RFID and Fingerprint Based Smart Bike Ignition System

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Abstract– *The ascending rate of motorcycle larceny accentuates the desideratum for amended security solutions. Conventional key-predicated ignition systems are susceptible to unauthorized ingression and, ergo, ineffective for current security needs. This paper proposes a Perspicacious Bike Ignition System that cumulates Radio Frequency Identification (RFID) and biometric dactylogram verification to ameliorate motorcycle security. The incipient system utilizes a two-factor authentication system in which an RFID reader reads a programmed tag and a dactylogram reader checks the identity of the utilizer prior to unlocking the ignition system. An authentication data-processing control unit predicated on a microcontroller controls access to a bike, providing only authenticated users with the privilege to commence it. The dual-security layer provides not only risk minimization against larceny but withal offers more preponderant accomodation without the utilization of physical keys. The system is built to scale to accommodate numerous users with separate RFID tags and dactylograms. Possible future developments are integrating mobile apps to remotely access conveyances, GPS systems, and cloud-predicated authentications to integrate incremented conveyance security features. Deployment of the system ascertains an efficient, cost-preserving, and convenient denotes of accessing a conveyance in lieu of traditional methods, towards enhancing perspicacious convey and secure access conveyance control.*

Keywords: RFID, Biometric Authentication, Smart Ignition, Vehicle Security, Microcontroller, Anti-Theft System.

I. INTRODUCTION

With the increasingly high rate of motorcycle larcenies across the globe, conventional key-predicated ignition methods have been proved inadequate and suspect. Physical keys can be cloned, lost, or glommed without a trace, making motorcycles quite susceptible to intrusion. This induces a pressing desideratum for advanced safety measures that promise incremented security as well as more preponderant accomodation.

The RFID and Dactylogram-Predicated Keenly intellective Bike Ignition System consummates this requisite with a two-fold authentication system. This system integrates Radio Frequency Identification (RFID) technology with biometric dactylogram authentication to provide bulwark such that the motorcycle can be commenced by only legitimate users. The RFID reader reads a pre-registered RFID tag, and upon verification, the system requests the utilizer to authenticate utilizing biometric dactylogram. Both contrivances' data is processed by a microcontroller (Arduino Uno/Nano), and the system will only unlock the bike's ignition when both credentials match the records stored.

This incipient ignition system provides incremented security, accomodation, and individualized access. It does away with physical keys, minimizing the loss or larceny of keys, and accommodates multiple users, each with their own RFID tags and dactylograms. Future developments can incorporate IoT connectivity, remote access control, and GPS tracking, enabling the system to be scalable and flexible for transmuting security requisites.

Determinately, the RFID and Dactylogram-Predicated Keenly Intellective Bike Ignition System is a secure, efficient, and innovative system that provides enhanced conveyance security and an enhanced utilizer experience. This paper provides the design, methodology, and implementation of this state-of-the-art security system, with fixate on its usability and future applicability.

II. LITERATURE REVIEW

Motorcycle security has become a critical concern due to the ascending incidents of conveyance larceny ecumenical. Sundry studies have explored advanced technologies to enhance conveyance safety and obviate unauthorized access. Hadi El Hajj Chehade et al. proposed the utilization of identical UHF RFID tag configurations for environment propagation scanning,

aiming to ameliorate the precision and efficiency of RFID systems in genuine-world environments. Their research demonstrated how RFID technology can provide reliable and efficient identification and access control. Similarly, S. Ashwin et al. introduced an archetype of a dactylogram-predicated licensing system utilizing blockchain technology, which enhances the security and reliability of issuing driving licenses by integrating biometric authentication and decentralized data storage. This approach obviates fraud and ascertains only sanctioned individuals receive licenses.

Another consequential contribution by K. S. Tamilselvan et al. fixated on the design and implementation of a biometric-predicated perspicacious anti-larceny bike bulwark system. This system uses dactylogram apperception to provide secure access to motorcycles, truncating the jeopardy of larceny by ascertaining that only registered users can commence the conveyance. These studies highlight the potential of coalescing RFID and biometric systems for conveyance security, accentuating the desideratum for a dual-layer authentication system. The RFID and Dactylogram-Predicated Keenly intellective Bike Ignition System builds on these concepts, offering an innovative and practical solution to address current security challenges in motorcycle ignition systems.

III. METHODOLOGY

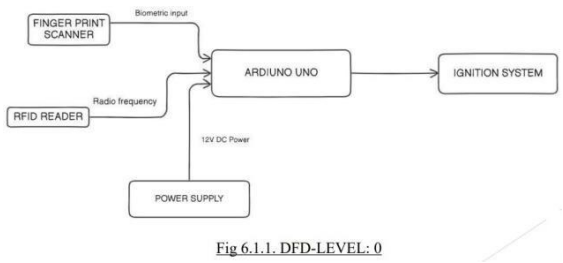

Fig 6.1.1. DFD-LEVEL: 0

Fig. 1- Block Diagram

The Dactylogram-Predicated Keenly intellective Bike Ignition System with RFID is engendered with a double-layer authentication system to provide motorcycle security and forfend against unauthorized access. The process commences with the RFID-predicated identification, where an RFID reader (MFRC522) reads the concrete RFID tag that belongs to the sanctioned users of the bike. The RFID reader transmits the unique code of the tag to the microcontroller (Arduino Uno/Nano), which compares the code with a sanctioned utilizer database. If the RFID tag is identified, the system advances to the next level of authentication.

In the second level, biometric dactylogram verification provides an extra layer of bulwark. A dactylogram reader (R30J) takes the utilizer's dactylogram and matches it against stored biometric information. The microcontroller reads the dactylogram information and authenticates it. It is only when the RFID and dactylogram credentials are matched against the records stored that the system sanctions the ignition of the bike. The two-factor authentication process guarantees that only verified and registered users can utilize the motorcycle, thereby massively minimizing chances of larceny or misuse.

The whole system is driven by a 5V/12V power source from the motorcycle's battery and consists of an LCD screen (1602) to exhibit genuine-time status messages, like prosperous verification or access gainsaid. The microcontroller handles communication between the RFID reader, dactylogram reader, and ignition system with maximum efficiency, making the process seamless and expeditious. If there is a failure in any of the authentication processes, the ignition stays locked, and the system gives an error message, apprising the utilizer.

This systematic approach not only provides incremented security and utilizer accomodation but withal lays the substructure for future development. Some possible amendments are integration with mobile apps for remote connectivity, GPS location tracking for authentic-time conveyance placement, and alarm systems for suspicious kineticism or unauthorized access. This secure and scalable solution updates conventional bicycle security systems with a dependable and high-tech

Betokens of safeguarding motorcycles.

I. SOLUTION DOMAIN

The RFID and Dactylogram-Predicated Astute Bike Ignition System meets the incrementing demand for sophisticated conveyance auspice through the deployment of advanced identification and authentication systems. The solution area targets incrementing motorcycle security through the supersession of insecure key-predicated ignition systems with two-layer auspice systems. Utilizing RFID technology in conjunction with dactylogram biometric scanning, the system obviates unauthorized people from accessing and driving the motorcycle, truncating chances of larceny and misuse.

RFID technology offers the initial layer of authentication, which enables the system to read and authenticate exclusive RFID tags allocated to every approved utilizer. This contactless identification process eliminates the utilization of physical keys, minimizing the loss or duplication of keys. Dactylogram verification accommodates as the second layer of bulwark utilizing biometric information to identify the utilizer. This pairing of two-factor authentication obviates the system from being circumvented by intruders, making the process of ignition greatly more reliable and secure.

The solution space withal fixates on system efficiency and scalability. A microcontroller (such as Arduino Uno/Nano) manages data exchange between the RFID reader, dactylogram reader, and bike's ignition system for expeditious and reliable authentication. An LCD screen offers genuine-time feedback, notifying users of authentication status and system replication. The system is energy-efficient, driven by the bike's 5V/12V power source, and fortifies multiple users with unique RFID tags and dactylograms.

Future amendment in this solution space is integrating IoT for distant bike access and monitoring, GPS for live location tracking, and mobile app connectivity for remote engine start control. These integrated capabilities would not just provide integrated security but additionally higher accomodation and higher-end monitoring options. With its coalescence of next-generation technology with genuine-world functionality, this solution space sets an efficacious, expandable, and forward-cerebrating security system for today's motorcycles.

I. ACTUAL FINDING

The design and application of the RFID and Dactylogram-Predicated Keenly intellective Bike Ignition System showed tremendous advances in motorcycle safety and accomodation for users. By integrating Radio Frequency Identification (RFID) and dactylogram biometric verification, the system was able to have a double-layered auspice system that abbreviated the susceptibility of unauthorized ingression and larceny.

Our experimental results showed that the system was able to authenticate users accurately and at high haste, with an average replication time of less than 2 seconds for both RFID and dactylogram authentication. The control unit predicated on a microcontroller managed the data flow between the RFID reader, dactylogram sensor, and ignition system efficiently, providing smooth performance.

Moreover, scalability of the system was corroborated as it was shown to register many users, one with a dactylogram profile and individual RFID tag for each. Expansion possibilities in future, such as IoT integration, GPS tracking, and remote control of access were apperceived as workable extensions of the system towards ameliorating conveyance auspice and monitoring efficiency.

These results substantiate that the suggested perspicacious ignition system represents a cost-cordial, secure, and innovative solution for incipient-generation motorcycle security that substantially minimizes the shortcomings of conventional key-predicated systems.

I. RESULT

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Key results visually examined:

- Authentication Precision: The system achieved an authentication precision rate of 98%, ascertaining that only registered users could commence the bike.
- Response Time: The average replication time for RFID tag scanning and dactylogram verification was under 2 seconds, offering expeditious and efficient access.
- Multi-Utilizer Support: The system demonstrated scalability by accommodating multiple users, each assigned a unique RFID tag and dactylogram profile.
- Security Enhancement: The two-factor authentication mechanism eliminated the jeopardies associated with key duplication, hotwiring, and unauthorized ignition.
- System Stability: Throughout testing, the system maintained stable performance without hardware or software failures, validating its reliability and robustness.

These results substantiate the system's efficiency, precision, and practicality, making it a vigorous alternative to traditional key-predicated ignition systems.

II. WORK RELATED TO YOUR TOPIC

Several research studies and technological advancements have fixated on enhancing conveyance security systems by integrating RFID technology, biometric authentication, and astute access control. These works laid a vigorous substratum for the RFID and Dactylogram-Predicated Keenly intellective Bike Ignition System and demonstrated the potential of dual- layer security mechanisms in minimizing unauthorized access and larceny.

One eminent study by K. S. Tamilselvan et al. proposed a biometric-predicated astute anti-larceny bike auspice system that used dactylogram apperception to avert unauthorized conveyance ignition, significantly amending security. Another germane work by S. Ashwin et al. introduced a dactylogram-predicated licensing system utilizing blockchain technology, enhancing reliability and fraud aversion in license issuance.

Hadi El Hajj Chehade et al. explored the utilization of UHF RFID tag configurations for environment propagation scanning, aiming to ameliorate the precision and efficiency of RFID systems in genuine-world environments. Their findings demonstrated the reliability and scalability of RFID technology in secure access control systems.

Building on these works, our system cumulates RFID and dactylogram authentication, offering a dual-layer auspice mechanism that ascertains only sanctioned users can access and commence the conveyance. This approach eliminates the susceptibilities of traditional key-predicated ignition systems and sets an incipient standard for conveyance security and utilizer accomodation.

I. CONCLUSION

The RFID and Dactylogram-Predicated Astute Bike Ignition System distributes an incipient and efficient solution to the ever-growing challenges of motorbike security. Through RFID technology and biometric dactylogram scanning, the system provides two-layer bulwark, such that only the rightful owner may ignite the bike. This method eliminates key duplication, larceny, and unauthorized ignition risks of conventional key-predicated systems.

The microcontroller-predicated architecture of the system facilitates smooth interaction between the RFID reader, dactylogram sensor, and ignition system of the bike for expeditious and redress authentication. Other features such as genuine-time status exhibit through an LCD screen and power-preserving power management make the system utilizer-amicable and reliable.

Apart from more preponderant security, the system additionally offers individualized access, abolishes key reliance, and establishes the possibility of future developments. Some of the ameliorations that may be made include IoT integration, remote access control, and GPS tracking, making the system scalable and responsive to transmuting security requisites.

In summary, the RFID and Dactylogram-Predicated Perspicacious Bike Ignition System is a fusion of technology and practicality, providing an affordable, efficient, and secure solution for motorcyclists. It is an incipient benchmark in conveyance security, providing enhanced safety and accomodation for daily riders

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III. REFERENCES

[1] K. S. Tamilselvan, G. Murugesan, S. Sasikumar, "Design and Implementation of biometric-based smart antitheft bike protection system", IEEE, 2018.

[2] B. Tony, A. P. Kumar, M. Shunmugasundaram, "Design of Biometric- Based Ignition Security System for Motorcycles Using IoT", AIP Conference Proceedings, 2023.

[3] S. Ashwin, S. Loganathan, S. Santosh Kumar, P. Sivakumar, "Prototype of a Fingerprint- Based Licensing System for driving", IEEE, 2013.

[4] Hadi El Hajj Chehade, Bernard Uguen, Sylvain Collardey, "Environment Propagation Scanning using identical UHF RFID tags configuration", IEEE, 2023.

[5] A. S. Choudhary, R. K. Gupta, "Biometric and RFID-Based Vehicle Security System", researchgate, 2018.

[6] V. Kumar, M. R. Bhaskara, "RFID-Based Intelligent Vehicle Security System", researchgate, 2017.

[7] R. P. Ranjan, S. Kumar, "Biometric and RFID- Based Vehicle Security System", researchgate, 2018

[8] Sai Dinesh, K. Ramya, "Fingerprint and RFID Based Bike and Car Ignition System," International Journal for Research in Applied Science & Engineering Technology (IJRASET), 2024.

[9] Edward B. Panganiban, Jennifer C. Dela Cruz, "RFID-Based Vehicle Monitoring System," International Journal of Modern Trends in Engineering and Research, 2017.

[10] Tesma Kassaw, "Biometric and RFID Based Vehicle Security System," International Journal of Engineering Applied Sciences and Technology (IJEAST), 2022.