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Bluetooth Enabled Fingerprint Lock

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Abstract: In an age where security is paramount, our project introduces a revolutionary solution: the Bluetooth- enabled fingerprint lock. By seamlessly integrating biometric authentication with wireless connectivity, our lock offers unparalleled convenience and security. No more fumbling for keys or remembering complex codes; with a simple tap of their finger, users can securely access their spaces. Our accompanying mobile application provides intuitive control, allowing users to manage access permissions and monitor lock status remotely.
Keywords: Bluetooth, Access Control, Connectivity, Authentication.

I. INTRODUCTION

The Fingerprint door locker concept addresses the prevalent security challenges in our day-to-day lives. Traditional physical keys can be easily duplicated at a low cost, lost, or stolen, posing significant risks. To overcome these issues and enhance security, biometric security gadgets offer a viable solution. Unlike physical keys, biometric data, such as fingerprints, cannot be stolen or lost, and the chances of unauthorized duplication are minimal, significantly improving overall security. Security concerns have persisted throughout history, especially for companies, houses, and various other spaces. In the modern era, individuals are increasingly concerned about their security. Combining door locks with biometrics emerges as a practical solution. Biometric verification involves uniquely identifying individuals based on distinguishing biological traits such as fingerprints, hand geometry, earlobe geometry, retina and iris patterns, voice waves, DNA, and signatures.

II. SIGNIFICANCE OF THE SYSTEM

The Bluetooth-enabled fingerprint lock project stands out with its significant potential to enhance both security and convenience, catering to the rising demand for intelligent and automated solutions in various sectors. Aligned seamlessly with the prevailing trend of integrating technology into daily life, the initiative addresses the critical need for robust access control in residential, commercial, and industrial spaces. In residences, the project offers a modern, user-friendly alternative to traditional locks, enabling seamless and keyless entry. In commercial settings, these advanced locks contribute to fortified office security by allowing access only to authorized personnel in restricted areas. Industrial applications benefit from the project's robust security features, preventing unauthorized entry to sensitive facilities. The incorporation of Bluetooth connectivity adds the capability for remote access management, delivering an additional layer of flexibility and control.

III. LITERATURE SURVEY

1) Suraj Pandey , Vivek Yadav ,Rajkumar Yadav ,Yograj , Swatika Srivastava,"Smart Door Lock System", IJRTI

In the dynamic landscape of evolving technology, safeguarding corporate environments and offices has risen to paramount importance. The escalating threats of data breaches and unauthorized access emphasize the need for a robust and automated security framework. Conventional means of identification, including passwords and ID cards, have become vulnerable and prone to compromise. Manual door locks, reliant on keys, can lead to frustration and inconvenience, particularly when keys are lost or misplaced.
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2) Halliru, Umar Muhammad, "Design and Construction of Smartdoor Security System using Arduino and Bluetooth application" from Department of Electrical and Electronics Engineering, Abubakar Tafawa University

In response to the inadequacies of current home security systems, these research endeavors focus on the development of an advanced smart door locking system, offering a promising solution to enhance the management of home safety.The integration of Arduino IDE software and a Bluetooth module HC-05 plays a pivotal role in establishing seamless connectivity between the smartphone, microcontroller, and door lock. authorized individuals, enabling them to control door functions conveniently.

Authorized users can gain door access effortlessly by installing a dedicated application equipped with an open/close button on their smartphones. The HC-05, acting as both a receiver and transmitter, establishes communication with the microcontroller. The microcontroller, serving as the processing unit, plays a critical role in evaluating the entered password's accuracy. Following this evaluation, the microcontroller instructs the servo motor to either open or close the door, enhancing the security and accessibility of the home

3) Prof . Sumedh V. Dhole, Akshay Kumar, Mayank Gupta, Rishabh Arora," Wireless Biometric Lock using Arduino with the IoT" from International Research Journal of Engineering and Technology

In contemporary professional environments, workplace security poses a significant challenge for individuals both within and outside office premises. Given the complexities of security frameworks, it stands as a primary concern in today's fast-paced and competitive world, where physical means alone cannot ensure the protection of personal belongings. In response to this challenge, individuals seek alternative solutions that offer enhanced, reliable, and automated security. We find ourselves in an era where everything is interconnected within a network, allowing anyone to access information from anywhere globally. Consequently, the risk of unauthorized access and data breaches becomes a pressing issue.

4) Akshaya Krishnadas Bhat, Siddesh Praveen Kini, "Password Enabled door locking system using Arduino and IOT" from International Journal of Engineering Research and Technology

In the contemporary landscape, prioritizing security is crucial, whether it's safeguarding one's residence, vehicle, or digital accounts. While existing market solutions offer satisfactory outcomes, high-security options often come with a hefty price tag. Consequently, there's an increasing demand for an economically viable security system to address this pressing need.

Introducing a password-enabled door-locking system, which finds applicability in various settings such as households, offices, and desk units. The system operates by verifying the entered password's validity and grants access solely to authorized users. This solution stands out as an efficient means of preventing unauthorized entries, providing a cost-effective yet reliable security option.

IV. METHODOLOGY

To achieve the objectives of this project, we are using the following methodologies:

1) Methodology of objective 1: Choose a reliable and accurate fingerprint sensor that can capture and store fingerprints securely.
2) Methodology of objective 2: Select a Bluetooth module (e.g., BLE) that suits your requirements for connectivity and power consumption.
3) Methodology for Objective 3: Plan for power sources, such as batteries or USB charging, and consider energy-efficient designs.
4) Methodology for Objective-4: Implement backup and recovery mechanisms in case of system failures or lockouts.
5) Methodology for Objective-5: Educate users on best practices for secure usage and the importance of keeping their mobile devices and lock firmware up-to-date.

V. PROPOSED SYSTEM

Our proposed system employs a Bluetooth-enabled fingerprint lock system would integrate biometric authentication with wireless connectivity for enhanced security and convenience. Users would enroll their fingerprints, which would be securely stored and encrypted within the lock's database. Upon approaching the lock, the Bluetooth connection would automatically establish, prompting the user to authenticate via their registered fingerprint. This seamless process ensures quick access while maintaining robust security measures. Additionally, remote management and access control features could be implemented through a companion mobile app, allowing users to grant or revoke access to designated individuals remotely.
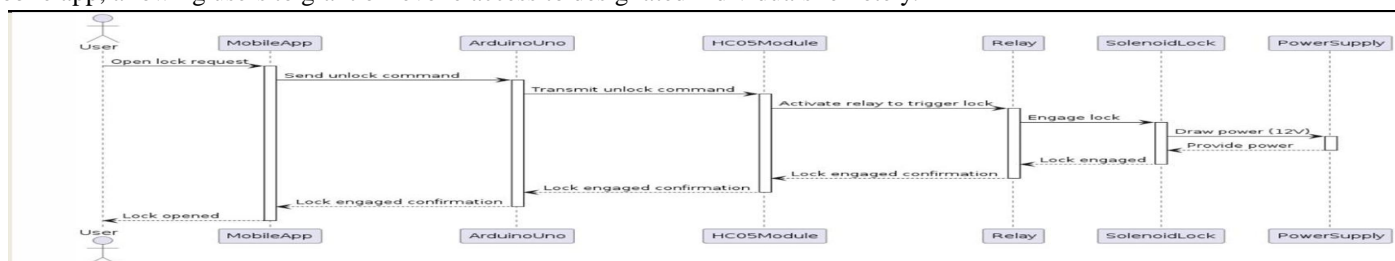

Fig 1. Proposed Architecture

VI.   RESULTS

The Testing of a Bluetooth enabled fingerprint lock involves several steps, including checking Bluetooth connectivity, registering and authenticating fingerprints, scanning for Bluetooth signals, and checking for security vulnerabilities. To test the lock, first ensure that your device's Bluetooth is enabled and can pair with the lock. Register your fingerprint on the lock and test if it can unlock the door.Test the lock's battery life and the low battery warning system if it is battery-powered. Finally, test the lock's durability and resistance to physical attacks. It is crucial to ensure that the lock has robust security measures in place, as the security of a Bluetooth enabled fingerprint lock heavily depends on the encryption methods used in Bluetooth communication and the security of the fingerprint recognition system.
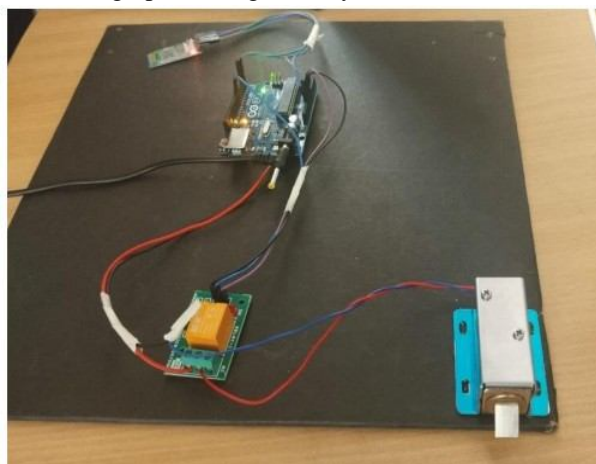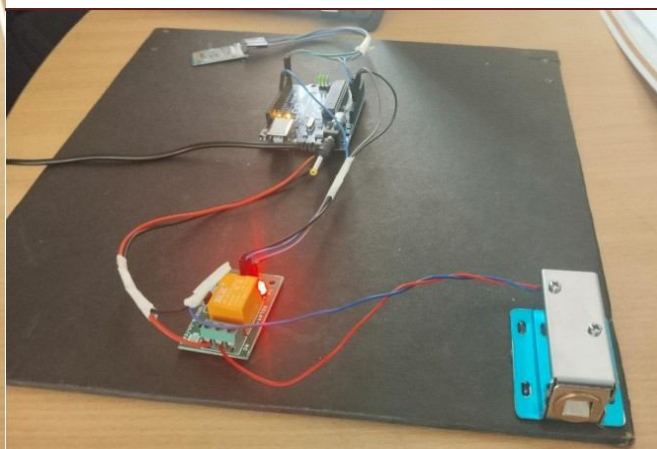

Fig 2:Before unlocking   Fig 3 :After unlocking

VII.   CONCLUSION AND FUTURE WORK

Bluetooth enabled fingerprint locks offer a convenient and secure way to unlock doors. However, some users have reported issues with fingerprint registration and unlocking. In some cases, the issue may be related to the user's phone or the lock's settings. For example, users may need to ensure that Bluetooth is enabled in the Wyze app and that the app has permission to access Bluetooth. In other cases, the issue may be related to the lock itself, such as a problem with the fingerprint sensor or the lock's software. Users have reported that the fingerprint sensor may not detect fingers properly if they are too cold. In these cases, users can try warming up their fingers before attempting to register or unlock the lock. Additionally, some users have reported issues with fingerprint registration and unlocking on certain phone models. In these cases, users may need to try registering or unlocking the lock with a different phone or using the keypad as an alternative means of unlocking the door. Overall, while Bluetooth enabled fingerprint locks offer many benefits, users may encounter issues with fingerprint registration and unlocking.

By ensuring that Bluetooth is enabled and that the lock's settings are correct, users can help to ensure that the lock works properly. Additionally, users can try warming up their fingers or using a different phone if they encounter issues with fingerprint registration or unlocking.

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