

Predictive Analytics for Motorcycle Theft Detection and Recovery

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Abstract:- Transportation is an integral component of our daily lives, and it is becoming increasingly common for people in the Philippines to rely on vehicles, such as motorcycles, as their primary mode of transportation. The prevalence of motorcycle theft has risen concurrently with the growing number of motorcycle users over the years. To address this issue, a system has been devised for the effective prevention and retrieval of stolen motorcycles in a timely and efficient manner. The user of this system is alerted through an alert notification when the motorcycle has been moved over a considerable distance or has been stolen. Additionally, the user can view the current location of the motorcycle, turn off the engine, and capture an image of the thief.

The system is composed of two parts: hardware and software modules. The hardware component includes a micro-controller, GSM, GPS, and a camera. The motorcycle serves as the primary controller of the entire system and is also responsible for its operation. According to the usability and functionality evaluation conducted, it was discovered that most users strongly agreed on the usefulness of the system.

Keywords:- Motorcycle, Theft Prevention, Image Capture, Hardware, Software, Micro-controller, GSM (Global System for Mobile Communications), Detection and Recovery.

I. INTRODUCTION

As the number of motorcycles on the road continues to increase, theft is becoming a threat. With this growing concern, it has become crucial for authorities and motorcycle owners to implement effective measures for the detection and recovery of stolen bikes. Predictive analytics is a powerful tool that can aid in achieving this goal by analyzing past data and predicting future patterns. By leveraging this technology, motorcycle theft detection and recovery can be significantly improved, ultimately leading to safer and more secure environments for riders. [1]

The latest car anti-theft system is a car alarm, a flashing light manner that makes use of different kinds of sensors that can be pressure, tilt, shock, and door sensors, but the shortcomings are cost, and it only averts the vehicles from theft but cannot be used to trace the thief. Customary

car-security systems rely on several sensors. When the first Car Alarm System was initiated, the system consisted mostly of electromechanical devices. As automation advances, they unfold into fully integrated microprocessor-positioned systems using diverse electronic sensors. In, the hardware and software of the GPS and GSM grid were advanced.[2]

A vehicle tracking system is an electronic device that is installed in a vehicle to enable the owner or a third party to track the vehicle's location. The design of this system has advanced significantly, utilizing GPS and GSM technology. This process is supported by an embedded system, which is used for tracking and positioning any vehicle using the Global Positioning System (GPS) and global system for mobile communication (GSM). The system continuously monitors the motion of the vehicle and provides real-time status updates upon request. [3]

Predictive analytics is a branch of data science that uses statistical techniques and machine learning algorithms to analyse historical data and make predictions about future events. such as location, time, type of motorcycle, etc., and creating models that can accurately predict when and where a theft is likely to occur.[4]

There are numerous potential benefits of using predictive analytics for motorcycle theft detection and recovery. By identifying high-risk areas and times, law enforcement agencies can effectively allocate resources for patrolling and surveillance. Motorcycle owners can also take proactive measures such as investing in additional security features or avoiding certain areas at times. This study delves into the application of predictive analytics in tackling motorcycle theft and its potential benefits in enhancing security measures. [5]

II. LITERATURE SURVEY

Kunnu Purwanto.et al.,2019 this research created an automatic motorcycle safety system called germ narcissistic. Origin's egocentric is the crucial invention in automatic vehicle security using a global positioning system (GPS), global system for mobile communication (GSM), and Radio frequency Identification (RFID). This system was created using a short communication service (SMS) to give vehicle information, similar as time, position, and alarm, to the

proprietor of the motorcycle. The arrangement of these technologies can be used as a practical and effective safety key for motorcycles [6].

Rushikesh Bokade.et al.,2022 Transport is an integral aspect of our daily lives. As time goes by, more and more individuals are relying on cars, particularly motorcycles with two wheels, as their primary means of transportation. Unfortunately, the number of motorcycle users and instances of motorcycle theft continue to rise each year. This paper examines and presents a variety of approaches to recover from potholes and speed breakers as a means of preventing theft [7].

Naruepon Panawong.et al.,2023 say that the controlling software for Arduino and other hardware components is created using C programming language. Additionally, the system architecture encompasses the operational framework. Furthermore, the design and construction of an electronic circuit board are connected to the sensors. Moreover, the motorcycle theft analysis process examines the data from the inclination sensor and the current location of the motorcycle. If motorcycle theft is detected, the proposed system sends a notification to the motorcycle owner via a messaging application. Finally, the communication of data between the hardware components and Firebase is established to determine the current location of the motorcycle [8].

Rometdo Muzawi.et al.,2022 this study showed that the system works by utilizing a cross pattern, a voltage sensor taken directly from the ignition of a motorcycle as a notification of the vehicle's life or death, and the Internet of Things capabilities. Moreover, this system has the benefit of being outfitted with a GPS Neo 6 sensor that tracks the motorcycle's location through longitude and latitude coordinates if the motorcycle is in motion [9].

Budi Artono.et al.,2020 say that GSM Module to send warning messages, and a GPS tracker to provide information in latitude and longitude coordinates to track the stolen motorcycle using Google Maps. GPS Tracker works by reading the coordinates of the location of the objected. The tests were carried out by moving and integrating the motorcycle system, and the results can be seen in the coordinate changes, monitored by Google Maps showing the movement of the motorcycle. The system was significantly closer to the planned one [10].

III. PROPOSED SYSTEM

The proposed system is designed to address the issue of online bike theft prevention through a three-module architecture. The Controller/Admin module serves as the central management hub, overseeing user and bike provider operations, as well as maintaining the stolen bike database and reporting functionalities. Bike providers utilize the dedicated module to list second-hand bikes for sale, with integrated checks against the stolen bike database to ensure legitimacy. Meanwhile, users benefit from a streamlined

interface for purchasing second-hand bikes and reporting stolen ones, receiving timely notifications about relevant listings. This system's unique focus on theft prevention and recovery sets it apart, emphasizing security measures and integration with law enforcement databases to safeguard transactions and aid in the retrieval of stolen bikes.

A. Architecture Diagram

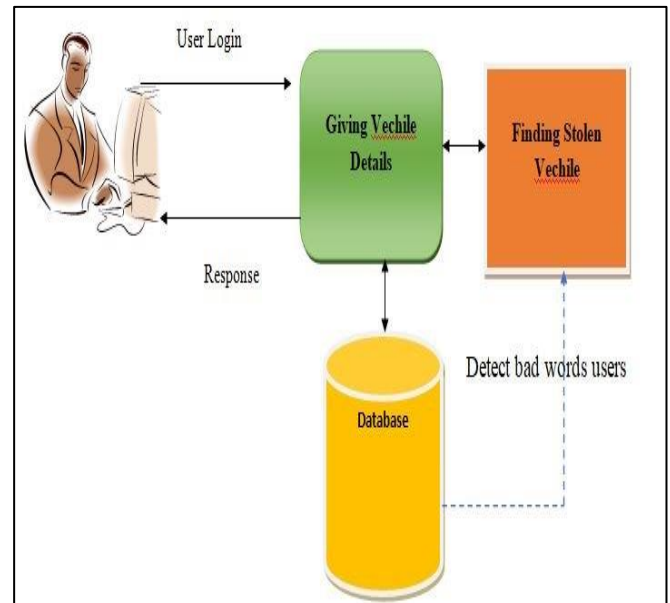


Fig 1: Architecture of Proposed System

B. Explanation:

The architecture diagram depicts a system where users can log in to access vehicle-related services. Upon successful login, users receive confirmation and can then request vehicle details or search for stolen vehicles. The system retrieves information from a database and presents it to users. Additionally, there's a component to detect and handle inappropriate user input. This architecture ensures secure access to vehicle information while promoting user safety and experience.

C. Module Description

System development deals with the operations that are carried out to get desired output from software product based on certain design specifications. This Application hold the following three main modules

- Controller
- Provider
- User

➤ Controller

The Controller module acts as the central hub for system management and user interactions, offering administrative tools and privileges upon secure login. Administrators can access user demographics and profiles through the "View User List" function and track vehicle history for maintenance purposes. User transaction patterns can be analyzed via the "View User Purchase History"

feature, while the "View Stolen Vehicle Status" aids in vehicle recovery efforts. The module also facilitates data visualization with the "View Graph" module and ensures secure session termination through the "Logout" feature, prioritizing data security and user privacy.

➤ *Provider*

The Provider module serves as the central hub for managing vehicle-related tasks efficiently. Providers start by securely logging into the system, gaining access to a range of tools and features. They can then delve into the vehicle history, reviewing past records and transactions. If there's a need to add a new vehicle to the system, providers can easily do so using the "Add Vehicle" function, ensuring that the database stays up to date. Additionally, the "View Vehicle" feature provides detailed information about specific vehicles, including specifications and ownership details. Providers can also use the "Check Request" function to handle user requests promptly and effectively. Lastly, the "Vehicle Status" feature provides real-time updates on the availability and condition of vehicles, allowing providers to make informed decisions. Overall, the Provider module streamlines vehicle management tasks, ensuring smooth operations within the system.

➤ *User*

The User module allows users to register securely and access system features after successful registration. Through functions like "View Vehicle" and "Vehicle Status," users can explore detailed vehicle information and receive real-time updates on vehicle status. In the event of a stolen vehicle, users can report it using the "Find Stolen Vehicle" function, contributing to community safety efforts. Additionally, users can share vehicle statuses with others and securely terminate sessions using the "Send/Share Status" and "Logout" features, respectively, prioritizing data security and privacy.

IV. RESULT AND DISCUSSION

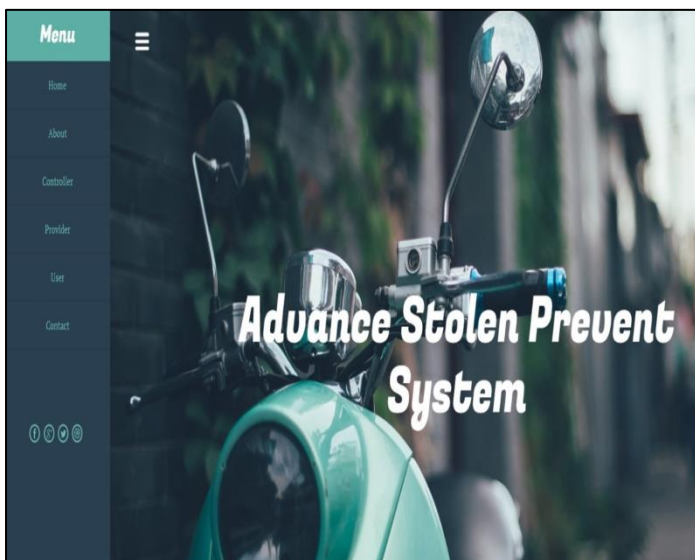


Fig 2: Home Page

In figure 2, demonstrates The Home Page design and layout effectively engage users, encouraging platform exploration and interaction. Continuous monitoring and optimization enhance usability and user retention.

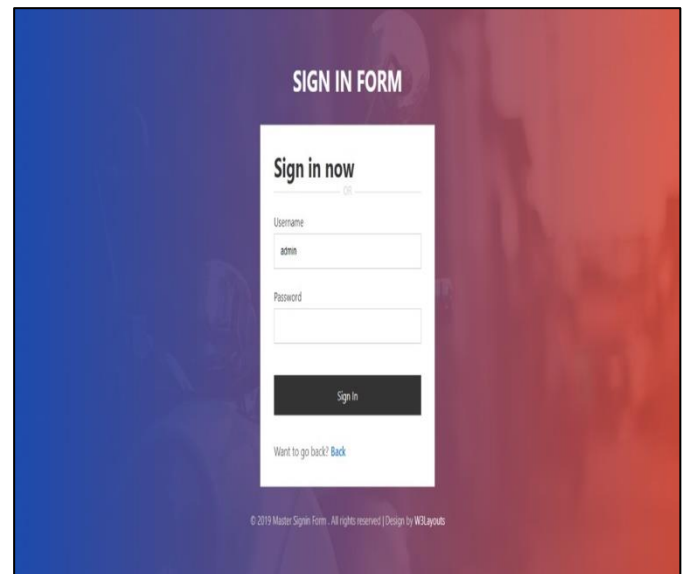


Fig 3: Controller Login Page

In figure 3, demonstrates The Controller Login Page features robust authentication and encryption mechanisms, ensuring secure access for administrators. The authentication process, granting authorized access to the controller system's functionalities.

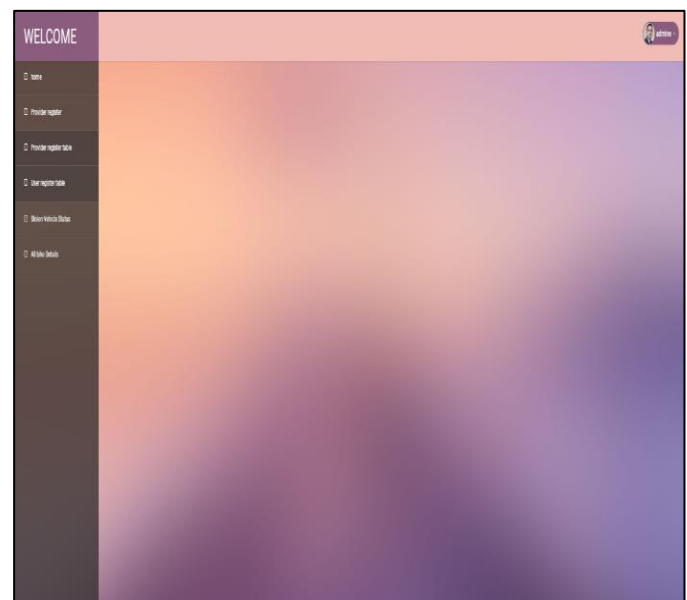


Fig 4: Controller Home Page

In figure 4, The Controller Home Page provides users with immediate access to pertinent information and functionalities enabling seamless registration processes for new providers.

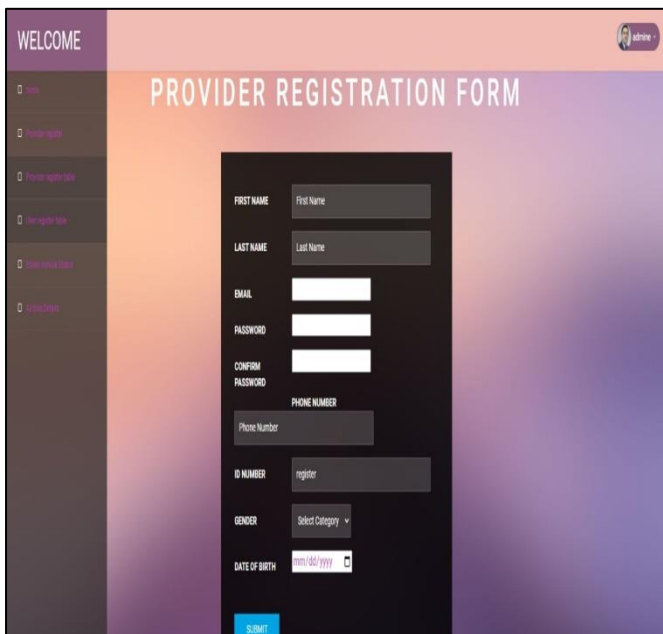


Fig 5: Provider Register Page

In figure 5, The Provider register page represented the users are required to input specific details, including their ID number, phone number, and other common information. Once these details are entered, users can submit the form to proceed with the registration process.

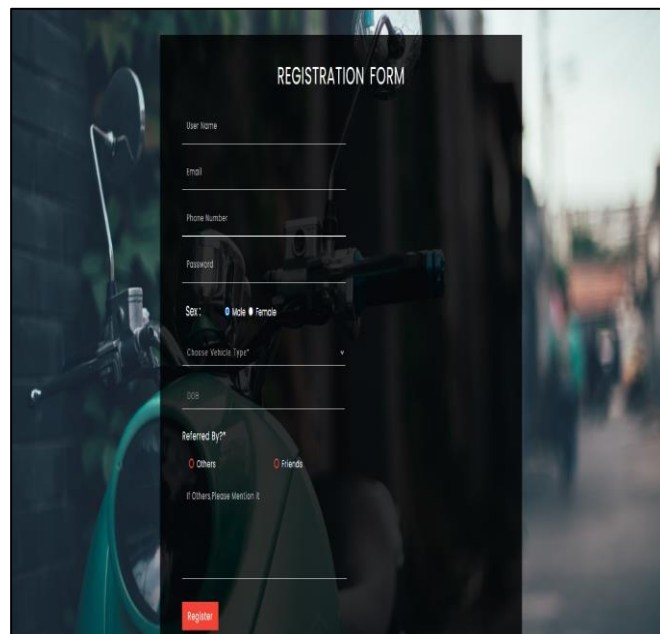


Fig 7: User Register Form

In figure 7 Upon registration, users can access vehicle details and status updates. To utilize these features, users enter registration details in the provided form.

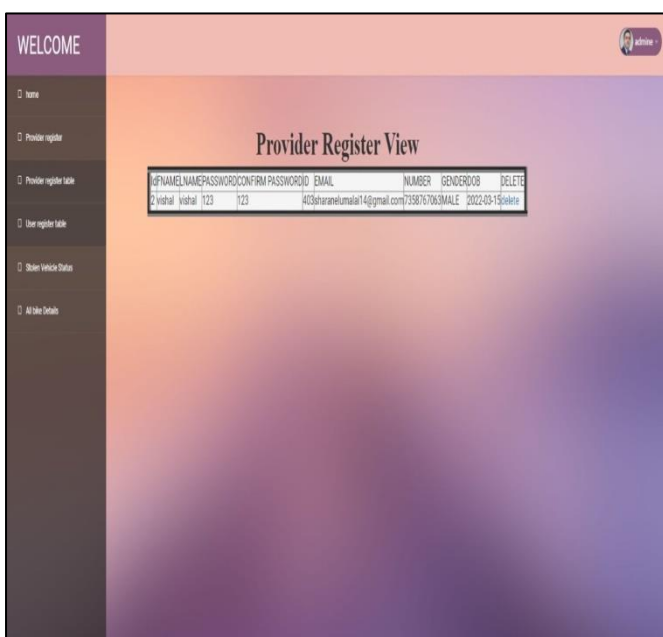


Fig 6: View Provider Details

In figure 6, demonstrate the after entering the details in the provider registration form and submitting it, the system displays a confirmation page. View Vehicle History: Review past activities and records related to vehicles within the system.

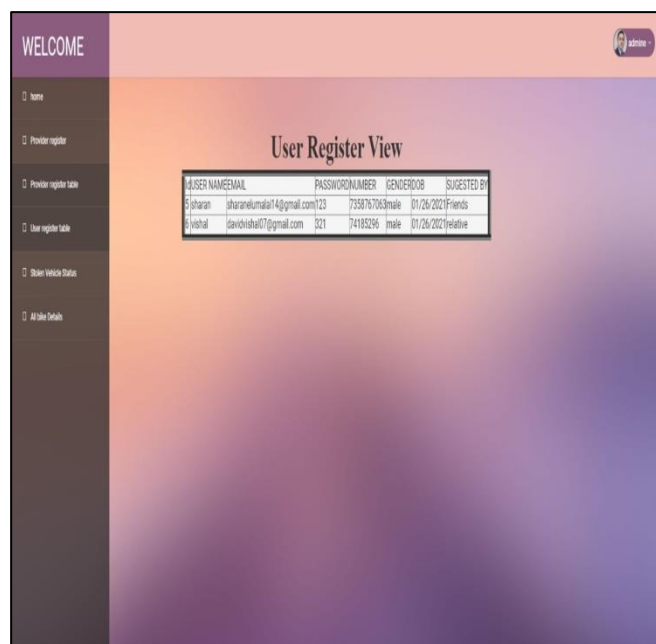


Fig 8: User Register View

In figure 8, Upon completing the user registration form, users can access both user and provider registration details. Users can view vehicle details and status, search for stolen vehicles, and share updates seamlessly before logging out.

Number	Vehicle model name	Address	Vehicle number plate	Vehicle engine number	Vehicle used km	Vehicle purchased date	DataRC Book
4321	115	1/29 North Street	4321	123	15000	2022-03-22	yes
789	pulsar	1/29 North Street	789	582	12	2022-03-15	yes
789	pulsar	1/29 North Street	789	582	12	2022-03-15	yes
852	heart	1/29 North Street	852	258	582	2022-03-08	no
852	pulsar	1/29 North Street	852	60040258	999	2022-03-23	no
852	pulsar	1/29 North Street	852	60040258	999	2022-03-23	no
600040	115	1/29 North Street	chennai	600040	female	2022-03-08	yes
REC BOOK BANK	dhujangan Street, Sattaperi	Chennai	614203	female	2022-03-16	yes	yes
600040	kidney	1/29 North Street	chennai	600040	male	2022-03-24	no
600040	115	1/29 North Street	chennai	600040	male	2022-03-25	yes
600040	pulsar	1/29 North Street	chennai	600040	female	2022-03-23	yes
600040	pulsar	1/29 North Street	chennai	600040	female	2022	03
4321	115	1/29 North Street	4321	123	142	2022	03
852	km	1/29 North Street	852	456	999	2022	03
600040	pulsar	1/29 North Street	chennai	600040	12	2022	03
600040	115	1/29 North Street	chennai	600040	999	2022	03
600040	kidney	1/29 North Street	chennai	600040	582	2022	03
741	bmw	1/29 North Street	741	147	745219	2022	03

Fig 9: All Vehicle Details

In figure 9, After users input their details, detecting and analyzing motorcycles by providing detailed information about comprehensive information regarding stolen vehicles and all vehicle details is displayed.

V. CONCLUSION

The completion of this project demonstrates that it has effectively resolved the issues present in the existing system and incorporated advanced features that satisfy current requirements and situations. However, our work also presents several additional challenges. For instance, in the realm of Web databases, a significant challenge is the development and maintenance of an appropriate workload that satisfies similarity-based ranking properties. Another intriguing challenge is determining techniques for inferring ranking functions over Web databases. Additionally, it would be fascinating to combine the concept of user similarity proposed in our work with existing user profiles to see if ranking quality can be improved even further.

The user will receive an SMS in case of unauthorized access or the location of their vehicle. These data are sent to a server, which then sends the information to the user-friendly android application. The application displays all the details, including the location of the vehicle.

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