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Advance Security System for Bike

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Abstract

Motorcycle theft crime index is recorded the highest crime in our country with many cases of losses reported at the police station. This happens due to lack of their security systems on the vehicle. Other reason is due to the negligent attitude of the owner of the security measures taken charge of the vehicle and the attitude of the owners. The aim of this paper is to invent a security system against motorcycles theft by using RFID (radio frequency identification) technology. It is based on RFID technology on ultra high frequency range (905-925 MHz) which can be applied to use in access control by using RFID tag attached to motorcycles. Additionally, the system can be modified to use for protecting other kinds of assets stealing such as cars, notebooks, bags, etc. The RFID tag contains a unique set of number as a code, so it can be identified. The qualifications and information of each property are recorded on a database interfaced to RFID reader. When the RFID tag responds to the RFID reader, it can read the data which is kept in tag and send these data to proceed in order to compare with the data on the database. In case the information read from tag is incorrect as condition that is recorded on the database. The system alarms security guards for further investigation. In addition, it can send a signal to activate an additional circuit to shut the motorcycle engine off and turn the closed circuit television (CCTV) on for recording as the theft occurs.The purpose of this project is to build an increased security system for motorbikes using radio frequency identification (RFID). RFID is a new method in a very efficient security system for smaller areas and limited to a certain distance communication. Basically, this system will be detected by an identification tag that was created specifically to these tools while with some added mobiles. With the help of this model, we can completely replace the key-based locking system of the vehicle with a unique card to turn on the ignition of the vehicle. RFID technology utilizes electromagnetic fields to identify and monitor devices affixed to objects. The system consists of a radio transponder, a radio receiver, and a transmitter that communicate with each other to transmit digital data back to the reader. This project seeks to develop a sophisticated system that enables multiple individuals to access the vehicle using RFID authentication methods. Users can effortlessly start their motorbike using this initiative.

Radio Frequency Identification (RFID) technology offers a promising solution due to its reliability, versatility, and ease of integration. This paper introduces an advanced security system for bikes, leveraging RFID technology to provide robust protection against thefts. The system employs RFID tags, readers, and a centralized control unit to monitor and manage bike access.

Index Terms - Work Flow, Circuit Details, Working,

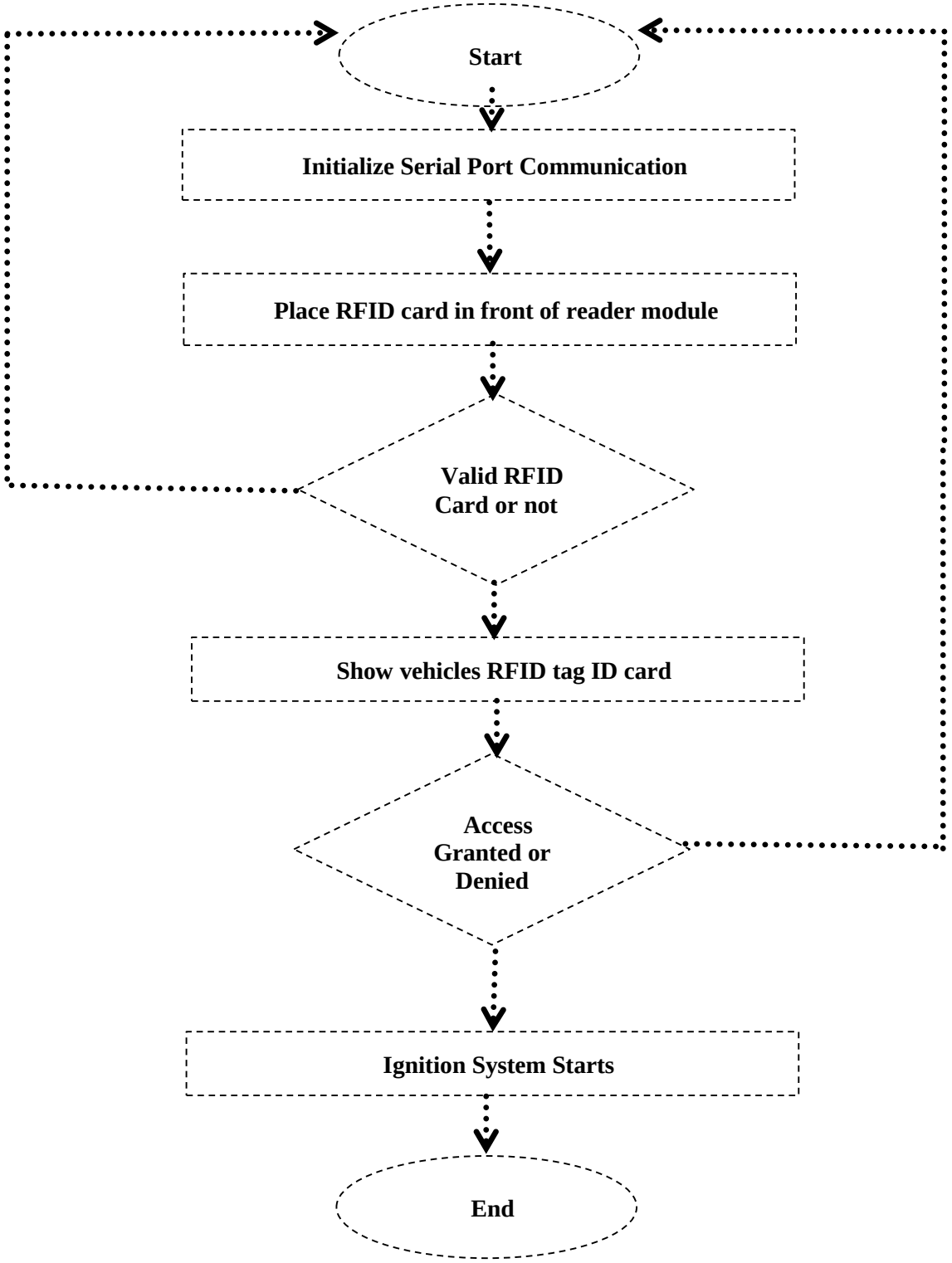
I. INTRODUCTION

According to the latest crime rate index, motorcycle theft crime records were high compared with the criminal cases of other types of vehicles such as cars. A security system is essential for motorist as the number of motorcycle theft increases every year. Various security systems are available in the market with variety of functions, operating modes and features. Most of the systems are expensive which make security system that offers excellent protection to your vehicle using radio frequency identification an effective one. RFID is used to identify and track the tags attached to objects automatically in the event of contact with the object and it also non-contact use wireless radio frequency electromagnetic fields to transmit data. RFID is a tool that potential successor to the technology of the bar code. Systems RFID has a feature, which is- it can withstand, rugged environments and can be read through a variety of visual materials that challenge with remarkable speed. Three basic components consists an RFID, namely, readers, names and tags. This advanced and secure system provides users with alternate methods to activate their motorcycle engine. With the RFID implementation, multiple users can access the system using an RFID tag, but only authorized members can operate the motorcycle. RFID technology utilizes electromagnetic fields to identify and monitor devices affixed to objects. The system consists of a radio transponder, a radio receiver, and a transmitter that communicate with each other to transmit digital data back to the reader.In today's world, bike theft is a significant concern for bike owners, leading to financial loss and emotional distress. Traditional security measures such as locks and alarms have limitations, and bike thieves are often adept at bypassing them. To address this issue, advanced security systems utilizing RFID (Radio Frequency Identification) technology offer a robust solution. RFID - based security systems provide enhanced protection against theft by leveraging

advanced technology to monitor, track, and secure bikes effectively.Bike thefts have become a prevalent concern worldwide, causing financial losses and emotional distress to owners. Traditional security measures such as locks and alarms have proven insufficient against determined thieves. Therefore, there's a growing demand for more sophisticated security systems capable of deterring theft effectively. RFID technology presents an attractive option due to its ability to provide secure identification.

II. WORK FLOW :

It is the series of activities that are necessary to complete a task. Each step in a work flow has a specific step before it and specific step after it, except for the first and last steps.



III. PRINCIPLE:

The principle of an advanced security system for bikes utilizing RFID (Radio Frequency Identification) revolves around employing cutting-edge technology to enhance the security and protection of bicycles. At its core, RFID-based security systems for bikes rely on the unique identification capability of RFID tags and readers. Each bike is equipped with an RFID tag containing specific identification information, which is wirelessly transmitted to RFID readers strategically placed at various checkpoints or entry points. When the bike approaches a reader, the reader emits radio waves that power the RFID tag, prompting it to transmit its unique ID to the reader. This information is then processed by a central control system, which verifies the bike's identity and authorizes access based on predefined parameters such as owner authentication or access permissions. Additionally, advanced security features such as encryption techniques and biometric authentication can be integrated into the system to further bolster protection against theft or unauthorized access. Moreover, the system can be augmented with GPS tracking functionality, enabling real-time monitoring and tracking of the bike's location in case of theft or loss. Overall, the principle of an advanced security system for bikes using RFID revolves around leveraging state-of-the-art technology to provide robust protection and peace of mind for bike owners, deterring theft and ensuring the safety of their valuable assets.By leveraging RFID technology, an advanced security system for bikes can provide a high level of security while offering convenience for authorized users. It helps deter theft and unauthorized use while also providing bike owners with peace of mind knowing their property is protected.

The principle of an advanced security system for bikes utilizing Radio Frequency Identification (RFID) technology revolves around leveraging RFID tags and readers to create a robust and reliable security framework. RFID technology employs electromagnetic fields to automatically identify and track tags attached to objects, in this case, bikes. The system comprises two main components: RFID tags and RFID readers.

RFID tags, typically small and inconspicuous, are attached to bikes in a secure manner. These tags contain unique identification information that is transmitted wirelessly when activated by an RFID reader. The information stored on the tag can include the bike's serial number, owner details, and other relevant data. Each tag is programmed with a unique identifier to ensure that no two bikes share the same identification, thereby enhancing security and traceability.

RFID readers serve as the interface between the RFID tags and the security system. Strategically placed in key locations such as entry points to parking areas or checkpoints, RFID readers continuously scan for RFID tags within their vicinity. When a tagged bike comes into range of a reader, the reader detects the tag's presence and reads its unique identifier. This information is then relayed to a central control unit or a cloud-based system for processing and authentication.

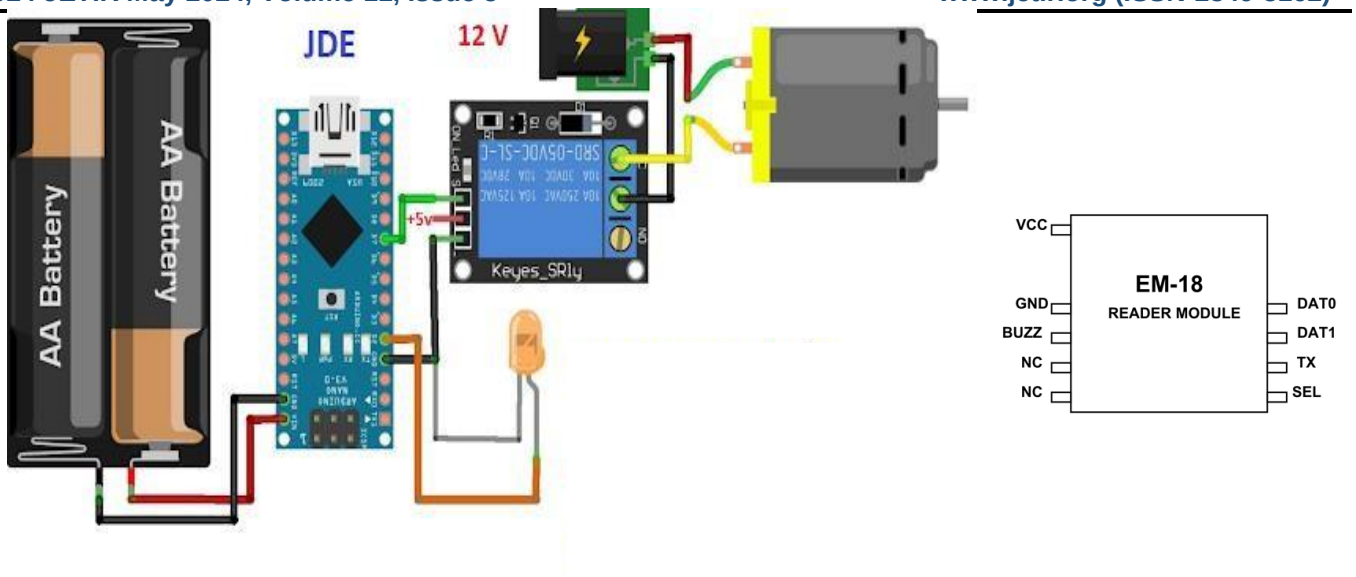
The security system is further fortified with the integration of alarms and alerts. In the event of unauthorized access or tampering with the bike, such as attempted theft or removal of the RFID tag, the system triggers an alarm to alert security personnel or the bike owner via SMS, email, or push notification. Additionally, real-time monitoring capabilities enable authorities to track the bike's location and movement, facilitating swift response and recovery in case of theft or loss.

Moreover, the advanced security system can be augmented with additional features such as geo fencing and remote immobilization. Geofencing allows the definition of virtual boundaries, and if the bike moves beyond these predefined boundaries without authorization, the system triggers an alarm. Remote immobilization empowers the owner or security personnel to remotely disable the bike's ignition system, thwarting theft attempts effectively.

Overall, the principle of the advanced security system for bikes utilizing RFID technology embodies a proactive approach to safeguarding assets. By combining RFID tags, readers, alarms, and other cutting-edge functionalities, the system establishes a formidable barrier against theft and unauthorized access, providing peace of mind to bike owners and enhancing overall security in urban environments.

IV. CIRCUIT OPERATION:

When an authorised person having the tag enters the RF field generated by the RFID reader, RF signal is generated by the RFID reader to transmit energy to the tag and retrieve data from the tag. Then the RFID reader communicates through RXD and TXD pins of the microcontroller for further processing.
Thus on identifying the authorised person, port pin P3.2 goes high, transistor T2 drives into saturation, and relay RL1 energizes to open the door for the person. Simultaneously, the LCD shows “access granted” message and port pin P1.7 drives piezobuzzer PZ1 via transistor T1 for aural indication.If the person is unauthorised, the LCD shows “access denied” and the door doesn’t open. LED2 and LED3show presence of the tag in the RFID reader’s electromagnetic field.To derive the power supply, the 230V, 50Hz AC mains is stepped down by transformer X1 to deliver a secondary output of 15V, 500 mA.
The transformer output is rectified by a full-wave rectifier comprising diodes D1 through D4, filtered by capacitor C1 and regulated by ICs 7812 (IC2) and 7805 (IC3). Capacitor C2 bypasses the ripples present in the regulated supply. LED1 acts as the power indicator and R2 limits the current through LED1.A single-side PCB for RFID-based security system is given below for download. Assemble the circuit on a PCB as it minimizes time and assembly errors. Carefully assemble the components and double-check for any overlooked error.



1. Arduino Nano: The Arduino Nano is an open-source breadboard-friendly microcontroller board based on the Microchip ATmega328P microcontroller (MCU) and developed by Arduino.cc and initially released in 2008. It offers the same connectivity and specs of the Arduino Uno board in a smaller form factor. The Arduino Nano is equipped with 30 male I/O headers, in a DIP-30-like configuration, which can be programmed using the Arduino Software integrated development environment (IDE), which is common to all Arduino boards and running both online and offline. The board can be powered through a type-B mini-USB cable or from a 9 V battery.

1-channel

2. Relay Module: The Single Channel Relay Module is a convenient board which can be used to control high voltage, high current load such as motor, solenoid valves, lamps and AC load. It is designed to interface with microcontroller such as Arduino, NodeMCU, etc. It also comes with a LED to indicate the status of relay.The relay is the device that opens or closes the contacts to switch ON/OFF other appliances operating at high voltages.

3. RFID EM-18: EM18 is a RFID reader module which is used to read RFID tags of frequency 125 kHz. After reading tags, it transmits unique ID serially to the PC or microcontroller using UART communication or Wiegand format on respective pins. Radio- frequency identification (RFID) is the wireless non-contact use of radio-frequency electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. The tags contain electronically stored information. This EM-18 RFID Reader is a Tiny, simple to use RFID reader module. With a built in antenna, the only holdup is the 2mm pin spacing.

4. RFID Card: RFID cards are used for applications where tracking or identifying personnel is important or where access control is required. Various RFID frequency bands are utilized in cards today, including 125 kHz low frequency proximity, 13.56 MHz high frequency smart card and 860-960 MHz ultra-high frequency (UHF). Proximity cards and smart cards are often referred to simply as "RFID cards." The type of RFID frequency band used depends on the application, factoring in security level, read range and data transfer speed requirements.

5. LCD Display: This is a very basic 5mm LED with a yellow lens. It has a typical forward voltage of 2.0V and a rated forward current of 20mA. A must have for power indication, pin status, opto-electronic sensors, and blinky displays.

6. DC Motor: A DC motor is an electrical motor that uses direct current (DC) to produce mechanical force. The most common types rely on magnetic forces produced by currents in the coils. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in part of the motor. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances.

7. Jumper Wires: Used to connect the components in order to run the device successfully

V. WORKING OF ADVANCED SECURITY SYSTEM FOR BIKE:

An advanced security system for bikes utilizing Radio-Frequency Identification (RFID) technology operates through a sophisticated integration of hardware and software components aimed at ensuring maximum protection against theft and unauthorized access. At its core, RFID technology employs electromagnetic fields to automatically identify and track tags attached to objects, in this case, bikes. The system begins with the installation of an RFID tag, typically a small, passive device containing a unique identifier, on the bike itself. This tag is securely affixed to a discreet location, ensuring it cannot be tampered with easily.

The RFID reader, the central component of the security system, is strategically placed in proximity to where the bike is parked or stored. This reader constantly emits radio waves, waiting for signals from RFID tags within its range. When the bike approaches, or someone attempts to interact with it, the RFID tag emits a signal in response to the reader's query. The reader captures this signal and decodes the unique identifier embedded in the tag.

The captured identifier is then processed by the system's software, which performs authentication and validation checks against a database of authorized bikes and users. This database contains information about registered bikes and their owners, including unique identifiers associated with each RFID tag. If the identifier matches an entry in the database, the system grants access to the bike, allowing the owner to use it without any hindrance.

However, if the identifier does not correspond to any authorized entry or if there's an attempt to tamper with the RFID tag, the system triggers an alarm, alerts the owner through various means such as SMS or push notifications, and potentially notifies law enforcement or security personnel. Additionally, some advanced security systems may incorporate GPS tracking capabilities, enabling real-time monitoring and location tracking of the bike, further enhancing its security features.

In summary, an advanced security system for bikes utilizing RFID technology provides robust protection against theft and unauthorized access by leveraging the unique identification capabilities of RFID tags, coupled with sophisticated authentication mechanisms and real-time monitoring functionalities. This integration of hardware and software components creates a comprehensive security solution tailored to safeguarding bikes in various environments and scenarios.Overall, an advanced security system for bikes using RFID offers robust protection against theft and unauthorized access while providing convenience and peace of mind to owners.

This security system employs an Arduino Nano board, RFID EM-18, 1-channel relay module, yellow led, breadboard and connecting wires, DC motor and 12V battery. The RFID Reader, card and relay module are controlled by Arduino. All the modules are programmed in such a way that the entire system achieves synchronization. The Arduino microcontroller is programmed in such a way that the RFID Reader and the sensor are made to work in the desirable way. An interlocking system is established between the Arduino and relay module using the RFID as inputs. The battery's positive terminal is controlled by the NO switch, relay, and MCB, while the negative terminal is directly connected to the ignition. The NO switch is located near the stand, and the bike only starts when the stand is removed, connecting the battery supply to the relay. Once the RFID card is recognized, the relay closes, allowing the ignition to receive the control signal. The Arduino controls and recognizes the RFID and sends Send a signal to the relay. The relay is linked to the vehicle's main ignition as well as to the MCB. The engine produces power output to the wheels based on the input provided by the accelerator. Firstly, the system will check either the system received the ID number from the RFID reader or not. If ID number received, system will compare it with the pre program ID number. If the number matched than the secure mode will be deactivated and user can use the motorcycle as usual. But if number does not match, the system will trigger an alarm.

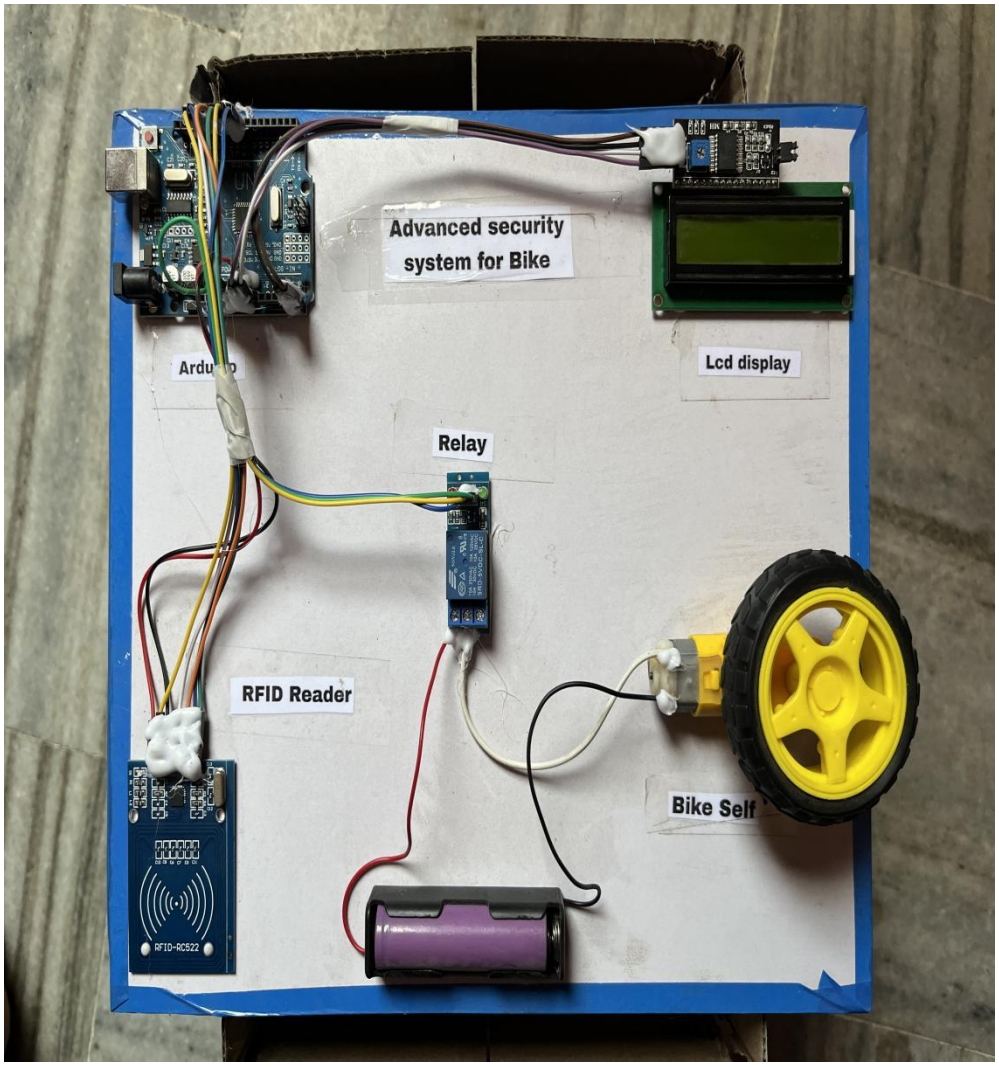
VI. APPLICATIONS

Advanced security systems for bikes have various applications that cater to the diverse needs of bike owners and stakeholders involved in bike security. Some of the key applications include:

1. Personal Bike Security: The primary application of advanced security systems is to protect individual bikes from theft. Bike owners can install GPS trackers, electronic locks, and alarm systems to deter theft and track their bikes in case of theft attempts.
2. Bike Sharing Programs: Advanced security systems play a crucial role in bike sharing programs by ensuring the security and traceability of shared bikes. GPS tracking enables operators to monitor bike locations in real-time, prevent theft, and optimize bike distribution and maintenance.
3. Bike Rental Services: Bike rental services can leverage advanced security systems to safeguard rental bikes and streamline rental operations. GPS tracking allows rental companies to track bike usage, manage fleets efficiently, and locate bikes for pickup or return.
4. Courier and Delivery **Services:** Delivery companies that utilize bikes for courier services can benefit from advanced security systems to protect their assets and ensure timely deliveries. GPS tracking enables dispatchers to monitor delivery bikes, optimize routes, and mitigate theft risks.
5. Bike Parking Facilities: Bike parking facilities in urban areas can integrate advanced security systems to enhance bike security and user experience. Electronic access control systems and surveillance cameras help prevent theft and vandalism in bike parking areas.
6. Smart Cities Initiatives: Advanced security systems contribute to smart cities initiatives by promoting sustainable transportation and enhancing public safety. By encouraging bike usage through improved security measures, cities can reduce traffic congestion, carbon emissions, and reliance on motor vehicles.
7. Law Enforcement and Recovery Efforts: Law enforcement agencies can utilize advanced security systems to combat bike theft and recover stolen bikes. GPS tracking enables authorities to locate stolen bikes, apprehend thieves, and reunite stolen bikes with their rightful owners.
8. Community Engagement Programs: Community organizations and advocacy groups can promote bike security awareness and support initiatives to combat bike theft. By providing resources and information on advanced security systems, these programs empower cyclists to protect their bikes and contribute to safer communities.

VII. RESULT

The implementation of advanced security systems for bikes employing RFID (Radio Frequency Identification) technology has yielded significant results in enhancing bike security and reducing theft incidents. With RFID, bikes are equipped with tags containing unique identifiers, which are detected by RFID readers installed at various checkpoints or entry points. This technology enables efficient tracking and monitoring of bikes, ensuring that only authorized individuals have access. Moreover, in case of unauthorized attempts to move or tamper with the bike, the RFID system triggers immediate alerts to owners or security personnel, facilitating prompt intervention. Consequently, the result is a considerable decrease in bike theft rates, as potential thieves are deterred by the robust security measures in place and the heightened risk of detection and apprehension. The peace of mind provided to bike owners, knowing that their vehicles are safeguarded by advanced security systems, is invaluable, fostering a sense of trust and confidence in the effectiveness of modern technology in combating crime.



VIII. CONCLUSIONS

The implementation of an advanced security system for bikes utilizing RFID technology offers significant benefits in enhancing the security and protection of bikes against theft. Through the integration of RFID tags and readers, along with additional features such as alarms and GPS tracking, this system provides a multi-layered approach to safeguarding bikes.

One of the primary advantages of this system is its effectiveness in preventing unauthorized access to bikes. By requiring RFID authentication for bike ignition, the system ensures that only authorized users can operate the bike, thereby reducing the risk of theft. Moreover, the use of RFID technology enables seamless and convenient access for authorized users, eliminating the need for traditional keys and simplifying the authentication process.

Furthermore, the inclusion of features such as alarms and GPS tracking enhances the security capabilities of the system. In the event of unauthorized access or tampering, the alarm system activates, alerting both the owner and nearby individuals to the attempted theft. Additionally, the GPS tracking functionality allows owners to locate their bikes in real-time, increasing the likelihood of recovery in the event of theft.

Overall, the advanced security system for bikes utilizing RFID technology represents a robust solution for addressing the growing concern of bike theft. By leveraging RFID technology, along with additional security features, this system offers a comprehensive approach to protecting bikes and provides peace of mind to owners regarding the safety of their valuable assets.

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