ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/24nov116

Accident Prevention with Real-Time System for Two-Wheeler

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Publication Date: 2025/03/24

Abstract: Speed is a primary factor in road accidents, leading to a considerable number of fatalities. Many lives could be preserved if emergency services were alerted quickly about accidents and could arrive at the scene without delay. This project tackles this problem by suggesting an automated system for detecting accidents and sending alerts. The system is intended to identify accidents through sensors, pinpoint the exact location of the incident using GPS, and immediately inform the nearest emergency services.

Specifically, the system utilizes an accelerometer to recognize unusual vehicle movements, such as tilting, upon detecting an accident, the system transmits real-time notifications that include the vehicle's precise coordinates to emergency contacts, ensuring rapid assistance. This prompt response is vital, particularly in countries like India, where the rate of fatalities from road accidents is alarmingly high. By automating the detection and notification process, this system seeks to significantly decrease the time required for medical help to reach accident victims, potentially saving numerous lives.

How to Cite: Anand Labade; Anushka Chavhan; Shreyash Bhandarwar; Prashant Vallapure. (2025). Accident Prevention with Real-Time System for Two-Wheeler. *International Journal of Innovative Science and Research Technology*, 9(11), 3736-3740. https://doi.org/10.38124/ijisrt/24nov116.

I. INTRODUCTION

Road accidents account for a major number of injuries and fatalities around the world, especially affecting riders of two-wheeled vehicles, who are particularly at risk on the roads. Although there have been advancements in safety measures, deaths continue to happen, often because of slow medical responses after accidents. In emergencies, medical assistance can make a crucial difference between survival and death. initiative, titled "Accident Prevention with Real-Time Alert System for Two-Wheeler," aims to bridge this gap by utilizing mobile technology to improve response times and enhance the chances of survival in the event of a motorcycle accident.

The system combines an accelerometer and GPS, which are both widely found in smartphones, to detect crashes in real-time. Upon detecting an accident, the system quickly sends a notification, providing the precise location of the incident, to preselected emergency contacts and rescue services. This swift communication is designed to significantly cut down the delays in providing aid to victims of accidents. Additionally, a feature allowing for the cancellation of false alerts enables users to dismiss notifications if they are unharmed.

By prioritizing the rapid identification of accidents and the immediate alerting of emergency services, this project aims to lower fatalities and enhance outcomes following crashes for two-wheeler riders. Utilizing technology that is already present in most smartphones, the system presents an inexpensive, easy-to-access, and efficient solution to a significant challenge faced by riders globally.

II. OBJECTIVE OF LITERATURE SURVEY

The main goal of this project is to reduce the number of fatalities resulting from delays in medical care after motorcycle accidents. When an accident occurs, the system will automatically utilize the accelerometer and GPS features in most smartphones to identify the crash and instantly send out a notification.

This alert, which contains the precise location of the incident, will be directed to emergency services of the rider's chosen contacts, such as friends and family. This approach aims to ensure that victims receive prompt medical aid, which could be crucial in avoiding deaths.

At the heart of this initiative is the application of a multi-axis accelerometer to detect motorcycle crashes or falls accurately. Once a collision is identified, the system activates an automatic notification, conveying the rider's location and event time. To mitigate unnecessary distress, the system will feature a false alert option. This will enable the

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rider to manually cancel the alert if they are unharmed or if the crash detection was incorrect.

Furthermore, the system is set up to alert emergency contacts and services promptly. These notifications are intended to facilitate a swift and efficient response, lowering the duration it takes for emergency personnel to arrive at the accident scene. In essence, this project aims to enhance response times and improve the outcomes for road accident victims by providing immediate and precise information to those capable of delivering assistance.

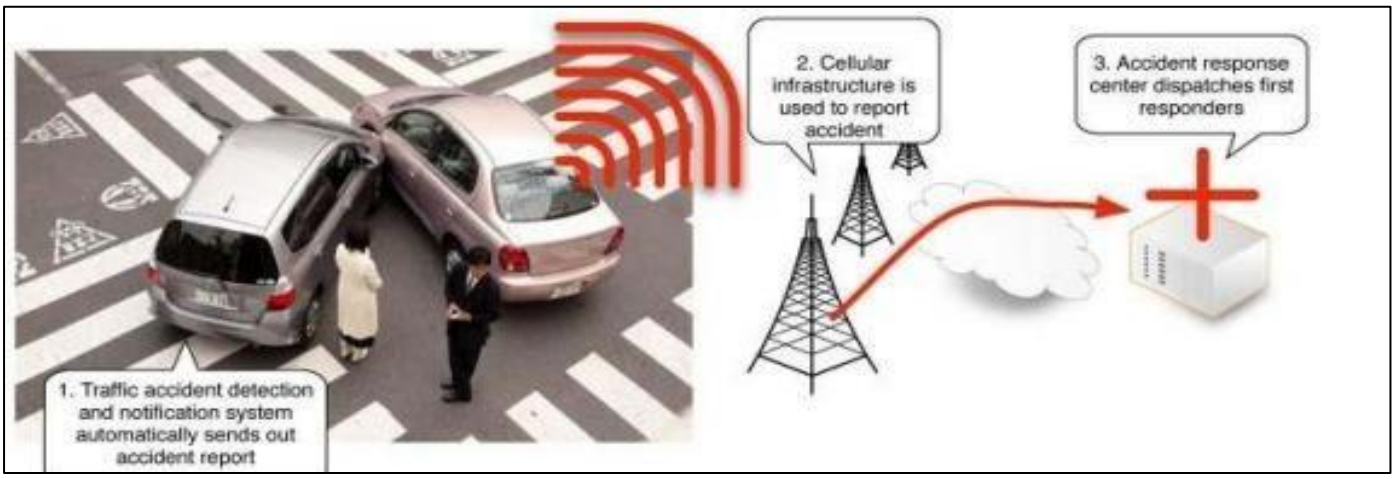

Fig 1: Design Thinking Process

III. LITERATURE REVIEW

With the increasing use of two-wheeled vehicles, there has been a simultaneous rise in road accidents involving them Research shows that these vehicles are especially at risk due to their limited structural protections, lower stability, and higher susceptibility to external conditions. In many nations, particularly those with high urban density, two-wheelers represent a substantial part of the vehicle population and, consequently, many road accident injuries.[1] This situation amplifies the necessity for effective accident prevention strategies targeted at twowheelers, as current measures have mainly concentrated on vehicles equipped with more protective features. This heightened vulnerability underscores the urgent need for innovative, realtime alert systems specifically designed for twowheeler riders, since conventional approaches do not adequately address the obstacles that these vehicles encounter on the road.[1]

Research indicates that the main causes of two-wheeler accidents stem from human mistakes, adverse environmental elements, and infrastructural deficiencies. Key human errors contributing to these incidents include speeding, distracted driving, and a lack of awareness regarding traffic regulations. Adverse weather conditions—like rain and fog— reduce visibility and stability, increasing the chances of accidents. Furthermore, inadequate road infrastructure, such as potholes, poor lighting, and insufficient lane markings, disproportionately impacts two-wheelers due to their smaller size and lighter weight. These insights reveal the necessity for comprehensive solutions that tackle both human and environmental factors, mainly through advanced technologies capable of adapting to varying driving conditions and proactively assisting riders in avoiding dangers.[2]

Current safety measures for two-wheelers tend to focus on reactive responses rather than preventive measures. For instance, the implementation of antilock braking systems (ABS) in two-wheelers has effectively decreased braking distances and helped prevent skidding, especially on slick surfaces. While ABS has contributed to lowering accident rates in specific situations, it does not address a wider array of accident causes, such as collisions with other vehicles or unforeseen obstacles. Helmet sensors that detect collisions and alert emergency contacts represent another commonly employed solution. However, these sensors primarily focus on postaccident responses rather than averting accidents from occurring in the first place. Therefore, while these systems enhance safety to some extent, they do not suffice on their own to significantly lower accident rates among two-wheeler users.[3]

Real-time alert systems, frequently found in fourwheeled vehicles, hold great potential for preventing accidents. These systems utilize technologies like vehicle-to-vehicle (V2V) and vehicle-toinfrastructure (V2I) communication, relying on real-time data from sensors and cameras to track traffic conditions and identify potential collision threats. By issuing early warnings, these systems have been shown to enhance driver reaction times, helping them avert accidents. However, the application of these technologies to two-wheelers has been limited. Unlike cars, two-wheelers require compact, lightweight, and weather-resistant equipment capable of withstanding diverse road conditions. Additionally, two-wheelers possess distinct spatial dynamics and necessitate customized algorithms to accommodate their unique movement patterns and agility. These characteristics pose challenges in adapting existing fourwheeler technologies directly to twowheelers without considerable adjustments.[4]

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Recent technological advancements have facilitated the creation of real-time alert systems designed specifically for twowheelers. Proximity sensors, GPS tracking, and machine learning algorithms are being investigated as potential elements of a comprehensive safety solution. Proximity sensors can identify nearby objects and provide instant feedback to the rider, while GPS tracking allows for ongoing monitoring of location and speed. Machine learning algorithms can improve these systems by analyzing behavior patterns of riders and traffic conditions to predict and prevent possible accidents. For example, if the system senses the rider is approaching an intersection at a high speed, it could issue a warning based on the likelihood of encountering cross-traffic. Despite the ongoing promise of these technologies, their practical and cost-effective implementation poses challenges, particularly in developing nations where most two-wheeler riders live and where high-end safety technology resources are often limited.[5]

Despite significant progress in safety technology for accident prevention, there remain considerable gaps in creating affordable, effective solutions specifically for two-wheelers. Many existing systems are either not tailored to the unique spatial and mechanical requirements of these vehicles or are prohibitively expensive for widespread adoption. Additionally, there has been insufficient research on combining machine learning with sensor data to formulate predictive models specifically for two-wheeler riders. Such models could facilitate more accurate, context-specific warnings that account for factors like traffic density, rider speed, and road conditions. This deficiency in specialized research and development represents an opportunity to delve into real-time alert systems that accommodate the distinct needs of two-wheelers, ultimately enhancing road safety for this vulnerable segment of road users.[6]

In light of these gaps, current research advocates for the development of a real-time alert system specifically designed for two-wheelers. Utilizing a combination of sensor data, GPS, and machine learning algorithms, this system aims to forecast and prevent accidents prior to their occurrence. This solution could not only deliver immediate warnings about potential hazards but also aid in developing a deeper understanding of risk factors for twowheelers, paving the way for more data-informed approaches to road safety. This project is anticipated to bridge the divide between existing technologies and the practical safety necessities of two-wheelers, providing a feasible, scalable solution for preventing accidents.[7]

IV. PROPOSED SYSTEM

The proposed framework for "Accident Prevention with Real-Time alert system for two wheelers" intends to upset the wellbeing of bike riders by coordinating state of the art innovation to screen their current circumstance and give opportune cautions about likely perils. At the core of this framework lies a complex mix of sensors and GPS innovation that works consistently together to make a complete consciousness of the encompassing traffic scene. The sensors are intended to identify close by vehicles, walkers, and different obstructions, while the GPS module ceaselessly surveys the rider's area and speed, permitting the framework to adjust to changing traffic conditions continuously. At the point when a potential danger is recognized — like a coming vehicle or an unexpected hindrance — the framework rapidly processes this data and issues prompt cautions to the rider through an instinctive portable application or a cap mounted show. These cautions fluctuate in direness in light of the idea of the danger; for example, in the event that a vehicle is drawing closer at rapid from behind, the framework will give a basic admonition that prompts the rider to make a quick move, like switching to another lane or changing pace. This opportune data is critical in forestalling mishaps, as it engages riders to go with informed choices and respond to perils before they grow into risky circumstances. Additionally, the framework uses progressed AI calculations to break down the information gathered after some time, upgrading its ready instruments through constant improvement. By gaining from individual rider conduct and different traffic situations, the framework can fit its cautions to fit the remarkable riding style of every client, accordingly expanding the viability of the warnings. Moreover, the total information assembled by the framework can be significant for more extensive examination on accident patterns and examples, adding to a more prominent comprehension of the variables that lead to bike mishaps. This understanding can illuminate future wellbeing guidelines and drives pointed toward further developing street security for all clients. At last, the proposed constant ready framework looks for not exclusively to establish a more secure riding climate for bike clients yet in addition to cultivate a culture of wellbeing and mindfulness among riders. By utilizing innovation to give ideal admonitions and improve situational mindfulness, the framework tries to lessen the occurrence of mishaps, making streets more secure for everybody.

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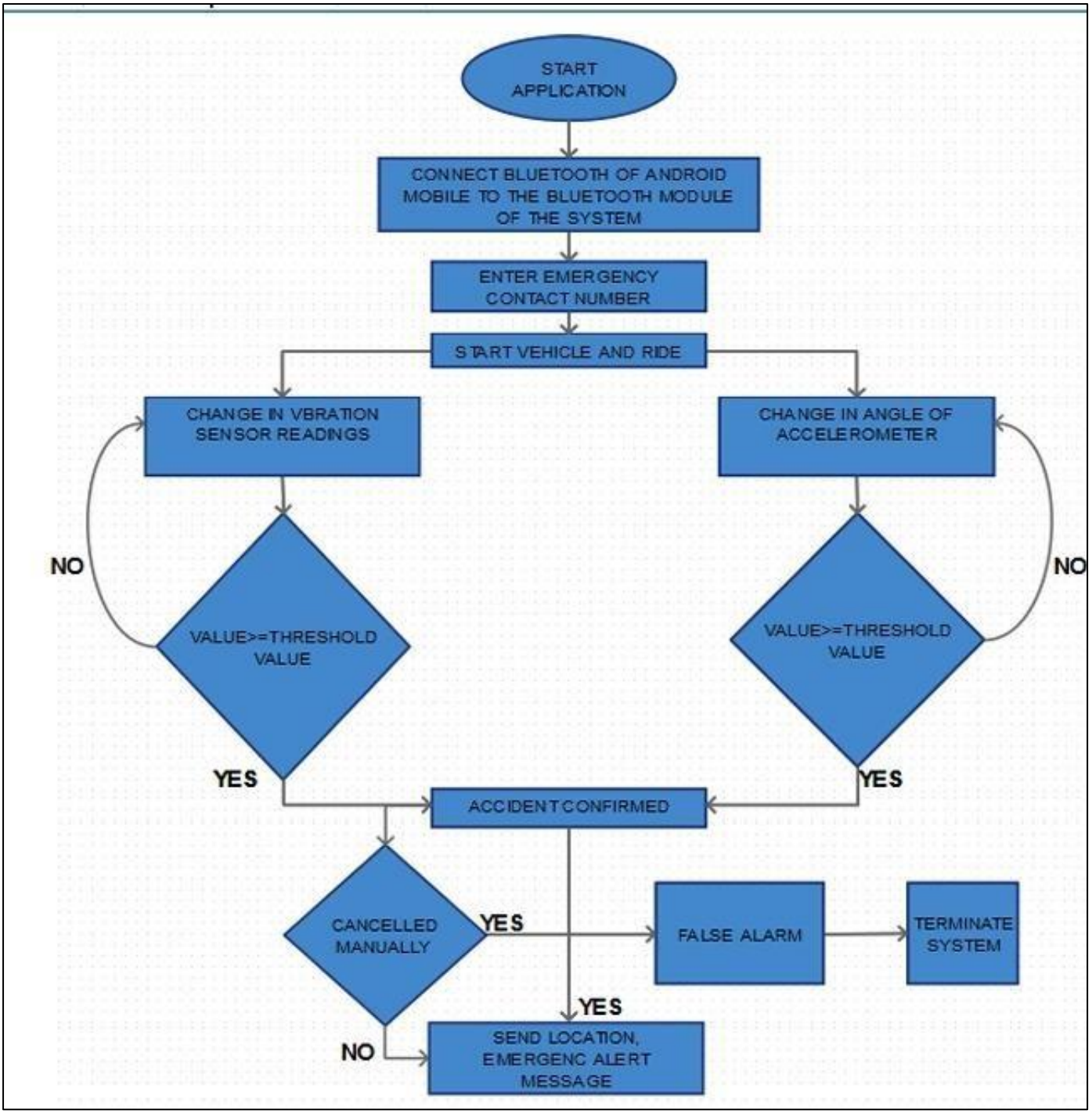

Fig 2: Flow Diagram

V. CONCLUSION

All in all, the " Accident Prevention with Real-Time alert system for two wheelers " addresses a huge headway in the work to improve the security of bike riders on the streets. By bridling the force of current innovation, including sensors and GPS, this proposed framework can convey convenient and important cautions that assist riders with exploring potential risks actually. The incorporation of AI permits the framework to develop, adjusting its reactions in light of true information and individual rider conduct, consequently guaranteeing a customized security experience. This proactive methodology engages riders to settle on informed choices as well as adds to a more extensive comprehension of mishap patterns, working with upgrades in street security guidelines and practices. As bike utilization keeps on developing around the world, carrying out such imaginative security arrangements is principal in alleviating the dangers related with riding. At last, the outcome of this framework could prompt a significant decrease in mishaps and fatalities, cultivating a culture of security that focuses on the prosperity of all street clients. By focusing on the turn of events and sending of constant ready frameworks, we can prepare for more secure, more capable riding encounters that benefit people and society overall.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/24nov116

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