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IOT Based Road Safety System

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ABSTRACT:According to statistics, for every four minutes a person dies in a traffic accident and thousands of accidents occur each year. These accidents could be prevented if drivers and passengers wore seat belts and alcohol was not used while driving. Accidents that occur on the road today are caused by over speeding, drunk driving and drowsy driving. It is estimated that for every 4 minutes a person dies on the road and thousands of accidents occur every year. However, lives can be Nowadays, many accidents occur because of over speeding, drowsy driving, and driven under the influence. According to statistics, for every four minutes, a person dies from a road accident and also thousands of accident are recorded every year. But Most automobile accidents these days are due to dangerous driving habits, such as excessive speed and drunk driving. Continuous object detection and location tracing system is implemented using sensors and mobile application to deal with these problems efficiently.

KEYWORDS: Accident; Driver; GPS; Ultrasonic sensor; Cloud;

I. INTRODUCTION

According to the data, India experiences 4,80,652 accidents annually that result in 1,50,785 fatalities, 1,817 accidents every month that result in 413 fatalities, and 55 accidents per day that result in 17 fatalities. To protect other road users, such as drivers and pedestrians, automated and assisted collision avoidance is required. Since pedestrians are more frequently involved in fatal incidents, extra care should be taken to ensure their safety [20]. Advanced sensors [20,15] utilised on such vehicles include cameras, LASERS scanners, Photonic Mixer Device (PMD) or Infrared (IR), and RADARs [20,16]. Obstacles and vehicle-to-pedestrian (V2P) collisions can be avoided utilising these sensors. As the only form of communication in this system, smartphones with cellular technology are used. A Cloud-based system is the result of this strategy [17]. Data collected from drivers and pedestrians via mobile applications is stored in the cloud [3]. The precise location of the motorist and pedestrian is displayed on the map via GPS [8,15]. Name of the user and location are among the details. Obstacles are found using an ultrasonic sensor. A beep sound warns the driver if an obstruction is detected. The MQ-3 sensor is used to detect alcohol. When an obstruction is found, the automobile slows down. The car is stopped if alcohol is detected. GSM can transmit the information to surrounding emergency services in the event of an accident. To reduce the amount of time needed, this system must be implemented.

Road users are detected through wireless communication, even when they are blocked by actual objects. For instance, it is feasible to foresee a potential accident and warn both the motorist and the pedestrian if a pedestrian is approaching the road in a rural area at night or from behind parked cars. Additionally, since a pedestrian is anyone who is carrying a communication device with a designated app, it will be unnecessary to distinguish a pedestrian from a car or other roadside item (a challenge for sensor-based techniques). A smartphone can be used for the application to establish communication with pedestrians.

II. RELATED WORK

According to M. Liebner et al2021 .'s [1] hypothesis, smartphones have long since acclimated to our daily lives. The objective is to deploy them as mobile sensors for active safety systems that attempt to protect vulnerable road users like pedestrians and cyclists. They come with both a broadband internet connection and cutting-edge GPS onboard sensors.

Sara Sime Tabor in 2018 [2] proposed a brand-new technology named the Cloud-based Traffic Data Collection, Reporting and Management System. This system primarily collects data from the cloud about road accidents, etc. in order to promptly prevent fatal accidents and more accidents. The author focuses mostly on Ethiopia's method for reporting road accidents. This system keeps track of data that the traffic police officer has officially registered. Additionally, users with access to the system can submit information on accidents they encounter and those that happen.

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Jane Elizabeth, 2018 [3] described 1016 developers responded to the poll, which is a reasonable number. Given that it is for mobile development, it should come as no surprise that Android developers are strongly represented (67%); but, web developers (45%) and iOS developers (30%) also did well. 52 percent of users said they are currently working on an app that will be released soon, while 15% of users said they had previously published a Flutter app. Almost 80% of users said Flutter was very useful in assisting developers in achieving their aim. In essence, compliments for the Flutter documentation were highlighted in the survey's comments.

In 2017, Akshaya G. S. et al. [4] proposed system primarily makes use of hardware elements including mobile devices and their sensors, as well as software in the form of an Android application. This mobile application sends a WhatsApp message to the affected individuals and the emergency services after receiving a notification from sensors. Utilizing the integrated development environment Android Studio, a mobile application was created (IDE). The driver's phone has an installed mobile application. In the event of an accident, concerned parties and emergency services instantly receive notification along with the precise location.

Marisamynathan et al., 2016 [5]. In this study, the crossing habits of 775 pedestrians at signalised junctions in Mumbai, India, were examined. Based on the results of the statistical tests, the major variables influencing the changes in pedestrian crossing speeds, compliance behaviour, and interactions between pedestrians and vehicles were identified and tabulated. Significant variables influencing pedestrian compliance behaviour include gender and group size. The influencing factors in pedestrian-vehicle interactions are determined to be the type of approaching vehicle and an appropriate distance between the pedestrian and the vehicle.

Pierre Merdrissgnac et al., 2014 [6] described the collision outcomes frequently result in fatalities for vulnerable road users, emphasising a critical need for solutions to safeguard such road users. By allowing drivers to communicate information, wireless communications have the potential to support road safety. It relies on vehicle to vehicle (V2V) and vehicle to infrastructure (V2I) communications to prevent inter-vehicle collisions. It begins by outlining the need for a minimum information exchange distance to give other road users enough time to understand the situation and respond. It introduces the V2ProVu pedestrian protection application, which offers Wi-Fi communications, risk assessment, and danger alarming features.

P. Nagendra Babu et al. in 2015 [7]. The foundations of cloud computing, the history of computing, its characteristics, benefits, and drawbacks have all been covered. Applications benefit from the provisionable virtualized resources offered by cloud computing environments. Pay-as-you-use billing is used for users. The open-source cloud engine resource management system's queuing, scheduling, and resource managing module are meant to be supplemented by the cloud scheduler. Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS) are just a few of the cloud computing services covered in this survey. Although there is some payment flexibility, there is no assurance of client security.

In this study, S. Luukkainen and colleagues 2015 [8] analyse a GPS-enabled mobile traffic safety business model. The strategy used a case study that focused on an older technology suggested by Bagheri et al (2014). Using expert interviews and a study of prior research, we evaluated the service using the STOF model. A number of crucial business model problems were noted and thoroughly discussed. The end-user value proposition, battery life, GPS location accuracy, and the financial design were the primary problems. Even if no end users are charged for the service, the insurance companies' interest in the driving data gathered by it suggests that there is a basis for a successful business in the field.

The study by Cho Woong et al. (2016) [9] introduces elderly safety message delivery devices that can be used in a conflict zone. Considered are service scenario's with overall system architecture. We suggested a special communication technology after delving into technical concerns with communication and location information technologies. In the future, it will be necessary to use the suggested technologies to confirm the effectiveness of the proposed solutions.

Roy et al., 2014 [10]. Inertial sensors in smartphones can assess a person's walking path, regardless of how the phone is held in relation to the body, according to this article. The internal procedures are based on research into how people's movements affect cell phones, as well as strategies to assess and remove magnetic interference from compass data. More importantly, the native compass on a cell phone may be significantly enhanced, ultimately improving all applications that depend on the compass.

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According to WHO, 2014 [11], efforts to improve road safety have saved millions of lives over the past ten years, but they have also posed a serious obstacle to the fulfilment of global goals for health and development. Built on successful experiences from a variety of nations, including Australia, France, Ghana, Malaysia, the USA, and Vietnam, the global strategy is based on the best evidence of what works. By strengthening traffic user behaviour, enhancing the safety of roads and automobiles, and enhancing emergency services, the decade aims to save millions of lives.

According to J. J. Anaya et al. (2014) [12], vulnerable road users frequently die in car and pedestrian crashes, demonstrating a critical need for solutions to safeguard such vulnerable road users. By facilitating information sharing amongst road users, wireless communications have the potential to support road safety. There is very little research being done on communication mechanisms for pedestrian safety, in contrast to vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications for preventing inter-vehicle incidents. It investigates if a Wi-Fi system can meet the application requirement by reporting field tests and measurement-based analyses. Additionally, it features the V2ProVu pedestrian protection application, which offers Wi-Fi communications, risk assessment, and danger alarming functionalities.

According to M. Whaiduzzaman et al. (2014) [13], automotive networking has grown into a prominent research field because of its unique features and uses, including standardisation, effective traffic control, road safety, and infotainment. Vehicles are anticipated to have a comparatively larger amount of onboard processing power, storage, and communication systems. In order to sustain and advance Intelligent Transportation Systems, a number of technologies have been implemented (ITS). Numerous ideas have recently been put out to overcome the difficulties and problems associated with vehicle networks. The answer is vehicular cloud computing (VCC). A brand-new hybrid technology called VCC uses on-the-spot decision-making resources found in vehicles, like processing power, storage capacity, and the internet, to dramatically improve traffic management and road safety.

According to G. Araniti et al., 2013 [14], a wide range of applications for traffic efficiency and road safety are meant to respond to the urgent need for smarter, greener, and safer mobility. The strengths and weaknesses of LTE as an enabling technology for vehicle communications are analysed in this article, along with its strengths and weaknesses. Additionally, open questions and crucial design decisions are highlighted to serve as guidance for future study.

D. Fernandez Llorca et al. in 2011 [15]. Developed collision avoidance system (CAS), it is a system for autonomous vehicles that focuses on preventing accidents. A part of the stereo-vision-based pedestrian detection system provides accurate estimates of the time until the accident. Using a high-precision Global Positioning System and fuzzy controllers for the actuators that simulate human behaviour and reflexes, the collision avoidance activity is carried out (GPS).

The specific type of advanced driver assistance systems (ADASs) and specific pedestrian protection systems (PPSs), which are the subject of active research targeted at enhancing traffic safety, are described in D. Geronimo, et al., 2010 [16]. In order to alert the driver, apply the brakes, and deploy the external airbags if a collision is unavoidable, a PPS's goal is to identify the presence of both stationary and moving individuals in a certain area of interest around the moving vehicle. It describes two issues plaguing the field of research—the absence of a widely accepted standard and the difficulty in recreating many of the suggested procedures, which makes it challenging to contrast the various methodologies. The task of identifying pedestrians from photos is broken down into several processing steps, each with specific duties.

In C. L. Huang et al., 2010 [17], a fuzzy logic-based adaptive-period single-hop broadcast protocol is described. It takes into account a number of variables that may have an impact on the broadcast period, including visibility, vehicle speed, received signal strength, and the number of one-hop nearby nodes. Additionally, it examines how different influences affect the single-hop broadcast period. It is demonstrated through simulations that the proposed FLASB protocol performs much better in terms of network load ratio, average one-hop delay, and delivery ratio.

Y. Toor et al. in 2008 [18]. A complete analysis of the state-of-the-art for vehicle ad hoc networks is provided by . It begins by going over potential applications for VANETs, such as user and safety applications, and by determining their specifications. The solutions then are categorised based on where they fit into the open system interconnection reference model and how they relate to user or safety applications. It evaluates their benefits and drawbacks and offers recommendations for a better strategy. Additionally, it covers the various techniques employed to replicate and assess the suggested fixes. It ends with recommendations for a broad architecture that could serve as the foundation for an actual VANET.

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C. Sugimoto et al. in 2005 [19] described a pedestrian to vehicle communication system model for avoiding pedestrian accidents. There is no need for alternative infrastructure. By using two communication methods and a sophisticated algorithm for assessing the impact risk and the need for care, the system may convey information between pedestrians and cars with limited time and distance to prevent the collision. We will keep improving the algorithm for anticipating the ideal timing of warning, which is dependent on the traffic conditions, in order to produce more pertinent notifications.

T. Gandhi et al., 2007 [20]. To better grasp the nature, concerns, solutions, and difficulties surrounding the issue, provides a description of recent research on the improvement of pedestrian safety. It offers a thorough analysis of current research projects looking at collision prevention and pedestrian safety. When reviewing the research initiatives and programmes in various nations, the significance of pedestrian protection is underlined on a worldwide scale. A systemic explanation of active safety systems based on pedestrian detection using sensors in vehicles and infrastructure is provided after a description of pedestrian safety measures, which includes infrastructure improvements and passive safety features in automobiles.

III. METHODOLOGY

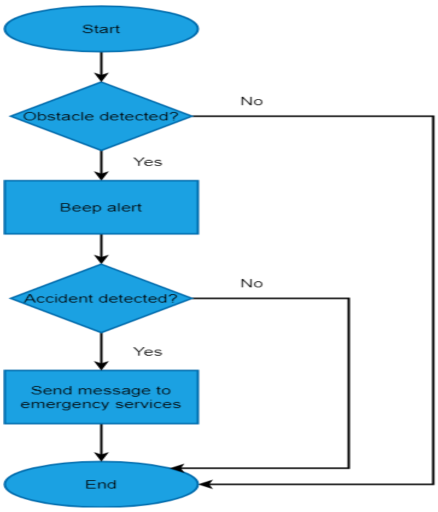

Fig. 3.1 Flow Chart

Figure shows work flow of accident detection system. Initially sensors get activated, it detects obstacles such as objects at a certain distance and alert driver with beep sound. Further, using accelerometer, if collision is detected, GSM is activated and the message is sent to emergency service and family member.

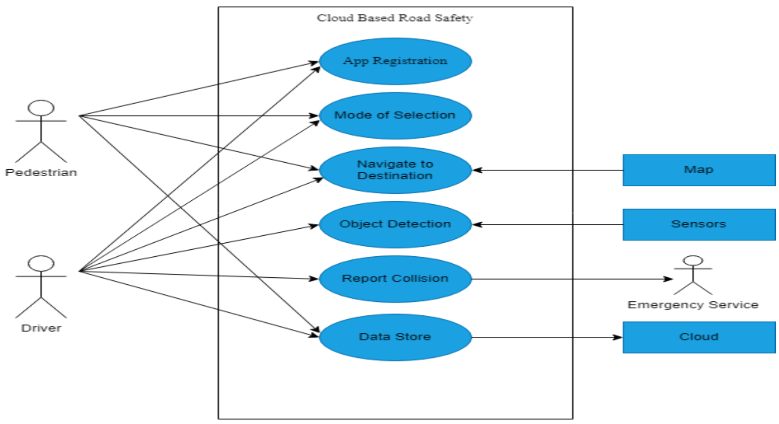

Fig. 3.2 Use Case Diagram

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IV. RESULTS AND DISCUSSIONS

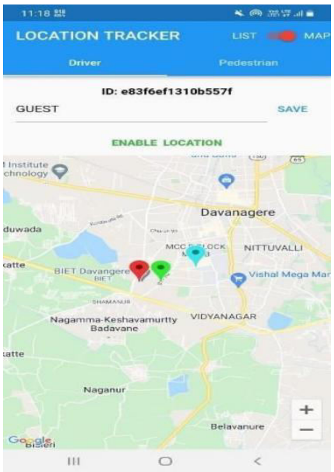

Fig. 4.1 Driver Mode

Description: This figure shows driver mode and map is displayed. Map points locations of all application users.

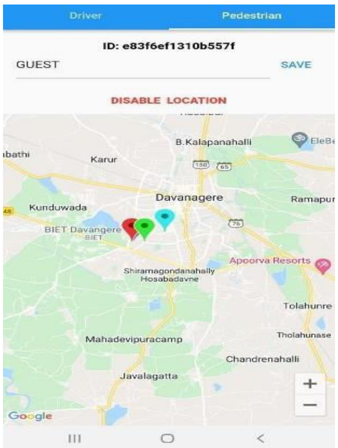

Figure 4.2 Pedestrian Mode

Description: This figure shows pedestrian mode and map is displayed. Map points locations of all application users.

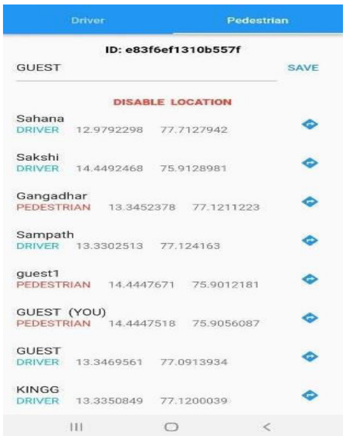

Fig. 4.3 List of users

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Description: This figure displays list of application users along with their longitude and latitude scales.

Fig. 4.4 Hardware Setup

Description: This figure shows hardware connection. Ultrasonic sensor and NodeMCU are connected.

V. CONCLUSION AND FUTURE WORK

This system, which uses IoT and mobile applicationsto ensure the safety of both drivers and pedestrians on the road. We were able to understand the limitations of the current technology with the help of the literature review. This system is a user-friendly programme that attends to user demands. The programme for smartphones is used to locate vehicles, pedestrians, barriers, and collisions. Data storage services like Firebase are employed. A warning message is issued to the driver if a risk is found. Additionally, a notification is transmitted to emergency personnel in the event of a collision. Because it is automated, this method operates quickly and saves a lot of time compared to manual systems, which can take some time to contact emergency services. Future work is GSM installation for sending messages to emergency services and family member in case of accident.

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