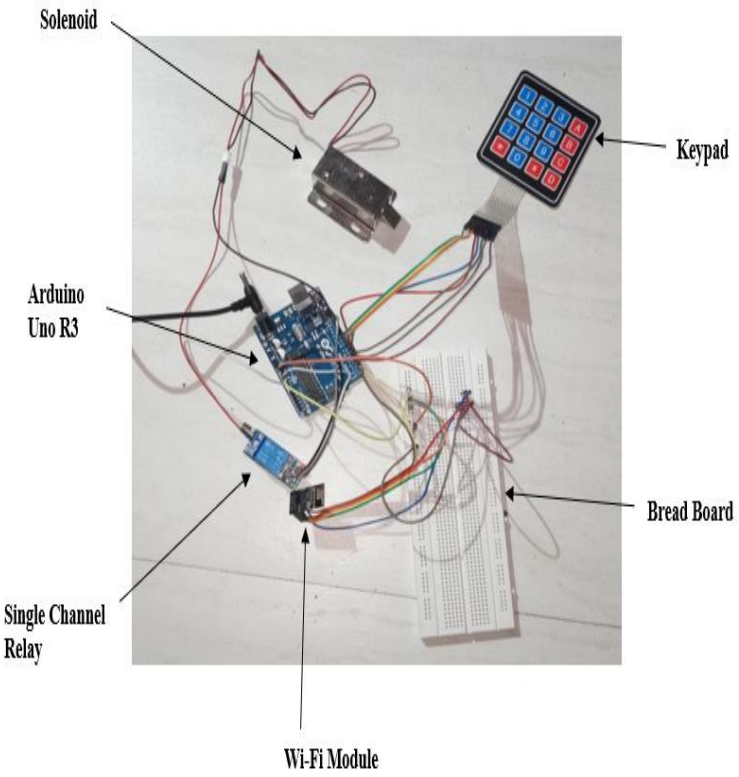


Fig 7. Pin Connection Details

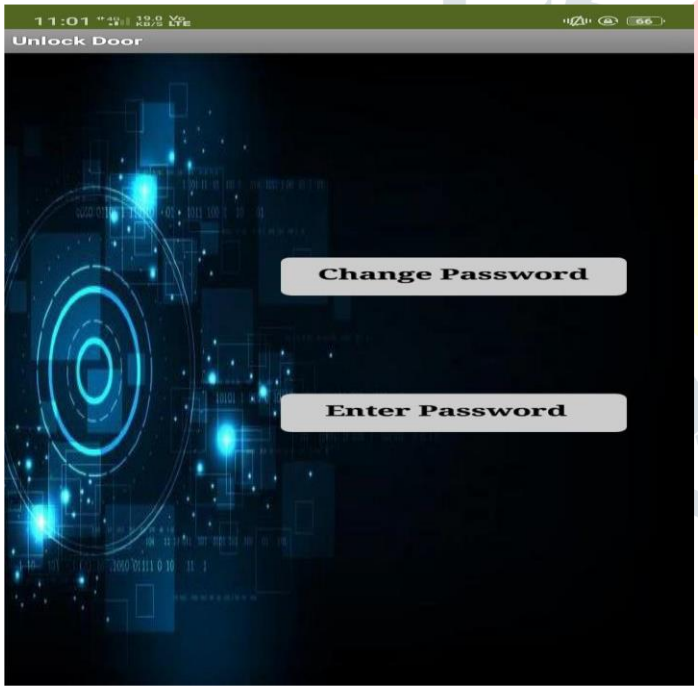


Fig 8 System Snapshot1

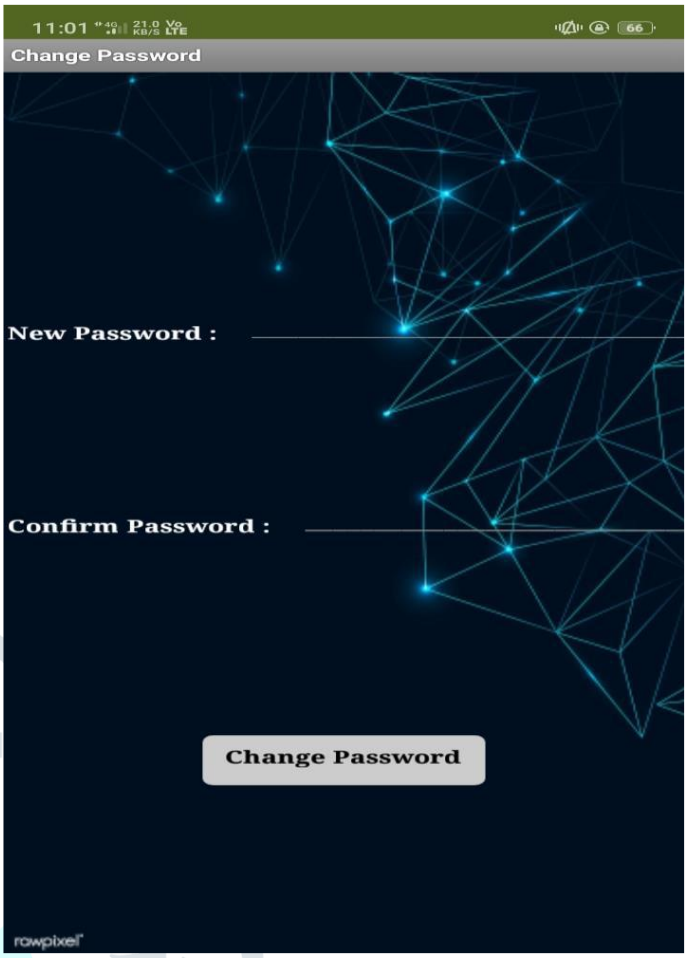


Fig 9 System Snapshot 2

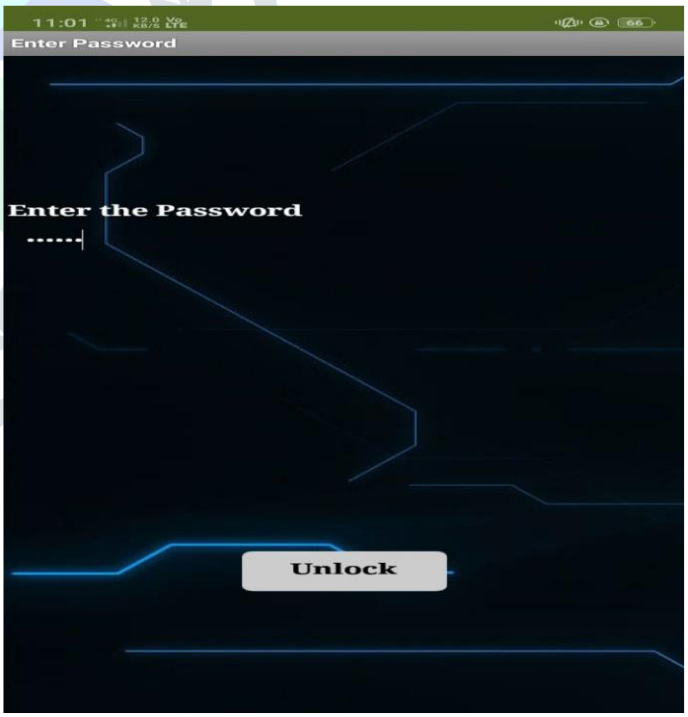


Fig 10 System Snapshot 3

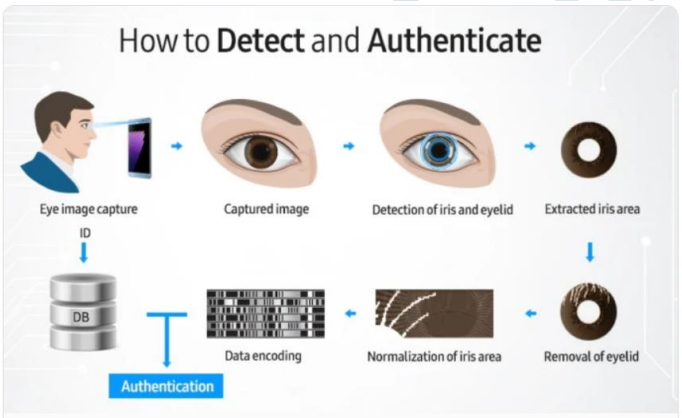
VII. Future Work

How it works:

Fun fact: Two different colored eyes are real. This is iridium heterochromia and, is found in less than 1% of the worlds populations. The most common eye color is brown, while green, amber, silver are the three rarest colors[3].

This iris is the beautiful part of eye that determines color of the eye. If we see closely at your product, you will see different wavy lines on its surface that cut from the inside and outside from the outside to the inside. This lines create pattern that the iris scanner "reads" to know its you.

These lines are waves are very difficult. It is randomly generated and does not change over period. so, it's safe that is everyone's eyes are unique. Even you left , right eyes have their own iris-patterns![3]



Using Iris-Scanner, the door lock can be more secure than exiting systems.

VIII. Conclusion

In future, the current research can be continued using smart and new techniques. We have developed a device that is small, low cost, high capacity, long-lasting, and receives a longer signal. In addition, the project was accepted an appreciated bye the customers and worked in many structures. It provides convenience, flexibility, reliability, affordability.

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