OTP BASED SMART WIRELESS LOCKING SYSTEM USING ARDUINO

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Abstract: The OTP-Based Smart Wireless Locking System using Arduino is an innovative solution designed to enhance the security and convenience of traditional locking mechanisms. This system leverages the capabilities of Arduino microcontroller and wireless communication technologies to create a secure and user-friendly lock system that operates based on One-Time Password (OTP) authentication. To unlock the system, users need to generate an OTP using a designated mobile application. The OTP is securely transmitted to the central control unit via a wireless communication protocol such as Bluetooth. Upon verification of the OTP's validity, the central control unit sends the corresponding command to the designated wireless lock module, instructing it to unlock. The system incorporates several advanced features to enhance security and functionality. Firstly, the OTP ensures a higher level of security by utilizing unique passwords for every authentication attempt, minimizing the risk of unauthorized access. The OTP-Based Smart Wireless Locking System using Arduino offers a reliable, secure, and user-friendly solution for modern access control needs.

I. INTRODUCTION

In today's technologically advanced world, security plays a crucial role in safeguarding our belongings. Traditional mechanical locks are no longer sufficient to meet the increasing demands for enhanced security and convenience. As a result, innovative solutions like the OTP (One-Time Password) based smart wireless locking system have emerged. The OTP based smart wireless locking system utilizes the power of Arduino, a popular open-source electronics platform, to create a secure and efficient locking mechanism.

This system eliminates the need for physical keys and instead relies on a unique one-time password generated for each access attempt. By leveraging wireless communication technologies such as Bluetooth or Wi-Fi, the smart locking system enables users to control and monitor their locks remotely. It is connected to a reliable and secure OTP generation algorithm that generates a unique password for each access attempt, ensuring maximum security against unauthorized access. To operate the system, users simply need to enter the generated OTP through a smartphone application or a dedicated control panel. The Arduino verifies the OTP and triggers the locking or unlocking mechanism accordingly. Furthermore, the smart wireless locking system offers additional features such as real-time notifications, access logs, and the ability to grant temporary or time-limited access to authorized individuals.

II. LITERATURE SURVEY

➢ Pradnya R. Nehete, J. P. Chaudhari,S. R. Pachpande[1] have y proposed door lock systems based on Biometrics Techniques and Password Based Systems are studied and their problems and as per their knowledge, not a single system is suitable for all types of applications. Day by day technologies are developing and techniques of robbery are also developing. So, need is to develop a new smart and unbreakable technique in further studies.

➢ Mr. Patil Bhushan, Mr. Mahajan Vishal, Mr. Pawar Mayur [2],have concluded that Smart-Lock-System will open the door leading to a wide range of innovations in the world of lock systems wherever they may be. With its ease of installation and use, minimum complexity, wide applicability options, and strong feasibilities guarantees a huge aspiring step forward into a better future lock system. All of the above can't be considered authentic or even possible without considerately taking into account one of the most vital aspects to the innovation: security.

➢ S. Umbarkar, G. Rajput, S. Halder, P. Harname and S. Mendgudle[3], have understood that for all the three modules i.e., the keypad ,Bluetooth and gsm module they successfully operate the servo motor to open and close the door lock. If know person enters wrong password wrong for three consecutive times then the digital door lock system generates alert messages to the gsm mobile number and also start the buzzer alarm for security alert.

➢ Aishwarya I P[4],has surveyed that different methods of door lock system has been analysed and surveyed. Based on this survey, the suitability of each method and their application in different areas is understood. Since technology evolves, the methods to bypass or defeat the security systems are evolving as well. An advanced door-lock security system must be designed and developed, either by combining currently-present security techniques or by introducing a novel technique that overcomes the various issues in existing system.

➢ Snehalata Raut, Dimple chapke , Akash Sontakke , Nayan Pounikar , Prof. Neha Israni[5],have given basic idea of how to control Door automation security system using OTP. It also provides a high-level security and easy for Android phone users. This project based on Android platform which is Free Open-Source Software. So the implementation rate is inexpensive and it is reasonable by a common person and buildings.

➢ Amanpreet Singh, Adarsh Sachan, Kashish Gupta, Gautam Kapoor, Harsh Kumar Singh, Ananya Singh [6], to develop a system that provides a robust security system to the user that the user can trust easily. This system is inexpensive and simple to set up. It is a durable and multiple mode device that can be operated by a single tap on the app or by OTP authentication.

➢ Deeksha P, Mangala Gowri M K, SateeshR ,Yashawini M , Ashika V B [7]This paper discuss about a microcontroller established digital code locker is explained with fundamental of digital locking procedure. The program language which is used to programming is C++.this paper discusses about the draw backs of conventional locking system using mechanical keys. The author discusses about many advanced ways of locking with digital platform such as OTP based locking, RFID based locking. Also, the methods of locking using electromagnetic door locker, solenoid

➢ Pradip Tilala, Anil K. Roy and Manik Lal Das [8], the proposed system integrates firebase cloud messaging to such automation system to eliminate the need of gsm module. The system gives access to some routine users and also to heterogenous users(guests, delivery persons etc).

➢ Akash, Anuj Kumar Singh, Ashwini Kumar Singh, Prince Kumar Gupta, Vipin Kumar Verma. This project comes under Home automation. Home Automation system an intelligent network of device which is used to control home appliances. In earlier stages for safety purposes key based locking system and electronic wireless locking systems are used which are not safer.

➢ Nayana R, Shashidhar R Nayana R, Shashidhar R, in this system one unique password is set by the programmer the user should know this password and it is his responsibility to maintain that unique password confidentially. The person who knows the password can unlock the door. It is like ATM card pins. If the code entered by the user is incorrect then buzzer facility will be provide at the locker it will sound and inform the owner that some unauthorized person is trying to access the lock.
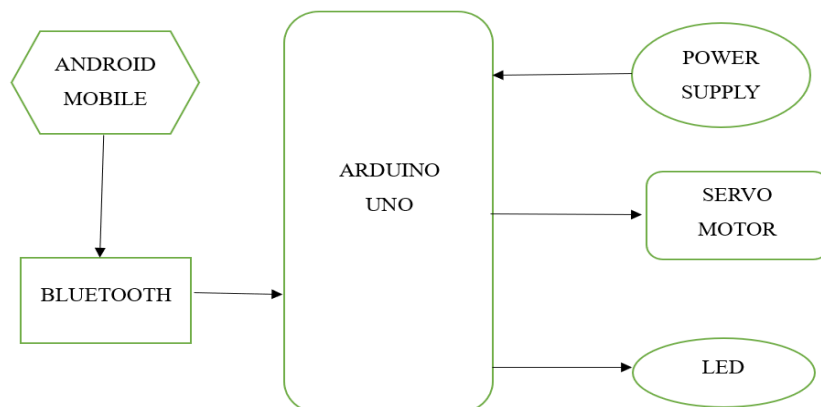
III. PROPOSED SYSTEM

Fig 1 . System Block Diagram

The proposed system allows the owner to access their home/lockers without requiring a traditional key. every time a person tries to unlock a new OTP will be generated.
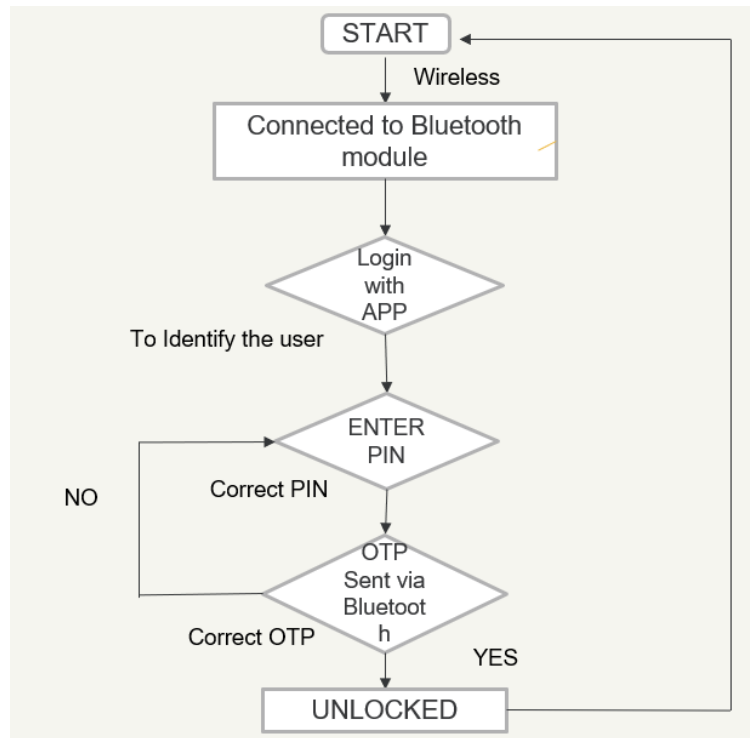
Fig 2. Flow chart

IV.   PROBLEM IDENTIFICATION

Smart locks, those that aren't updated regularly, can be exposed to tampering.

Being electronic devices, they might be violated by IT experts who can create unauthorized fake access codes with smartphones.

A sudden blackout of the control unit or a fault of the recognition device.

The occurrence of errors on the part of the human being so that the loss of the key is very likely, also carrying many keys that expose them to loss or ease of theft, also you can forget to close the lock, and here the lock cannot be closed by itself because it is mechanical and does not depend on Electromechanical

V.   METHODOLOGY

In this project first we connect the Arduino UNO controller to HC-05 Bluetooth module. In this we connect the transmitter and receiver pin of Arduino to the HC-05 receiver and transmitter. Then we connect to vcc and ground pin of HC-05 to servo motor positive and negative pin signal pin of servomotor connect to the Arduino pin number 09. Then we create app using MIT app inventor for random OTP generation. Then we include the code portion of working to the Arduino microcontroller using Arduino IDE. Then we give the power supply to Arduino board through power bank or battery .

HARDWARE IMPLEMENTATION

- **Bluetooth Hc05**- It is basically used to transfer data between two devices in this module we use Bluetooth for serial communication which provide switching mode between master and slave.

- **LED** - Led it used for showing whether our entered OTP is correct or not. If OTP matched, then servo motor performed action and Led will be glown.

- **Some Wires/Jumper Wires** -Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed.

- **Servo Motor** - It is basically used for performing the locking action which have very high torque. A servo motor is a Rotary actuator or linear actuator that allows for precise control of angular or linear accumulator angular or linear position, velocity, and acceleration.

- **5V Battery/Power Bank** - A *battery* is a source of electric power consisting of one or more electrochemical cells with external connections for powering electrical devices.

- **USB Type B for Programming Arduino** – it is used to connect it to Arduino for transferring the data.

SOFTWARE TOOLS

Arduino UNO - It is a microcontroller board based on ATmega328P. It has 14 digital input/ output pin 6 analog inputs, a 16 MHz watch crystal, a USB connection a power Jack, an ICSP header and a reset button.

MIT APP -MIT App Inventor is an intuitive, visual programming environment that allows everyone even children to build fully functional apps for smartphones and tablets.

VI. RESULT

The system prompt the user to enter a valid OTP to gain access. The OTP is be generated through a mobile app. The Arduino board utilizes Bluetooth to receive the OTP from a smartphone The Arduino board will verify the received OTP against a pre-shared secret or a database of valid OTPs. If the OTP matches, the system will grant access by unlocking the door or activating an electronic lock mechanism.

The system securely store the OTPs, ensuring that they are not easily accessible to unauthorized individuals. Techniques like encryption or hashing can be employed to enhance security. The system maintain a log of access attempts, including successful and unsuccessful ones. This log can be useful for monitoring and auditing purposes. This system include features to add, modify, or remove users and their corresponding OTPs.

This is achieved through a dedicated mobile application. The overall success of the OTP-based smart wireless locking system will depend on the implementation quality, security measures, and reliability of the hardware and software components involved. It's important to thoroughly test and validate the system to ensure its effectiveness and robustness.
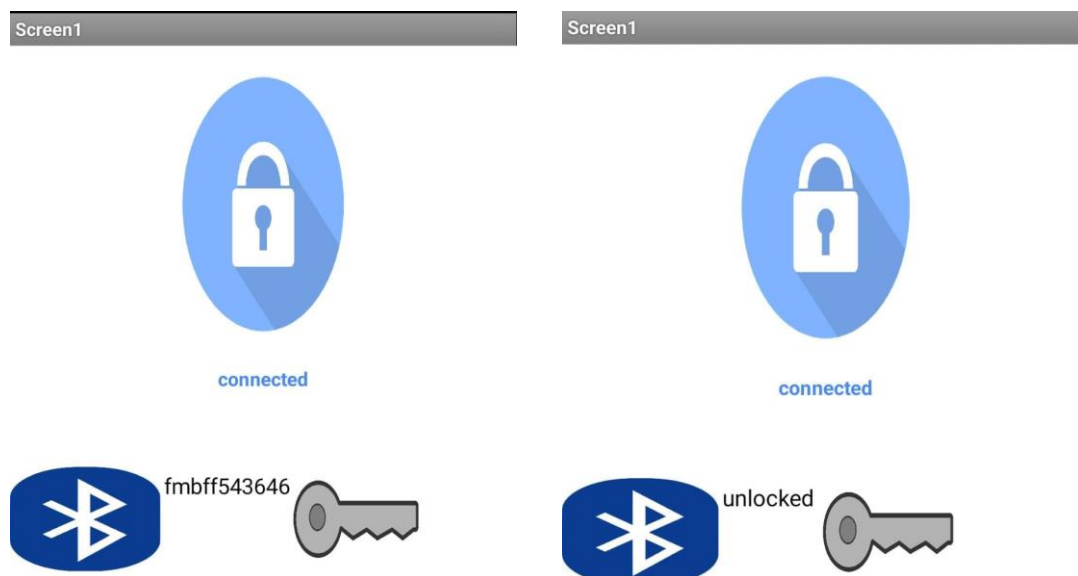
VII. CONCLUSION

Many times we forgot to carry the key of our home. Or sometimes we come out of our home and door latch closes by mistake. In these cases it is really difficult to get inside the house . This project will help in keyless entry and at the same time will be more secure. This idea will minimize the overall cost by the use Bluetooth instead of GSM (which charges for providing service).Smart door lock is one of the most popular digital consumer devices due to its ease of use and affordable price. In fact, it replaces many common types of locks. This is project is good enough to provide security as long as password not shared and project is completely based on Android platform which is free open source software, So implementation rate is also inexpensive and easy to install anywhere. Its main advantage is to open door lock using an android where password is encrypted and home owner's mobile phone will be notified every time the door opens. Hence, the project can be achieved in lesser time compared to other techniques previously employed.

VIII. FUTURE SCOPE

Smart locks could soon integrate smart camera technology into the device, as well as be primed for PIR motion detectors, night vision capabilities, wide-angle HD cameras, and two-way audio for remote communication. The opportunities for smart locks to become an all in one security device are endless.

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