

# A Comparative Study of Choosing the Most Affordable Smart Door Lock

Padmanava Karmakar<sup>1</sup>, Prof. Kaushal Gor<sup>2</sup>

<sup>1</sup>PG Student, MCA, Parul Institute of Engineering and Technology-MCA, Parul University, Vadodara, Gujarat, India

<sup>2</sup>Assistant Professor, MCA, Parul Institute of Engineering and Technology-MCA, Parul University, Vadodara, Gujarat, India

## ABSTRACT

Our generation is smart, people are getting smarter by using smart technologies. Smart devices make life simple, easy, and secure too. Now talking about security, the general public has significantly worried about conceptual security either in family units or in workplace conditions. So setup of Smart Lock is much needed in present condition. Using conventional key locks there are so many difficulties like what if your keys are lost, or thieves may break through old locks or maybe they can get your keys somehow and break through your house or workplace. There are many researchers who have developed or tried to develop Smart Door Lock in various techniques. But there is one thing to remember, not everyone can afford a high-cost security system where in this vast population everyone needs an affordable security system or we can say smart door locks for them. So, I am working on this to compare various Smart Door Locks already available and get the conclusion which can be most affordable for all of us rather than only high-profile rich people.

**Keywords :** Internet-of-Things, Smart Door Lock(SDL), Sensors.

## Article Info

Volume 9, Issue 5

Page Number : 01-06

## Publication Issue :

September-October-2022

## Article History

Accepted : 20 Aug 2022

Published: 04 Sep 2022

## I. INTRODUCTION

There are different types of smart door locks available but our concern is to find out most affordable door lock. So, I have taken mainly 4 different types of door lock for detailed comparison and then I can get the conclusion. Before coming to conclusion it would be in our mind that we are prioritising the average people and trying to come out with their solution. I will compare their detailed techniques, methods and implementations.

## II. LITERATURE REVIEW

Comparison of other SDL technologies and finding out the cheapest one

[1] PASSWORD BASED SECURITY LOCK SYSTEM by Arpita Mishra, SK Dubey, Sachin Dubey, Siddharth Sharma :These people have developed a password based smart door lock using GSM technology, which enables the user to remotely control the operation. Just by pressing keypad of remote telephone the user performs ON or OFF.

The model contains a matrix keypad, a door latch opener and a GSM modem for the security dial up interfaced with the microcontroller. The keypad

interfaced to the controller is used as the password entry system to open or close the door .As soon as the user enters the correct password the door lock opens. If the password is incorrect the security alarm is rung .The GSM modem uses UART interface to the controller .When the unauthorized person gives an invalid password the controller uses the modem to inform the owner.

To build the device they are using Tmega 8 microcontroller,4\*3 number keypad,16\*2 character LCD module ,vehicle centre lock motors and power.

The basic concept of software design is should scan the pressed key values by the microcontroller and according to that signal change of the port D it return which key has pressed and check if entered password and stored password is same or not. If they match motor is activated and the door is opened.

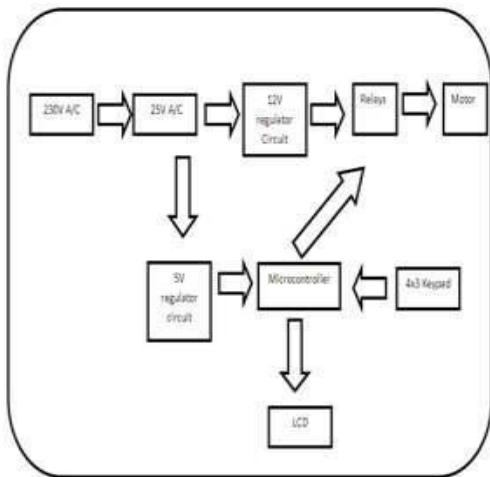


Fig-1: Block diagram[1]

[2] Smart Door Lock Using IoT by Karthik A Patil, Niteen Vittalkar, Pavan Hirenmath, Manoj A Murthy: They have created a budget friendly smart door lock by using biometric authentication .They are using mobile phone’s finger print scanner.

They are using Arduino Nano as microcontroller,Bluetooth HC 05,Servo moto,wires 10 cm,battery 5-6 V ,these components as hardware .They are using Kodular to bake Android app and Arduino IDE as software .

We have to create a loop function that stores device ID sent via Bluetooth.It is stored in “read” string.If condition is used for verifying device id.If it is authenticated the application sends device id to Arduino Nano board.If authentication is matched the servo motor is unlocked.If authentication is not done that is finger print is not matched the lock is remained in lock position.

Then they bakes android application. After the installation of the application and the code is uploaded into the smartphone. Then following components are connected then soldered together.

Pins	Components
Rx	Bluetooth Tx
Tx	Bluetooth Rx
5V	Bluetooth 5V
GND	Bluetooth GND
GND	Servo Motor GND
Pin 9	Servo Motor Signal Wire

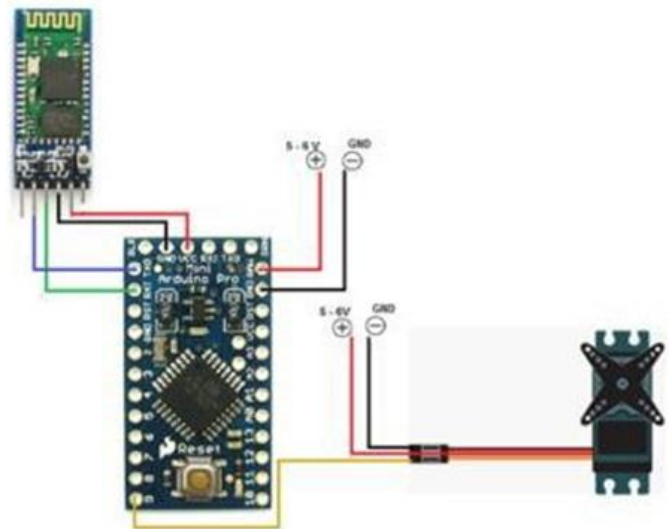


Fig-2:Connection[2]

At last servo motor is attached in that broken lock and the lock is powered using a battery of 5-9V. Then the Bluetooth in phone is turned on and is paired with the Bluetooth module connected to the Arduino board. On opening the application the Bluetooth icon shows into lock icon.

As we touch the fingerprint symbol, a message box requesting to unlock with fingerprint pops up. Next touch the fingerprint sensor on the smart phone . In the event that it matches with the fingerprint set in the smart phone, at that point it turns the lock to 'on position' and simultaneously the lock symbol changes into unlocked icon

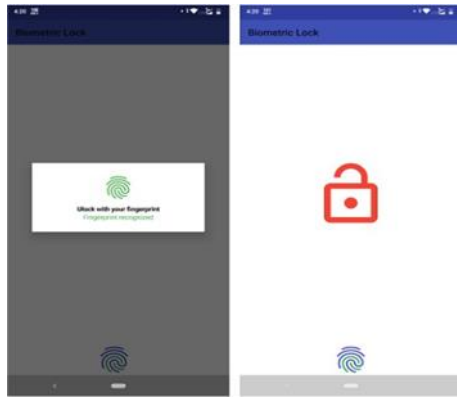


Fig-3:App Interface[2]

[3] Kristoffer Djupsjo and Masar Almosawi implemented an high security based smart door lock. They used Particle Photon micro controller, Estimote's Bluetooth beacon,

A relay has two circuits; a control circuit and a load circuit. When the control circuit is turned on current starts flowing through a coil, it generates a magnetic field that attracts the armature and the load circuit is closed. A relay is used to control different circuits by one signal. Relays are used whenever it is necessary to control high power or high voltage with a low power circuit. Low power devices as microprocessors can drive relays to control electrical loads beyond their direct drive.

The Photon MCU was used to test a basic functionality within the design. A test program was written to control a LED on the microcontroller itself. Thereafter, a test environment was set up on a breadboard to control an external LED using a relay that controls the high voltage coming from the source. The microcontroller would interpret the signal to determine whether turning on/off the LED.

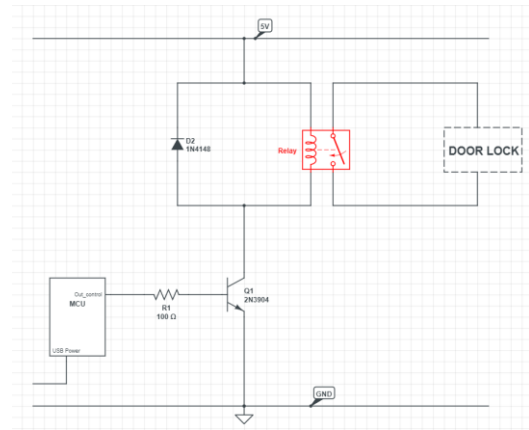


Fig-4:System circuit[3]

1. Android Application asks for authentication by sending username and password via HTTPS.
2. "Auth API" asks for an access token from Azure AD with provided user credentials, resource ID, and client ID.
3. If the information sent with the request is valid the Azure AD and it responds with an access token valid for 2 hours.
4. The token is sent back to the Android Application via HTTPS. The Android client can now make authenticated calls to the Door API.
5. The Android application will start listening for registered beacons. When a Beacon transmission is received, the application will confirm that the beacons are from a valid source.
6. The Android will request to open the door if the beacon validation is successful. Access token and the function name is provided in the HTTPS call.
7. The door will send a new HTTPS request to the particle if the received request is authenticated and authorized. The request to Spark Cloud will contain the unique access token and device for the Particle device.
8. Spark will send the specific function call (in this case "open door") to the device with the correct device ID.

9. The Photon device will return a specific value of the function called was executed correctly or not.
10. Spark Cloud will send an HTTPS response back to the door API containing information about the status of the request.
11. Door API sends a response back to Android telling the application if the request was successful or not.

No doubt it's a very secure and complex mechanism as well. Though it has challenges like LAN mistrust, Environment issues, app over privilege. But to implement it is quite costly and we can not consider it as the cheapest SDL.

4. Sensible lock: a protection system mistreatment Bluetooth and camera verification by Bhalekar Pandurang, Jamgaonkar Dhanesh, Prof. Mrs. Shailaja Pede, Ghangale Akshay, Garge Rahul :

The system are designed for security functions. it'll work as once the bell rings at the door, can act as a trigger to the camera and also the camera will capture the video of the person standing before of the door, can| be shown to the registered user UN agency is removed from home so he will establish the person and might share the key thereupon person for a specific fundamental quantity. This will increase nice security for homes which too while not human intervention.

The system is intended specified the motion of the user are captured from the camera and also the user are detected so solely he are given a key to lock or unlock. Our sensible lock system can operate over a wireless network like Bluetooth. There area unit 5 parts:

- 1) The management module is that the brain of the system.
- 2) The motor module controls the protection operation.
- 3) The communication module that's used for communication between the devices and also the management module.

- 4) The I/O module uses the Bluetooth Module and Smartphone for authentication.
- 5) The device module i.e Phone/ Bluetooth

The mobile device needs a word to extend the safety of the system. The hardware on the door uses a microcontroller to regulate a linear mechanism that acts because the protection mechanism. The Bluetooth protocol was chosen as a communications methodology as a result of it's already integrated into several golem devices and is secured through the protocol itself. It conjointly fits well into the planning necessities of the project for a short-range, wireless affiliation methodology. Our sensible lock system can operate over a wireless network like Bluetooth. There area unit 5 parts:

- The management module is that the brain of the system.
- The motor module controls the protection operation.
- The communication module that's used for communication between the devices and also the management module.
  - The I/O module that uses the RFID reader for authentication.
  - The device module i.e. Phone/ Bluetooth

The fundamental use of the sensible lock are the owner of the house. Once the buzzer rings, the camera are triggered and also the motion of the user are captured. The owner are abreast of regarding the person standing at the door, so the owner can establish the person and might share the key for a specific fundamental quantity. during this method, the system provides nice security.

They are operating within the software package golem, version 4.0, webserver-Tomcat, Database- MySQL. Hardware : phone with Bluetooth, ARM7 controller, and motor.

### III. CONCLUSION

1. For Password Based Security Lock System ,we can conclude its pretty much affordable as it is using Moto ,microcontroller ,LCD and the keypad. They are easily implemented and budget friendly too. It has major drawback if password is forgotten its quite difficult to unlock the door and goes through a lengthy process .Also LCD ,Keypad remains outside door so anyone harm them or even environment can cause any harm so it must be protected.
2. For 2<sup>nd</sup> Smart door lock i.e. Smart door lock using IoT ,it is using Arduino nano, BT HC 05,servo motor and some battery which is really budget friendly .This lock operates whole system via your phone and the authentication it is using is your fingerprint which is already available now a days in every mobile phones .As it is biometric based it provides you very strong security without any doubt and you don't even have to spend much cause it is using your mobile. Also the whole system is not much complex and not much exposed to outer side, so environmental harm is lesser here. So, we can keep it in our top choice till now.
3. On 3<sup>rd</sup> type of Door lock its IoT based smart door lock. It is also using microcontroller, Bluetooth beacons ,mobile along with cloud computing concepts .They are using Azure active directory to authenticate user ,Google beacon API and so on ,They have tried high class security door lock implement but the components are bit costly. And it got some implementation flaws too like LAN mistrust ,application over privilege ,environment issues .There idea is very unique but the technologies they are using like Google Beacon API , Google messages API are quite new and needed more security updation. So conclusion for this is we can not completely rely for security and its budget tight too.

4. SMART LOCK: A LOCKING SYSTEM USING BLUETOOTH TECHNOLOGY & CAMERA VERIFICATION uses ARM 7 controller ,liner actuator ,mobile with Bluetooth ,dc motors and camera sensors .So ,it is using more sensors like camera which makes it little bit costly and hard to maintain also .Some sensors are exposed to environment so easily can be harmed .But if we talk about security ,yes it provides sufficient security so it can be considered as choice if one extends his budget.

After analyzing all these points, I can get the conclusion that type2 is most affordable and secure at the same time.

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**Cite this article as :**

Padmanava Karmakar, Prof. Kaushal Gor, "A Comparative Study of Choosing the Most Affordable Smart Door Lock", International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET), Online ISSN : 2394-4099, Print ISSN : 2395-1990, Volume 9 Issue 5, pp. 01-07, September-October 2022. Available at doi : <https://doi.org/10.32628/IJSRSET229496> Journal URL : <https://ijsrset.com/IJSRSET229496>