

# BIKE ANTI-THEFT SYSTEM USING IOT

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**Abstract-** The proposed system integrates various sensors including accelerometers, gyroscopes, and potentially magnetometers to form an inertial measurement unit. This unit serves to detect motion, thereby addressing security concerns like theft and tampering in bicycle rental systems. Incorporating IoT technology, the system utilizes GPS for real-time location tracking, ensuring accurate positioning of the bicycle at all times. This feature enhances security by enabling prompt responses in case of theft or unauthorized movement. A robust locking mechanism is also a key component of the design, contributing to the safety of user bikes. By combining the data from multiple sensors such as accelerometers and gyroscopes, the system not only offers effective navigation but also enhances data accuracy, minimizing ambiguity in detecting motion anomalies. This proposed design not only employs cutting-edge IoT technology and GPS for precise tracking but also emphasizes a sturdy locking mechanism to ensure bicycle safety.

**Keywords:** Node MCU, Accelerometer, IoT technology, GPS Tracking System, Locking system.



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## INTRODUCTION

Property crimes are said to hover around 10 million annually. Of this, vehicle theft tops the list and often occurs in all parts of the world. There are so many recent technologies evolving and new methods are being upgraded to overcome this issue. The methods involved in vehicle theft detection have become aware to everyone including the burglars and they try to break the system and steal the vehicle.

In an era defined by interconnected devices, this project presents a groundbreaking approach to enhance bicycle security through the power of IoT technology. By combining advanced sensors and GPS capabilities.

The integration of GPS technology marks a significant leap forward in ensuring bicycle security. This project capitalizes on the real-time tracking capabilities of GPS, allowing users and administrators to constantly monitor the exact location of bicycles.

This study introduces an innovative design concept for an intelligent bicycle lock system by leveraging IoT technology. The proposed system integrates various sensors including accelerometers, gyroscopes, and potentially magnetometers to form an inertial measurement unit. This unit serves to detect motion, thereby addressing security concerns like theft and tampering in bicycle rental systems. Incorporating IoT technology, the system utilizes GPS for real-time location tracking, ensuring accurate positioning of the bicycle at all times. This feature enhances security by enabling prompt responses in case of theft or unauthorized movement.

A robust locking mechanism is also a key component of the design, contributing to the safety of user bikes. By combining the data from multiple sensors such as accelerometers and gyroscopes, the system not only offers effective navigation but also enhances data accuracy, minimizing ambiguity in detecting motion anomalies. An essential aspect of this intelligent lock system is its IoT application. This application serves as a centralized interface for users, providing live location updates and notifications related to any

suspicious activities involving the bike. In case of theft attempts, the system generates alerts through the IoT application, enabling swift actions to prevent potential security breaches.

## LITERATURE SURVEY

- In this study review we will be discussing IMU sensors which are used for motion capture. IMU sensors have accelerometers and gyroscopes sensor. These sensors have a different function depending on the application to the system. IMU is used for pose reconstruction or changing the apposition of the body oriented sensor that is attached. IMU used for signal sensor integration over time to estimate speed, position and orientation. Because the two sensors, accelerometer sensor and gyroscopes sensor suffer biases and sound variation, this oncoming cause an early estimation which is unreliable after a few seconds. [1].
- This paper describes the proposed methodology to build a safety system which is integrated with the smart helmet and intelligent bike to reduce the probability of two-wheeler accidents, bike theft and drunk drive cases. This device aims for the safety and security of two wheeler riders as well as of two wheelers. In this era, more than 1.5 lakhs people were injured because of road accidents. It is noted that 17 deaths happen for every one hour. The major reason is drunk driving. It is reported that the majority of road accidents happen only because of drunk driving. It has also been observed that other accidents are because of improper usage of helmets. This system is used to reduce the rate of accidents and rate of vehicle theft. This proposed methodology is implemented using RFID technology, password authentication and sensors namely gas sensor and proximity sensor. [2].
- This paper describes the proposed methodology to build a safety system which is integrated with the smart helmet and intelligent bike to reduce the probability of two-wheeler accidents, bike theft and drunk drive cases. This device aims for the safety and security of two wheeler riders as well as of two wheelers. This system is used to reduce the rate of accidents and rate of vehicle theft. This proposed methodology is implemented using RFID technology, password authentication and sensors namely gas sensor and proximity sensor. In this proposed methodology, a proximity sensor is fixed in the helmet so that the rider cannot ride the two-wheeler if he/she doesn't wear the helmet. Gas Sensor is fixed so as to sense whether the rider has consumed the alcohol. If so, the ignition system doesn't get on. The ignition system gets on and the gas sensor checks whether the rider has consumed alcohol or not, if yes, it will be detected by the gas sensor and the ignition system gets off automatically. The bike will start until the rider wears the helmet and if there is no alcoholic content present. When the rider needs to start the vehicle, he/she needs to use the password provided to start the vehicle in order to authenticate the owner of the vehicle. [3].
- This project introduces a smart bike with an IoT-based monitoring system for cyclists, focusing on real-time health and performance tracking. It incorporates sensors like heart rate, pulse oximetry, magnet reed, and GPS, all connected to a microcontroller and Wi-Fi module accessible through the Blink application. The data collected, including heart rate, oxygen levels, speed, distance, and location, can be viewed on a smartphone. Additionally, the text briefly mentions a separate IoT-based system for vehicle parameter monitoring and security. [4].

## AIM & OBJECTIVES

- This project aims to enhance bicycle rental system security using innovative IoT technology. By integrating GPS for real-time tracking, implementing a robust locking mechanism, and developing a specialized IoT application, the motivation is to address the limitations of existing solutions.
- The main objective of this project is to develop a novel intelligent lock system for bicycles that utilizes IoT technology and advanced sensors, such as accelerometers, gyroscopes, and potentially a magnetometer, to detect any unauthorized movement or tampering of bicycles within the rental system. Implement GPS technology for live location tracking of bicycles, monitored in real-time through a dedicated IoT application.

## Literature Survey Table

| Sr.No | Title of the paper  | Author's name                               | IEEE transaction/ Journal/ conference/ Workshop   | Summary   | Findings/ Limitations  |
|-------|---|---|---|---|--|
| 1     | Anti-theft Integrated Bike Lock with Accelerometer Motion Detection | Edward D.M. Cabalquinto; Lai M. Malabayabas | IEEE 14th International Conference on Humanoid, Nanotechnology, Information Technology, Communication and Control, Environment, and Management (HNICEM) | In this paper, discusses shortcomings in existing bicycle security systems and proposes an innovative approach using an intelligent lock with sensors like accelerometer for motion detection against theft. Combining sensor data enhances accuracy. Additionally, a novel voltage generator feature is introduced, distinguishing it from previous systems by activating nerves at a threshold frequency, strengthening security. | Oversimplification of Sensor Data<br><br>Might have accuracy problems.<br><br>Mainly focusses around voltage system. |

| Sr.No | Title of the paper  | Author's name                             | IEEE transaction/ Journal/ conference/ Workshop                     | Summary   | Findings/ Limitations   |
|-------|---|---|---|---|---|
| 2     | Safety helmet with alcohol detection and theft control for bikers | Dangeti Anu Preetham; Mukundala Sai Rohit | International Conference on Intelligent Sustainable Systems (ICISS) | In this paper, we've designed a Smart Helmet for the safety of bike riders which includes an alcohol sensor to ensure the one who is driving the bike is sober and a rider authentication using face recognition to control theft | Accuracy of Alcohol Sensor<br><br>Face Recognition Challenges<br><br>Limited Scope of Detection |

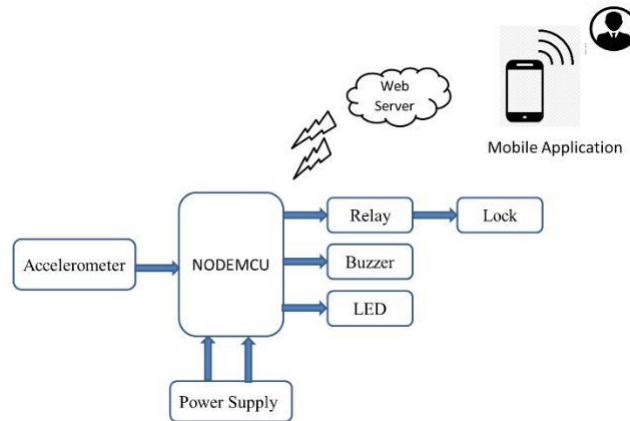
| Sr.No | Title of the paper   | Author's name             | IEEE transaction/ Journal/ conference/ Workshop  | Summary  | Findings/ Limitations  |
|-------|--|---------------------------|--|--|--|
| 3     | Microcontroller and Sensor Based Smart Biking System for Driver's Safety | S. J. Swathi; Shubham Raj | IEEE International Conference on Intelligent Techniques in Control, Optimization and Signal Processing (INCOS) | This paper describes the proposed methodology to build a safety system which is integrated with the smart helmet and intelligent bike to reduce the probability of two-wheeler accidents, bike theft and drunk drive cases | Too many complications<br><br>Its hard to achieve all the problems accurately every time |

| Sr.No | Title of the paper                 | Author's name   | IEEE transaction/ Journal/ conference/ Workshop   | Summary  | Findings/ Limitations   |
|-------|------------------------------------|---|---|--|---|
| 4     | Anti-Theft System for Two Wheelers | Atharva Teggi Soham Kakade Niranjana Wagh Deepak Mohite | International Journal of Advanced Research in Science, Communication and Technology(IJARST) | This Paper presents a smart bike with monitoring system for cyclists and also includes GPS tracking and key locking. | Not much focus on security, the main focus is health tracking |

## MOTIVATION

The existing solutions for bicycle rental system security, such as key-operated locking devices and remote-controlled locks, exhibit vulnerabilities and fail to provide robust protection against theft and tampering. These limitations underscore the need for an improved approach. The proposed concept addresses these challenges by utilizing IoT technology, GPS for live location tracking, a sophisticated locking mechanism, and an intelligent application. The goal is to create a comprehensive security system that effectively detects and prevents theft or tampering of bicycles in rental systems, overcoming the shortcomings of current solutions.

## SYSTEM ARCHITECTURE



**Fig -1:** System Block Diagram

## APPLICATION

- **Theft Prevention and Deterrence:** The primary application is to prevent bike theft by employing smart locks, alarms, and real-time monitoring to deter thieves and secure the bike.
- **Real-Time Location Tracking:** Bike owners can track the real-time location of their bikes using GPS technology, ensuring they are aware of where their bike is at all times.
- **Remote Locking and Unlocking:** Enable bike owners to remotely lock and unlock their bikes using a mobile app, adding an extra layer of convenience and security.
- **Bike Fleet Management:** For bike-sharing programs or bike rental businesses, IoT can be used to manage bike fleets efficiently, monitor usage, optimize bike distribution, and detect unauthorized usage or theft.

## FUNCTIONAL & NON-FUNCTIONAL REQUIREMENTS

**Functional requirements:** An IoT-based bike theft prevention system involves integrating various technologies to detect and prevent bike theft. Functional requirements for such a system can be divided into different categories, including detection, prevention, tracking, user interface, and notifications.

**Nonfunctional Requirements:** Non-functional requirements for an IoT-based bike theft prevention system are essential aspects that define the system's performance, usability, security, and other qualities.

Functional requirements

1. Registration
2. User Login
3. Real-time Tracking
4. Notifications
5. Remote Locking
6. Web Portal

## 7. Mobile Application

### Nonfunctional Requirements

1. Security
2. Authentication and Authorization
3. Reliability
4. Usability
5. Performance

### **SYSTEM REQUIREMENTS Software Used:**

- Windows 10 or above
- Arduino IDE
- Libraries of IOT
- IOT application Development interface

### **Hardware Used:**

- Buzzer
- NODEMCU
- Accelerometer
- LED
- LOCK
- Transistor
- register
- power supply

### **CONCLUSION**

In conclusion, an IoT-based bike theft prevention system represents a revolutionary approach to enhancing bike security and ensuring peace of mind for bike owners. By integrating cutting-edge technologies and connectivity features, this system offers a comprehensive solution to tackle the rising issue of bike theft. The system provides an array of functionalities including remote locking, real-time tracking, tamper detection, and emergency response capabilities, ultimately mitigating theft risks and enabling a safer environment for bike users. Bike owners can track their bikes in real-time using GPS, allowing them to know the bike's whereabouts and take prompt action in case of unauthorized movement. The IoT system incorporates smart locking mechanisms, tamper detection, and geofencing to enhance bike security and deter theft attempts.

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