JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Mobile Based Bike Lock

[1]Dr. Prashant Chaturvedi, [2]Shouryam Kumar, [3]Shivayu Rai,

[4]Yash Meena,
[5]Soyam Sullere
[1] Professor, [2-5] Research Scholar,

Department of Electronics & Communication Engineering
Lakshmi Narain College of Technology, Bhopal, Madhya Pradesh, India

Abstract

Bike theft has been a persistent issue in urban environments, necessitating the development of innovative security solutions. Traditional lock and key systems, while prevalent, have shown susceptibility to various theft techniques, ranging from lock picking to brute force attacks. As a response to these challenges, the Mobile-Based Bike Locking System emerges at the intersection of technology and security, leveraging the widespread use of smartphones to create a more robust and user-friendly bike security solution.

IndexTerms - IOT, Electric Energy, Energy Meter, Arduino.

1. INTRODUCTION:

Traditional bike security primarily relied on mechanical lock and key systems. While simple in design, these systems have become increasingly vulnerable to theft due to the availability of lock picking tools and techniques. Despite advancements in electronic locking systems, challenges persist. Users may forget PIN codes, lose key fobs, or face difficulties in managing multiple authentication devices. The ubiquity of smartphones presents an opportunity to address these challenges comprehensively. The Mobile-Based Bike Locking System aims to capitalize on the functionality of smartphones, integrating secure communication technologies to enhance bike security. By examining the historical context of bike security systems, we can identify the limitations of existing methods and appreciate the need for a more sophisticated and adaptable solution. The subsequent sections of this

report will delve deeper into the specific challenges faced by current systems and how the proposed mobile-based solution aims to revolutionize bike security. The prevalence of bike theft in urban environments has prompted a critical examination of existing bike security systems. Traditional lock and key systems, while widely used, exhibit vulnerabilities that contribute to the escalating rates of bike theft. Additionally, electronic locking systems, though more advanced, have their own set of challenges. Recognizing these issues is essential for understanding the need for the Mobile-Based Bike Locking System.

1.1 Overview of Mobile Based System:

- **Intuitive Mobile Application:** In order to address the ever-growing challenges in user authentication, the mobile application will implement secure methods such as biometric authentication. This will provide a more robust and reliable way to verify user identities, improving overall security.
- **Effective Communication Module:** The Mobile-Based Bike Locking System goes beyond just a lock by offering seamless connectivity between your smartphone and the bike's mechanism. This ensures a smooth user experience and incorporates emergency features. In addition to regular locking and unlocking, you'll have remote options in case of a lost phone, providing peace of mind and a truly comprehensive security solution.

2. LITERATURE SURVEY:

2.1. Existing Mobile-Based Bike Locking Systems: In recent years, technology has taken a wheel in bike security with the emergence of several mobile-based locking systems. These high-tech solutions aim to surpass the limitations of traditional U-locks and chains by offering enhanced security, convenience, and a range of features. For instance, SkunkLock combines a foul-smelling deterrent with remote locking and tamper alerts, while Hiplok SPIN integrates a chain lock with automatic locking and vibration alarms. Meanwhile, established brands like Kryptonite offer smart locks with features like access sharing and built-in alarms (KryptoLok Series 2). For those seeking ultimate connectivity, Bitlock utilizes cellular technology alongside Bluetooth for remote access and location tracking. Finally, Ottolock takes a biometric approach, incorporating a fingerprint sensor for keyless unlocking with additional features like theft notifications.

2.2. Technologies used: Communication protocols play a key role. Bluetooth Low Energy (BLE) reigns supreme for its low power consumption, perfect for battery-powered locks. It facilitates secure keyless locking within a short range. Cellular networks (GSM/LTE) offer the muscle for features like remote tracking and theft alerts, but come at the cost of faster battery drain. Near Field Communication (NFC) provides a convenient tap-to-unlock option but with a limited range compared to BLE and cellular. Authentication and security measures are equally important. Password authentication is widely used but susceptible to brute-force attacks if passwords are weak. Biometric authentication using fingerprints or facial recognition offers a more secure and convenient solution, though it might be pricier to implement. For maximum security, Multi-Factor Authentication (MFA) combines password and other factors like fingerprint, making unauthorized access significantly harder. By understanding these technologies, cyclists can make informed choices when selecting a mobile-based bike lock that best suits their needs.

2.3. Security Considerations: Mobile-based bike locks offer a plethora of features, but security remains the cornerstone. To safeguard against theft and user safety risks, these systems require robust security measures. A crucial aspect is strong authentication. Multi-factor authentication, fingerprint scanners, or secure PINs ensure only authorized users control the lock. Furthermore, secure communication channels are essential. Encrypted data transmission via protocols like HTTPS and TLS protects information from interception or tampering. Finally, well-defined authorization

mechanisms are paramount. Distinguishing user roles with varying permission levels prevents unauthorized access to critical functions, like remote unlocking or system setting modifications.

3. PROPOSED SYSTEM:

While mobile-based bike locking systems offer a wave of security advancements, unlocking their full potential requires a robust security framework. A multi-layered approach is crucial to ensure these high-tech locks effectively deter theft. Regular vulnerability assessments and penetration testing act as a first line of defense, proactively identifying and patching weaknesses before malicious actors can exploit them. Secure update mechanisms, like over-the-air updates, ensure timely distribution and installation of these critical security patches. User education plays a vital role as well. Equipping users with best practices like creating strong passwords, avoiding phishing attempts, and keeping their mobile app updated strengthens the overall security chain. Transparency is also key. Clear data privacy practices that inform users about how their data is collected, stored, and used foster trust and compliance with relevant regulations. Finally, a comprehensive security posture starts at the design stage. Conducting a thorough risk assessment helps identify, analyze, and prioritize potential threats and vulnerabilities. Developing effective mitigation strategies, such as implementing additional security controls or hardening the system, further strengthens the lock's defenses

3.1. Implementation and Working Details

Key Components:

Microcontroller
LCD
Buzzer
DC Motor
Android Application
Power Supply

The project mainly focuses on Mobile Based Bike Lock system for the consumers. The following block diagram shows the outline of project implementation.

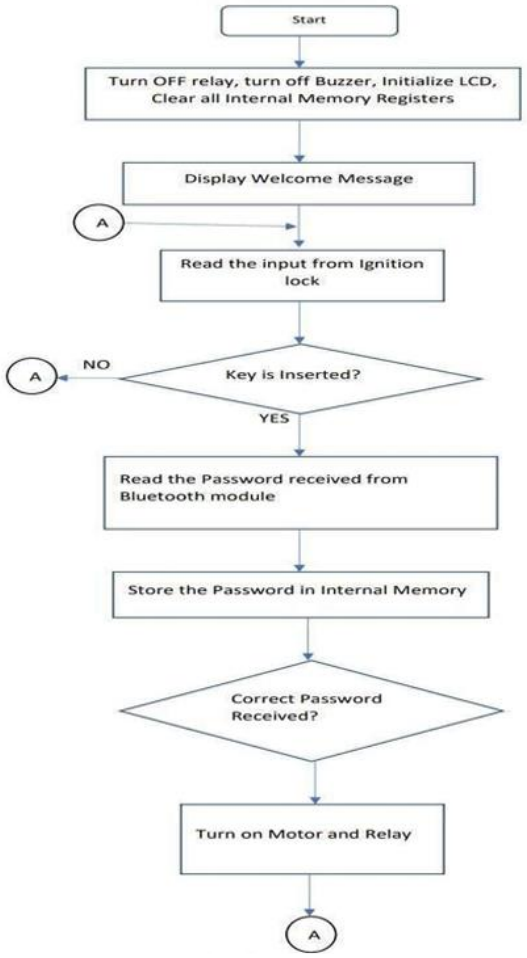

Fig 1: Block Diagram

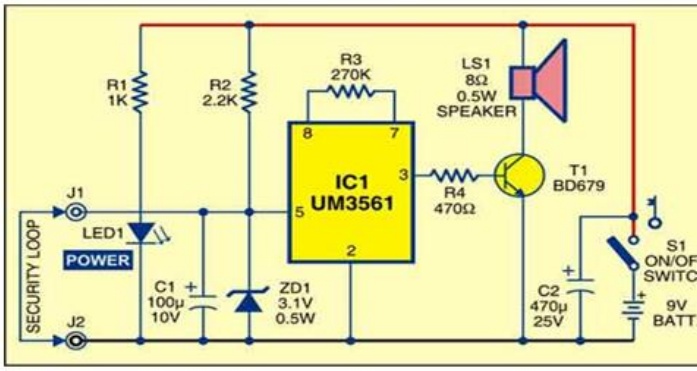

Fig 2. Power supply circuit

In power supply unit, a step-down transformer (Secondary12volt,1A) is used to covert 230V to 12V from main supply. Usage of bridge rectifier helps to convert Alternating current to direct current. The

capacitor is used to smoothen dc and to remove any sort of ripples. Usage of heat sink to ICLM7812 and LM7805 for safeguarding devices from overheating. Power supply unit distributes power to all the components. The arduino module takes the data from the energy meter and performs the necessary control operations and sends the required information like number of units through GSM / GPRS module. LCD module is used to get visual information like no. of units used and total amount user needs to pay.

Arduino empowers you to create interactive devices that bridge the gap between the digital and physical worlds. It's an open-source platform that combines a user-friendly hardware component, the microcontroller board, with a straightforward software development environment. The Arduino Uno is a popular example of such a board. Equipped with 14 digital pins and 6 analog pins, it allows you to connect various electronic components like sensors, lights, and motors to bring your ideas to life. Powering the board is flexible - you can use a USB cable from your computer or a battery. The Arduino programming language, based on C/C++, is designed with beginners in mind. This simplified approach makes it accessible even for those with no prior coding experience. In essence, Arduino provides a comprehensive and approachable toolkit for anyone interested in exploring electronics and physical computing projects.

Let's delve deeper into the technical aspects of the Arduino Uno. At its heart lies the ATmega328 microcontroller, a tiny computer packed with processing power. This microcontroller runs at 16 MHz, which translates to roughly 300,000 lines of code execution per second. It boasts 32 KB of flash memory for storing programs, 2 KB of SRAM for temporary data storage, and 1 KB of EEPROM for holding permanent data.

The Arduino Uno also features a variety of connection options. The 14 digital pins can be configured as either input or output pins, allowing you to read data from sensors or control devices like LEDs. Six of these pins are also capable of generating pulse-width modulation (PWM) signals, which can be used to control the brightness of LEDs or the speed of motors. The 6 analog input pins, on the other hand, are designed to read analog voltage signals from sensors like temperature sensors or light sensors.

In addition to these core functionalities, the Arduino Uno provides a convenient way to power your projects. You can either connect it to your computer using a USB cable, which will provide both power and a programming connection. Alternatively, you can use an external power supply, such as a battery pack, to power your project independently.

With its versatility, affordability, and beginner-friendly approach, Arduino has become a popular choice for hobbyists, educators, and professionals alike. It empowers individuals to turn their ideas into tangible creations, fostering innovation and exploration in the realm of electronics and physical computing.

4. FUTURE SCOPE:

The proposed mobile-based bike locking system has the potential to revolutionize bicycle security by offering a secure, convenient, and feature-rich solution. Here are some potential future scopes for such systems:

Market Adoption and Standardization:

Further research and development can contribute to industry-wide adoption and standardized evaluation criteria for mobile-based bike locking systems.

Integration with Smart City Infrastructure:

Integration with smart city technologies like bike-sharing programs and public transportation systems can further enhance user experience and promote sustainable transportation.

Advanced Sensor Integration:

Incorporating additional sensors for vibration detection, temperature monitoring, or even environmental conditions can offer even more comprehensive bike protection.

AI-powered Theft Prediction and Prevention:

Implementing AI algorithms for analyzing user behavior, location data, and environmental factors can lead to predictive theft prevention and proactive security measures.

User-Friendly Interfaces:

Developing user-friendly interfaces, such as mobile apps and web portals, can empower consumers to monitor and manage their bike usage and track it accordingly.

5. RESULT:

Overall, the proposed mobile-based bike locking system represents a significant step forward in bicycle security. Its ability to address user needs and offer a combination of security, convenience, and advanced features makes it a promising solution with the potential to revolutionize the way people experience cycling

6. CONCLUSION:

This mobile-based bike locking system transcends the limitations of traditional U-locks and chains, ushering in a new era of bicycle security. By prioritizing user needs, it offers a compelling combination of robust security features, unparalleled convenience, and a suite of innovative functionalities. This translates to a more secure and enjoyable cycling experience for everyone. Imagine the peace of mind of remote locking and

unlocking from your phone, eliminating the need to carry bulky keys. Furthermore, features like tamper alerts and location tracking provide an extra layer of security, deterring potential theft attempts and offering the ability to recover a stolen bike. The system's potential extends beyond basic security, with features like access sharing allowing you to grant temporary access to trusted individuals. Overall, this mobile-based bike locking system has the potential to revolutionize the cycling experience, offering a future where cyclists can enjoy the freedom of the road with enhanced security and unmatched convenience.

7. REFERENCES:

[1] Arduino. (n.d.). In Arduino Documentation. Retrieved from https://www.arduino.cc/

[2] Processing. (n.d.). In Processing Foundation. Retrieved from https://www.processing.org/

[3] Wiring. (n.d.). In Wiring. Retrieved from http://wiring.org.co/

[4] C Programming Language. (n.d.). In Britannica. Retrieved from https://www.britannica.com/technology/C-programming-language

[5] Atmel ATmega328 Microcontroller. (n.d.). In Atmel. Retrieved from http://www.atmel.com/products/microcontrollers/avr/megaavr.aspx

[6] USB-to-Serial Converter. (n.d.). https://en.wikipedia.org/wiki/USB-to-serial_adapter In Wikipedia. Retrieved from

[7] I2C (Inter-Integrated Circuit). (n.d.). In Arduino Documentation. Retrieved from https://www.arduino.cc/en/Reference/Wire

[8] SPI (Serial Peripheral Interface). (n.d.). In Arduino Documentation. Retrieved from https://www.arduino.cc/en/Reference/SPI

[9] Servo Library. (n.d.). In https://www.arduino.cc/en/Reference/Servo

[10] Arduino Documentation. Retrieved from Duemilanove Board. (n.d.). In Arduino Documentation. Retrieved from https://www.arduino.cc/en/Main/arduinoBoardDuemilanove

[11] Arduino Uno. (n.d.). In Arduino https://www.arduino.cc/en/Main/ArduinoBoardUno