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An ARDUINO UNO and an ESP8266 Wi-Fi module based one-time password (OTP) door lock system with a mobile app

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ABSTRACT

A growing number of individuals are making home security a top priority. Burglaries are only one of many dangers that families face when breadwinners are always on the go for employment, education, and other commitments. Finding or monitoring a home is important, but there are many more situations in which having older individuals or children with children is as important, if not more so. In this way, a home security system may provide safer environments. This method shows great promise in transforming our lovely home into a secure and pleasant environment where a variety of tasks, including remote monitoring, may be accomplished. These days, a home security system installation is a case study in using state-of-the-art technology to achieve this goal. With the help of wireless network technology, it is now possible to remotely monitor a number of common home equipment. This article aims to provide an Arduino-based security system that combines a Wi-Fi door lock with a mobile app to communicate a secure password. The result is a great and powerful system. Owners or authorised staff are the only ones who may enter via the door. When the user clicks, the system sends a one-time password (OTP) and, if the code is valid, opens the associated lock. We investigate potential solutions to the problems with current door lock systems by making use of Wi-Fi and one-time passwords (OTP) on mobile phones. With this system, users may live a life free from the worry of theft and other crimes thanks to its wireless OTP door lock system that utilises OTP (One-Time-Password) authentication and an Arduino smart phone-based design.

INTRODUCTION

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The increasing concern for home security in today's society has prompted the need for innovative solutions to safeguard residential properties. With the rise in time spent away from home due to various commitments, such as work and school, homes are left vulnerable to potential threats, including burglaries. Additionally, the responsibility of caring for older adults or children further emphasizes the importance of efficient supervision even in the homeowner's absence.

To address these challenges, the implementation of a reliable home security system has become essential. Leveraging advanced technology, these systems aim to create safer and more secure living environments by enabling remote monitoring and surveillance capabilities.

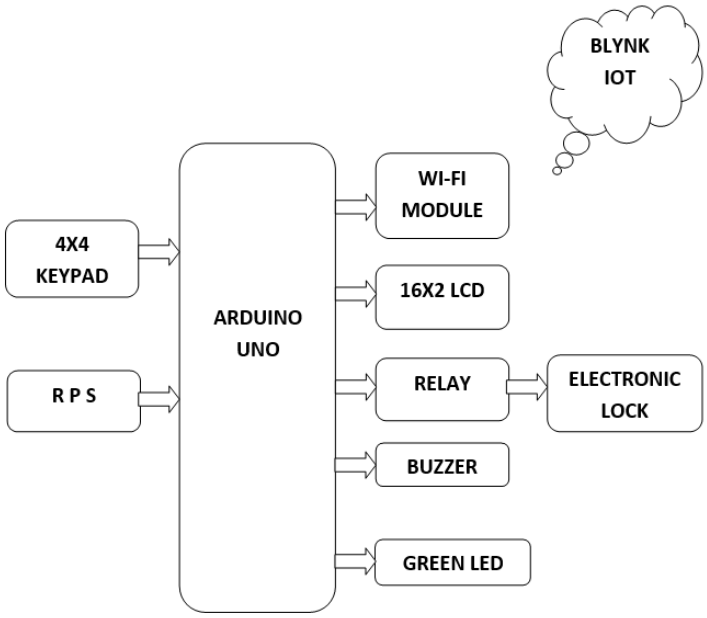

Figure.1 Block Diagram

OBJECTIVE OF THE PROJECT

The increasing number of people worried about their homes' security has motivated our effort to create a state-of-the-art system that combines modern technology with time-tested safety features. Utilising the power of Arduino technology, our aim is to provide a comprehensive solution that improves access control while also giving homeowners more convenience and peace of mind. The main goal is to make it possible to remotely monitor and operate home security systems by connecting door locking mechanisms to wireless networks. The incorporation of Wi-Fi connectivity allows users to efficiently control house access from any location with an internet connection, doing away with the need to be physically there.

The system uses One-Time-Password (OTP) authentication, a method that dynamically generates new access codes for every login attempt, to provide strong security. With this functionality,

an extra layer of protection against unauthorized access, significantly reducing the risk of intrusions or breaches.

LITERATURE SURVEY

1.**"Design and Implementation of a Wireless Door Lock System Based on OTP"** by D. S. Lohokare, V. D. Patil, M. S. Gaikwad, and S. P. Kalmar. This paper presents a detailed design and implementation of a wireless door lock system using Arduino Uno and ESP8266 Wi-Fi module. The system uses OTP for authentication and a mobile application for user interaction.

2. **"IoT Based Smart Door Locking System Using Arduino and ESP8266"** by S. R. Hosamani and S. S. Bhat. This paper discusses the development of a smart door locking system utilizing Arduino Uno and ESP8266 module. It explores the integration of OTP for secure access control along with a mobile application for remote operation and monitoring.

3. **"Secure Door Lock System using IoT with One-Time Password"** by M. S. Suvarna and S. R. Joshi. This paper proposes a secure door lock system employing IoT technology and OTP for authentication. Arduino Uno and ESP8266 module are utilized for communication between the door lock and the mobile application, ensuring secure access control.

4. **"Development of IoT Based Door Locking System using Arduino and ESP8266"** by S. S. Sawant and S. A. Karode. This paper presents the development of an IoT-based door locking system integrating Arduino Uno and ESP8266 module. The system employs OTP for user authentication, enhancing security, and a mobile application for remote access management.

5**. "Implementation of a Smart Door Lock System using IoT"** by S. R. Adake, A. R. Mali, and S. K. Chaudhari. This paper discusses the implementation of a smart door lock system utilizing IoT technology. Arduino Uno and ESP8266 module are employed for communication, and OTP is used for secure user authentication, controlled via a mobile application.

PROPOSED SYSTEM

This project focuses on the development of a home security system utilizing Arduino technology, integrating door locking mechanisms with Wi-Fi connectivity. By combining these

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elements and incorporating a mobile application for secure password transmission, the system aims to provide robust access control, allowing only authorized individuals to enter the premises.

Central to the system's functionality is the utilization of One-Time-Password (OTP) authentication, enhancing security by generating unique access codes for each login attempt. Through the integration of Arduino-based hardware and smartphone applications, the project aims to overcome existing challenges in traditional door lock systems, offering users a convenient and secure means of controlling access to their homes.

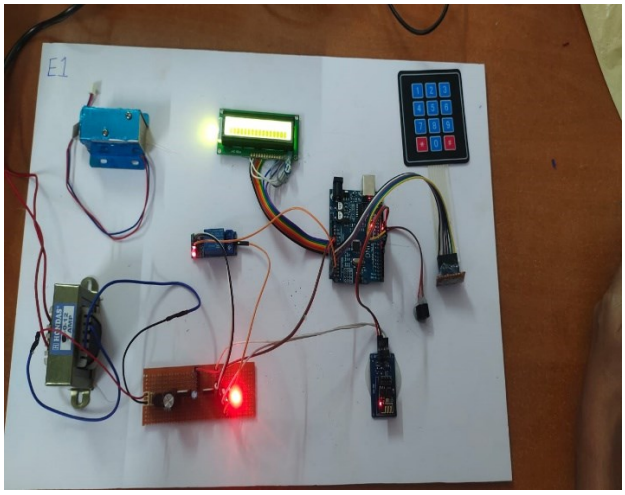

Figure.2 Working Kit

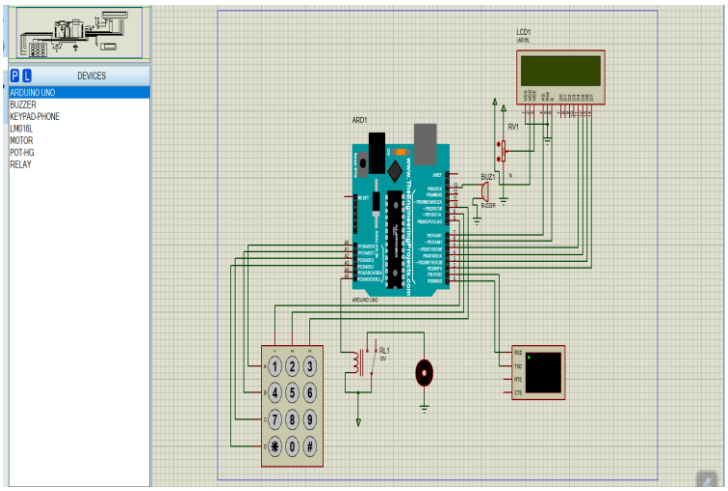

Figure.3 Schematic Diagram

RESULTS

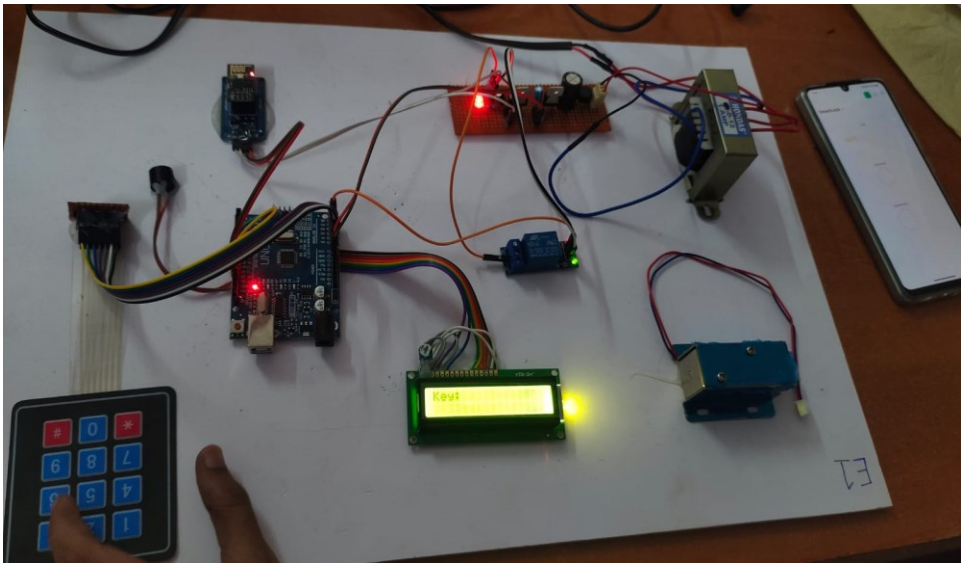

Figure.4 Entering the key

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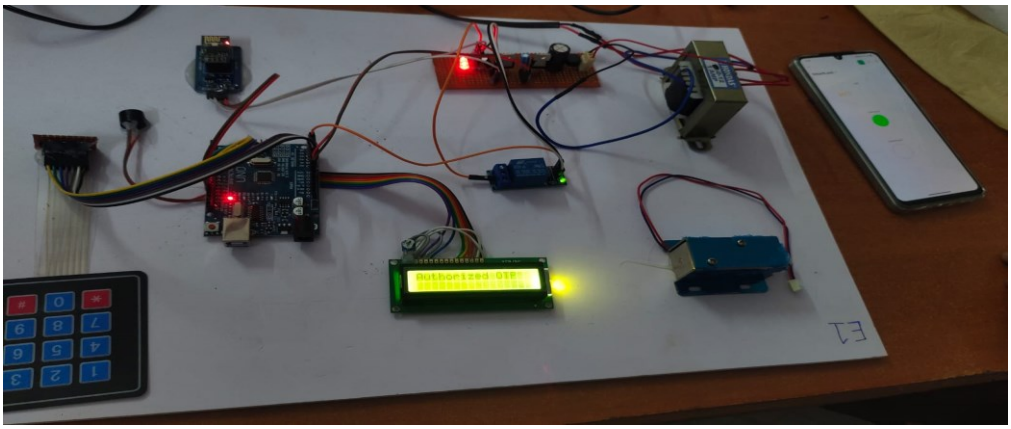
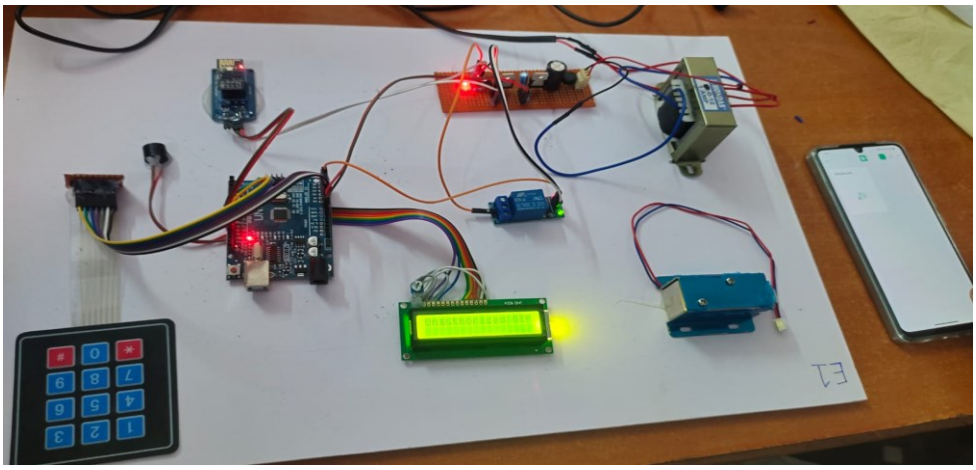


Figure.5 Authorized OTP



CONCLUSION

The successful implementation and simulation of the OTP-based door lock system in Proteus software mark a significant achievement in the realm of access control technology. Through meticulous design, thorough testing, and iterative refinement, the system has demonstrated robust functionality and reliability, laying a strong foundation for real-world deployment. By seamlessly integrating various hardware components such as the Arduino Uno microcontroller, keypad, LCD display, relay, electronic lock, buzzer, and LED indicator, alongside sophisticated software functionalities for OTP generation and verification, the system offers a comprehensive and effective solution for ensuring secure access control.

The system's capability to transmit OTPs to the Blynk mobile application and promptly verify them in real-time underscores its effectiveness in bridging the gap between virtual and physical access control domains. This seamless interaction not only enhances the user experience but also bolsters the system's overall security posture. The intuitive feedback mechanisms

incorporated into the system, including LCD messages, LED indicators, and buzzer sounds, contribute to its user-friendly interface while maintaining stringent security protocols.

In conclusion, the OTP-based door lock system emerges as a reliable, efficient, and user-centric solution for access control across diverse environments, ranging from residential homes to commercial establishments. Its successful implementation in Proteus signifies its readiness for real-world deployment, where it can play a pivotal role in safeguarding assets, properties, and sensitive area

FUTURE SCOPE

1. Enhanced Security Features: Integration of advanced encryption algorithms for OTP generation and transmission to further fortify the system against unauthorized access attempts.

2. Mobile Application Development: Development of a dedicated mobile application with enhanced features for OTP management, access control scheduling, and real-time monitoring of system activity.

3. Integration with Cloud Services: Integration with cloud-based services for remote access management, data storage, and analytics, allowing for seamless scalability and accessibility.

4. Biometric Authentication: Implementation of biometric authentication methods such as fingerprint or facial recognition for enhanced security and user convenience.

5. Smart Home Integration: Integration with existing smart home ecosystems for seamless interoperability with other IoT devices and automation systems.

6. Energy Efficiency: Optimization of power consumption through the use of low-power components and smart energy management techniques.

7. Customization and Personalization: Provision of customizable settings and user profiles to cater to diverse user preferences and requirements.

REFERENCES

1. "Arduino Programming in 24 Hours, Sams Teach Yourself" by Richard Blum and Jim Keogh - This book offers a comprehensive guide to programming Arduino microcontrollers, including detailed explanations of input/output operations, control structures, and interfacing with external components.

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2. "ESP8266 Web Server Step-by-Step: Using Arduino IDE" by Jithin Karthik - This resource provides a step-by-step guide to setting up and programming the ESP8266 WiFi module as a web server using the Arduino IDE, which can be useful for integrating WiFi capabilities into your project.

3. "Beginning Arduino Programming" by Brian Evans - This book covers the fundamentals of programming Arduino microcontrollers, making it suitable for beginners. It includes practical examples and projects that can help you understand how to interface with various sensors, displays, and other peripherals.

4. "Proteus Simulation-Based AVR Projects: A Practical Approach" by Rahul Tyagi - This book focuses on using Proteus software for simulating AVR microcontroller-based projects, which can be helpful for understanding how to design and simulate your OTP-based door lock system in Proteus.

5. "Blynk Essentials: Create IoT Apps for Arduino, ESP8266/ESP32, Raspberry Pi" by Volodymyr Shymanskyy - This resource provides an in-depth guide to using the Blynk IoT platform for creating IoT applications with Arduino, ESP8266/ESP32, and Raspberry Pi. It covers topics such as setting up Blynk projects, integrating sensors and actuators, and creating custom user interfaces.

6. Online tutorials and documentation: Websites such as Arduino.cc, Adafruit, SparkFun, and the official websites of components like the ESP8266 and Blynk provide extensive tutorials, guides, and documentation that can be valuable resources for your project.

7. Electronics forums and communities: Websites like Stack Exchange's Arduino and Electronics Stack Exchange, as well as forums like Arduino Forum and Reddit's r/arduino, are great places to ask questions, seek advice, and learn from the experiences of others in the electronics and Arduino communities.