IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

# Smart Vehicle Starter

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***Abstract:*** This project is focused on enhancing bike security, addressing common issues associated with traditional key lock mechanisms, such as key loss or duplication, which can increase the risk of bike theft. To combat these challenges, we have developed a "smart bike" system that provides next-level security using a fingerprint sensor. Users can easily start the bike by scanning their fingerprints, with the system capable of storing up to 127 fingerprint images. If a recognized fingerprint is scanned, the bike will power on; conversely, an incorrect scan will activate a buzzer and send an alert to the bike owner, indicating unauthorized access attempts.

In emergency situations, we aim to offer alternative access through the installation of an RFID card reader. By scanning an RFID card, users can also start the bike, serving as a secondary option when needed. Additionally, a GSM module is integrated to assist in critical conditions when help is required, particularly if communication devices are unavailable or the phone battery is dead. The user can simply press a button on the bike to send a real- time location or a distress message to their contacts via the GSM module.

***Keywords:*** Smart Bike System, Intelligent Vehicle Access, Multi-Level Security System, Unauthorized Access Prevention, Real-Time Emergency Communication.

## 1. INTRODUCTION

The primary objective of this project is to ensure comprehensive protection of bikes against theft. We are focusing on innovative technologies, such as fingerprint detection, RFID, and GSM communication, rather than traditional security methods. This system enables multiple functions, including fingerprint activation, RFID access, and GPS for location sharing, all at an affordable price point of around 2,000.

The fingerprint sensor activates the bike's engine upon successful identification of the user's fingerprint. The RFID card acts as a supplementary access method for situations where the fingerprint recognition fails or the bike owner is unavailable. Similarly, the GSM module provides emergency communication capabilities; for instance, during long rides of 100 km or more, if the user's phone battery dies, they can still dispatch a distress signal or their real-time location to friends and family.

Ultimately, our goal is to provide enhanced security for bikes, ensuring users feel safe and secure while using our smart bike, equipped with a range of additional features.

## 2. OVERVIEW

The Smart Bike Security System is designed to offer advanced protection for two-wheelers through the use of modern electronic technologies. Traditional bike security relies heavily on mechanical key locks that are vulnerable to being broken, duplicated, or misplaced, leading to an increased risk of theft. This project presents a robust security solution utilizing biometric authentication, RFID technology, and GSM communication.

In this system, a fingerprint sensor serves as the primary means of starting the bike, allowing only authorized individuals with registered fingerprints to activate the engine. The fingerprint module can accommodate up to 127 fingerprint templates, ensuring a high level of security.

### 2.1 Benefits of Smart Vehicle Stater

- ***Smart Bike Security System:*** An In-Depth Overview,

The growing incidence of bike thefts and the need for enhanced rider safety have led to the development of the Smart Bike Security System. This innovative system integrates various technologies to provide robust security features while ensuring user convenience. One of the key functionalities of this system is the ability to detain unauthorized access, which is achieved through advanced biometric authentication, utilizing a fingerprint sensor as the primary mode of identification.

***Emergency Communication:*** Another significant feature of the Smart Bike Security System is its emergency communication capability. In urgent situations, such as accidents or mechanical breakdowns, the GSM module facilitates critical communication. For instance, if a rider's mobile phone battery is dead, or if they encounter a situation where immediate help is needed, they can simply press an emergency button. This action activates a pre- programmed message that is sent to predefined contacts, containing both a plea for assistance and real-time location details. This feature not only enhances user safety but also ensures quicker response times in case of emergencies.

Overall, the amalgamation of these features results in a sophisticated system that provides enhanced security, emergency support, and user convenience—all at a cost-effective price point.

## 3. METHODOLOGY

The development of the Smart Bike Security System revolves around a careful integration of various hardware components coupled with effective software programming, aiming to enhance bike security and user safety. This innovative approach employs biometric authentication through a fingerprint sensor, complements it with RFID technology for backup access, and utilizes GSM communication for reliable external connections.

### *Hardware Components*

To construct the Smart Bike Security System, the following core hardware components are employed:

A. ***Arduino Uno***: This microcontroller serves as the brain of the system, coordinating all other components.
B. ***Fingerprint Sensor:*** This device captures and stores the fingerprints of authorized users, allowing only them to start the bike.
C. ***RFID Card:*** Serving as a secondary authentication method, this card comes into play when

fingerprint authentication is not feasible.

D. ***GSM Module:*** This module allows for real-time communication, providing alerts and sending location data during emergencies.

E. ***Relay Module:*** It acts as a switch to control the ignition of the bike, responding to the authentication signals from the fingerprint or RFID scanners.

F. ***Push Button:*** This button is used by the user to initiate the emergency communication features of the system.

G. ***Buzzer:*** This component serves as an alarm, alerting users when unauthorized access is attempted.

***System Setup:***

In terms of system configuration, both the fingerprint sensor and RFID reader are directly connected to the Arduino. When a user scans their finger or taps the RFID card, the signal is relayed to the Arduino, which checks the authenticity against the stored data. If the fingerprint or RFID matches an authorized entry, the relay is activated, allowing the bike to start.

For powering the system, a connection to the bike's existing battery is established, which eliminates the need for an external power source. By using specific resistors, the voltage and amperage are appropriately regulated to ensure the safety and efficacy of the components.

In instances where the scanned fingerprint or RFID does not match the authorized list, a buzzer alarm is triggered to notify the user of a potential theft attempt. Moreover, in the event of theft or unauthorized use, the GSM module plays a vital role by sending alerts, including the bike's location, to the owner's registered phone number when the emergency button is pressed.

To operate effectively, the GSM module requires a SIM card, similar to a mobile phone, and must be recharged periodically. This ensures uninterrupted communication capabilities for emergencies.

## 4. IMPLEMENTATION

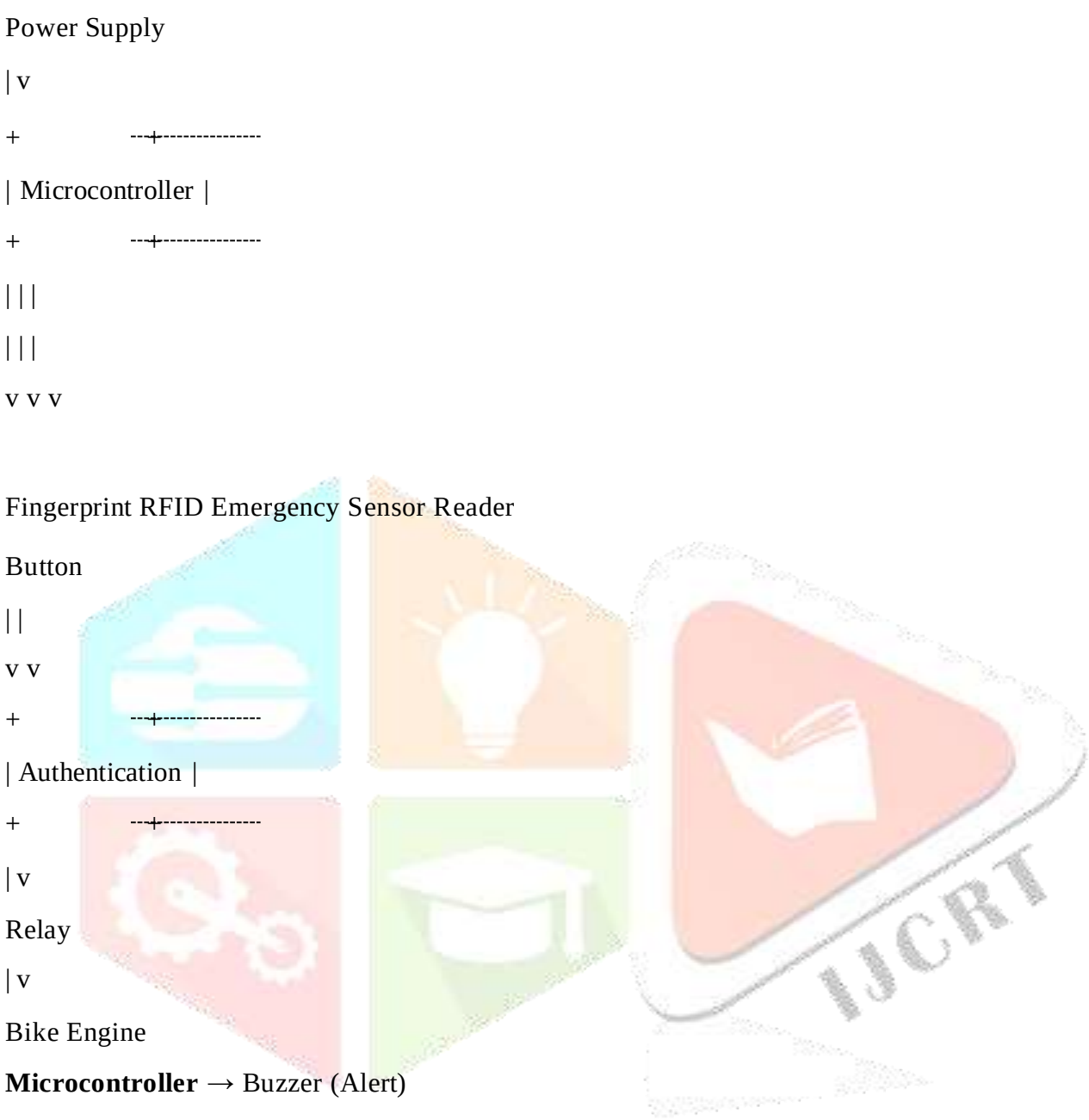
The implementation phase of the Smart Bike Security System focuses on the practical aspects of integrating the hardware components with the guiding software programming frameworks. The goal is to construct a seamless and user-friendly interface that manages secure bike access and acts promptly during emergencies.

To summarize, this project illustrates a sophisticated solution for bike security through the use of biometric authentication, RFID technology, and GSM communication. The core of the system revolves around using a fingerprint sensor as the main means of starting the bike, with the capability to store up to 127 unique fingerprints. This feature guarantees that only authorized individuals can start the bike engine.

In the event of unauthorized access attempts, an alarm sounds from the buzzer to deter potential thieves, while alerts are communicated to the bike's owner via the GSM module. Furthermore, the integration of RFID technology offers a reliable alternative for bike access, especially in circumstances where fingerprint verification may not be feasible.

In conclusion, the Smart Bike Security System presents an innovative, technologically advanced solution that addresses modern-day concerns regarding vehicle security and user safety. Through its strategic components, it ensures that users have peace of mind, knowing that their bike is not only protected but that they also have the means to seek help when necessary—all at a cost-effective price for the average consumer.

***Block digram***




## 5. CUSTOMER REQUIREMENTS:

Customer primary requirement is secure their bike and protect their bike from theft an unauthorized access Customers expect a security system that is reliable, easy to use, and more secure than traditional key-based locking systems.

Users require a keyless bike starting mechanism to avoid problems such as key loss or key duplication. Therefore, the system must support fingerprint-based authentication as the main access method. Since biometric systems may fail in certain situations, customers also require a backup access option, which is fulfilled by the RFID card system Another important requirement is real-time alert notification. If someone attempts to start the bike without authorization, the system should immediately activate an alarm and send a warning message to the bike owner. Customers also expect emergency assistance features, such as the ability to send a help message and live location to family members during accidents,

breakdowns, or when the rider' s phone battery is dead.

Low cost and low power consumption are also major customer requirements. The system should be affordable, durable, and suitable for daily use. Finally, customers expect the system to be easy to install, user-friendly, and reliable under different environmental conditions.

## 6. DESIGN CONSIDERATIONS

Design considerations are the important factors taken into account while developing the Smart Bike Security System to ensure proper performance, reliability, and user safety.

- **Security** is the primary design consideration. The system must allow bike access only to authorized users. Therefore, fingerprint authentication is used as the main security method, with RFID as a secondary access option. Unauthorized access attempts must trigger an alarm and alert notification.

- **Reliability** is another key factor. The system should work accurately under different conditions such as dust, heat, and vibration. The components selected should be durable and suitable for two-wheeler environments.
- **Cost effectiveness**: is considered to make the system affordable for common users. Low-cost yet efficient components are chosen so the total system cost remains around ₹2000 without compromising functionality.

- **Power consumption** is minimized to avoid excessive battery drain. All modules are selected to operate efficiently using the bike' s power supply.

- **Ease of use** is essential. Fingerprint scanning, RFID card access, and emergency button operation must be simple and quick, even for non-technical users.

- **Safety and emergency support** are also considered. The GSM module must reliably send emergency messages and location details during critical situations.

- **Scalability and maintenance** are considered so that future upgrades such as GPS tracking or mobile app integration can be added easily.

## 7. CONCLUSION:

In this project, a smart and practical bike security system has been successfully designed and implemented to reduce the risk of bike theft and improve rider safety. Instead of depending on traditional key-based locks, this system uses modern technologies such as fingerprint authentication, RFID access, and GSM communication to provide stronger and more reliable protection. The fingerprint sensor ensures that only authorized users can start the bike, while the RFID card acts as an alternate access method in emergency or special situations. Any unauthorized attempt immediately triggers an alarm and sends an alert message to the bike owner, which increases the chances of preventing theft. The inclusion of a GSM-based emergency feature allows the rider to send a help message and location details when assistance is needed, even if the mobile phone is not available.

This system is designed to be low-cost, easy to use, and suitable for everyday use on two-wheelers. Overall, the proposed smart bike security system offers an effective solution for vehicle protection and rider safety by combining affordability with advanced security features. The project proves that modern security technologies can be practically implemented to make bikes safer and smarter.

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