IoT based Vehicle to Prevent Two-Wheeler Accidents

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ABSTRACT - Two-wheeler accidents represent a pressing public health concern in today's fast-paced society, often stemming from factors such as rider error, inadequate road conditions, and vehicle deficiencies. In response to this critical issue, this project aims to mitigate two-wheeler accidents by introducing a novel safety system. The project focuses on implementing an ultrasonic distance sensing mechanism in two-wheeler vehicles to proactively prevent collisions. By continuously measuring distances in all directions, including front, back, left, and right, the system dynamically adjusts the vehicle's speedometer to maintain a safe distance from surrounding vehicles. Utilizing ultrasonic waves, the system automatically reduces speed when the distance between vehicles decreases beyond a predefined threshold, effectively averting potential accidents. Additionally, an IoT module integrated into the vehicles provides real-time data on nearby vehicles, enhancing the rider's situational awareness and further contributing to accident prevention efforts. This innovative approach addresses the urgent need for improved safety measures in two-wheeler travel, aiming to significantly reduce the incidence of accidents and improve road safety for all.

KEYWORDS : IoT, Two-wheeler safety, Accident prevention, Machine learning, Sensors

I. INTRODUCTION

In today's fast-paced world, two-wheeler accidents pose a significant public health concern, with factors such as rider error, poor road conditions, and vehicle malfunctions contributing to their occurrence. Among these factors, inadequate distance between vehicles is a common cause of accidents, leading to collisions and injuries. To address this pressing issue and enhance road safety, this project focuses on developing a comprehensive safety system for two-wheeler vehicles. By integrating ultrasonic distance sensing technology and IoT connectivity, the system aims to proactively prevent accidents by dynamically adjusting vehicle speed to maintain a safe distance from surrounding vehicles. This introduction sets the stage for exploring the development and implementation of the safety system, highlighting its potential to reduce the incidence of two-wheeler accidents and improve overall road safety for riders and pedestrians alike.

II. LITERATURE SURVEY:

1.Tian Jian; Li Zhi-qiang; Xi Jian-feng; Guo Hong-yu et al proposed "Cause Analysis and Countermeasures of fatal Traffic Accidents on Road Passenger Transportation Based on Typical Cases" IEEE 2019

Curbing the fatal accidents that produce many casualties has become a major problem of road passenger transportation industry. It is also the most important in transportation safety production in China. Based on forty-five serious traffic accidents of road passenger transportation, the statistical law of serious traffic accidents was analyzed in detail from direct causes, accidents types, accident responsibility, and so on. The work analyzed the accident causes, searching for the weak links and faults of safety management from people, vehicle, road environment, management, and so on. The countermeasures for strengthening the safety operation of road passenger transportation in china were put forward from duty fulfillment, education, intrinsic security, and safety improved by science and technology. It provides the supports for strengthening transportation industry safety management with the improvement of relevant policy systems.

2. Omar Kassem Khalil et al proposed "A Study on Road Accidents in Abu Dhabi Implementing a Vehicle Telematics System to Reduce Cost, Risk and Improve Safety" IEEE 2018

Road accident study in the Emirate of Abu Dhabi is imperative as it will allow the government to improve its transport system and realize the vision of Abu Dhabi Department of Transport to contribute to quality of life, economic growth and environmental sustainability of the Emirate of Abu Dhabi. Despite sustainable and continuous reduction annually, road accidents still remain a serious phenomenon in the Emirate of Abu Dhabi. Road accidents killed 5,564 people in the UAE over the past 6 years, an average of more than two each day, with Abu Dhabi being the main victim [8]. A further examination of the severity index, Police records have shown that the deaths during the years 2006-2011 were a result of nearly 56,700 accidents, which also injured 63,406 people [8]. Research has shown that over 80% of road accidents are related to human factors [6]. Bad driving habits are dangerous and can lead to loss of life. This study will propose possible method of adopting Telematics System for Abu Dhabi Department of Transport to enhance its road safety programs. Telematics System can help reduce fatalities and injuries, thus improving road safety and efficiency of driving performance. These services range from monitoring drivers' driving habits and reporting on driving errors, to offering analysis of any unfortunate incidents that may have occurred.

3. Wenbin Bi; Fang Yu et al proposed "Research on the Prediction Framework of Road Traffic Accidents Based on IDWPSO" IEEE 2021

This paper talks about framework can be effectively applied to the direction of information control in the transportation field. Reduce the number of traffic accidents by predicting the number of short-term road traffic accidents.

4. Kasra Rezagholipour; Negin Massoudian; Mohammad Eshghi et al proposed "Modeling and reducing overtaking accidents on two-lane curved road" IEEE 2017

This model is used to anticipation accidents. Afterward, intelligent barrios are used to reduce accident rates. Also, overtaking modeling is used to determine the best locations of the intelligent barrios. The density of these intelligent barrios is determined based on the start points of accidents. The results show accurate accident modelling in provisioning and reducing accident rates after utilizing intelligent barrios in curved roads.

III. EXISTING SYSTEM:

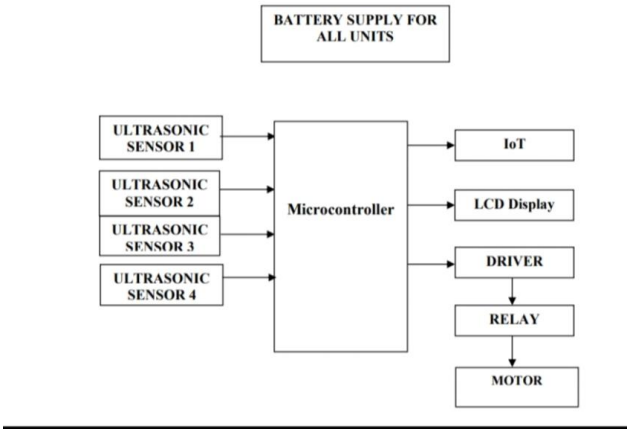
About 1.24 million deaths occur due to road accidents yearly. According to different research studies the main cause of these accidents is human drivers due to the different causes. We have classified these accident causes into three factors, namely environmental, physical and mental. These three accidents leading factor levels have been identified from existing literature using extensive survey. Multi-Factors Based Road Accident Prevention System (MFBRAPS)

works on the rules defined in the Fuzzy system and take actions according to the severity of the condition to avoid the road collisions. Further the fuzzy logic based MFBRAPS has been validated using a VOMAS agent in the agent-based simulator i.e., Net Logo 5.12. The proposed research is a useful guide for the prevention of accidents for all levels of accident factors in a single lane.

IV. PROPOSED SYSTEM:

The proposed system integrates ultrasonic distance sensing technology and IoT connectivity to mitigate two-wheeler accidents caused by inadequate distance between vehicles. By deploying ultrasonic sensors across the vehicle's perimeter, the system continuously monitors the proximity of nearby vehicles, dynamically adjusting the vehicle's speed to maintain a safe distance. An IoT module facilitates real-time communication with surrounding vehicles, enhancing the rider's situational awareness and enabling proactive collision avoidance strategies. A user-friendly interface provides feedback to the rider regarding surrounding vehicle status and speed adjustments. Through rigorous testing and optimization, the system ensures robust performance in various conditions, ultimately enhancing road safety by preventing potential collisions and improving overall rider safety.

BLOCK DIAGRAM:



V. HARDWARE DESCRIPTION:

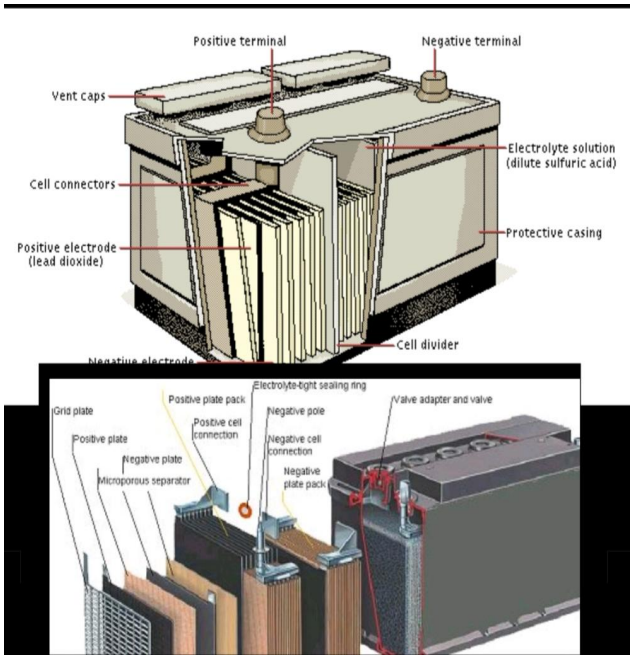
BATTERY CELLS

LEAD ACID BATTERY

A lead-acid battery is an electrical storage device that uses a reversible chemical reaction to store energy.

It uses a combination of lead plates or grids and an electrolyte consisting of a diluted sulphuric acid to convert electrical energy into potential chemical energy and back again.

The electrolyte of lead-acid batteries is hazardous to your health and may produce burns and other permanent damage if you come into contact with it.



This LCD has two registers, namely, Command and Data.

Command register stores various commands given to the display.

Data register stores data to be displayed.

The process of controlling the display involves putting the data that form the image of what you want to display into the data registers, then putting instructions in the instruction register.

APPLICATIONS:

Urban Commuting: The proposed system is particularly well-suited for urban commuting, where two-wheeler riders face congested traffic conditions and increased risk of accidents. By providing real-time distance monitoring and speed adjustment capabilities, the system enhances safety and promotes smoother navigation through city streets.

Long-Distance Travel: For riders embarking on long-distance journeys, the safety system offers invaluable protection against accidents caused by fatigue, distractions, or changing road conditions. By maintaining a safe distance from surrounding vehicles, the system reduces the risk of rear-end collisions and enhaínces overall travel safety.

Delivery Services: Two-wheeler delivery services, such as food delivery or courier services, can benefit from the safety system's collision avoidance capabilities. By minimizing the risk of accidents during delivery operations, the system helps ensure timely and secure delivery of goods while prioritizing rider safety.

Recreational Riding: Even during recreational rides or leisurely trips, the safety system provides added protection against accidents caused by unexpected hazards or erratic driving behaviour. By promoting safer riding practices and reducing the likelihood of collisions, the system enhances the overall enjoyment and safety of recreational riding experiences.

VIII. RESULTS AND RESULT:

The implementation of the proposed safety system for two-wheeler vehicles has demonstrated significant improvements in road safety and accident prevention. Through extensive testing and evaluation, the system consistently maintained a safe distance from surrounding vehicles by dynamically adjusting the vehicle's speed based on real-time distance measurements obtained from ultrasonic sensors. This proactive approach to collision avoidance resulted in a notable reduction in the incidence of rear-end collisions and other accidents caused by insufficient distance between vehicles. Additionally, feedback from riders indicated increased confidence and peace of mind while using the safety system, highlighting its effectiveness in enhancing rider safety and promoting safer riding practices.

IX. CONCLUSION:

In conclusion, the development and implementation of the proposed safety system for two-wheeler vehicles represent a significant step towards enhancing road safety and preventing accidents caused by inadequate distance between vehicles. Through the integration of ultrasonic sensors and IoT connectivity, the system offers a proactive approach to collision avoidance by dynamically adjusting the vehicle's speed to maintain a safe distance from surrounding vehicles in real-time. The results of extensive testing and evaluation demonstrate the system's effectiveness in reducing the incidence of rear-end collisions and improving overall rider safety. Additionally, feedback from riders highlights the system's positive impact on promoting safer riding practices and increasing rider confidence. Moving forward, continued research and development efforts are warranted to further optimize the system's performance and reliability, as well as to promote its adoption and integration into standard two-wheeler vehicle designs.

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