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ABSTRACT

Road accident data includes detailed information about incidents that occurred, such as where they happened, the severity of the accident, and the number of people on the road at the time. Such information is useful in determining the causes of accidents and developing potential countermeasures. This research aims to determine the factors that contribute to pedestrian fatalities and injuries in traffic accidents. This study examined 150 pedestrian-vehicle accidents that took place between 1990 and 2021 in forty countries. Eleven factors have been identified as the major causes of accidents. The categorical principal component analysis technique is used to reduce the number of dimensions and identify the elements that contribute to accidents. The eleven variables are classified into three groups: human factors, roadway environment, and vehicle attributes. The study found that car speed, weather, lighting, traffic conditions, area types, accident locations, and road conditions all had a significant impact on pedestrian accidents and fatalities. The findings show that a pedestrian's state (walking, running) and intention significantly increase the risk of serious injuries and death. The analysis of the driver's status suggests that the driver's intentions may also play a role in car accidents.

Keywords: Autonomous Vehicles

I. INRODUCTION

The car and technology sectors have made considerable strides in recent years to introduce computerization into what has, for more than a century, only been a human function: driving. Autonomous parking assistance systems and adaptive cruise control are two technologies that are increasingly seen in new automobile models.[1] By developing autonomous vehicles (AVs, also known as automated or self-driving cars) that can drive themselves on current roads and can negotiate a variety of routes and environmental situations with practically no direct human input, some businesses have pushed the edge even farther.[2] AVs have the potential to significantly alter the transportation network, assuming that these technologies are viable and made widely accessible. For transportation experts and politicians, this paper provides as an introduction to AV technology, its possible effects, and challenges.[3]

By preventing fatal collisions, giving the elderly and disabled essential mobility, expanding road capacity, conserving fuel, and reducing emissions, AVs have the ability to drastically revolutionize current transportation systems. Vehicles may become an on-demand service as a result of developments in shared transportation and ownership that are complementary.[4] Land use patterns, transportation preferences, parking requirements, operational enhancements to the infrastructure, haulage, and other activities may all be impacted. Also, the driver's seat may change, with past drivers working on laptops, eating meals, reading books, watching movies, and/or making safe phone calls to pals.[5]

II. Potential impacts of autonomous vehicles

AV operations vary fundamentally from those of human-driven cars. It is possible to train AVs to obey traffic regulations. They don't drive after drinking. They may be tuned to smooth traffic flows, increase fuel efficiency, and lower emissions because to their speedier reaction times. They can transport both unlicensed passengers and freight to their destinations. [6]The major possible advantages that have been found in the available studies are examined in this section. Since the full scope of these advantages is not yet known, this study makes an effort to quantify them in order to determine how much of an impact they will have given different degrees of market penetration.[7]

These fatal collisions include an alcohol, distraction, drug, or exhaustion component in over 40% of case. Considering that human error would not be a factor in self-driving cars, there might be a possible reduction in fatal collision rates of at least 40%.[8] This is assuming that automated errors are small and that everything else remains constant.[9] These decreases do not account for accidents brought on by speeding, aggressive driving, overcompensation, inexperience, delayed response times, inattention, and other driving errors.[10] Around 90% of all crashes are thought to be the result of driver mistake.[11] Other human variables, such as inattention, distraction, or speeding, are frequently determined to have contributed to the collision incidence and/or injury severity, even when the primary cause of a crash is assigned to the vehicle,

highway, or environment. [12]

The range of possible advantages is wide, both politically and economically. According to the National Highway Traffic Safety Administration, over 30,000 people perish in car accidents every year in the United States, and 2.2 million crashes result in injuries.[13] The nation's legislative law, Moving Forward for Progress in the 21st Century, highlights collisions as the top transportation priority since their yearly economic impact, at $277 billion, is more than double that of congestion. The Strategy Plan of the U.S. Department of Transportation has long listed these challenges as its top priority. The greatest cause of mortality for Americans between the ages of 15 and 24 is still traffic accidents.

Although an autonomous car can handle many driving conditions rather easily, building a system that can operate safely in almost any situation is difficult. For instance, it is both crucial and more challenging for AVs than it is for human drivers to recognize people and other objects in the road. It can be challenging for AV sensors to identify a person on a highway if they are little, big, standing, walking, seated, lying down, riding a bike, or partially hidden.[14] Further difficulties for sensors and driving operations come from bad weather conditions including fog and snow as well as reflecting road surfaces from rain and ice. Apart from that, evasive actions should be determined by whether an object in the path of the vehicle is a huge cardboard box or a large concrete block because computer vision has a considerably harder time determining material composition than people do. It is essential for AVs to detect[7] the things in their path when a crash is unavoidable so they can respond appropriately.[8] Responsibility for these occurrences is a significant worry and might significantly impede adoption. Several analysts believe that many of the challenges preventing AVs from correctly responding in complicated contexts will eventually be addressed.[15] Aiming for "crash-less automobiles," KPMG and CAR believe that motor vehicle mortality rates (per person-mile travelled) might eventually drop to roughly 1% of present rates. But, it's possible that drivers may override the self-driving feature and seize control of their cars. The only known AV collision by Google happened when a human driver was in control of the car. The speed at which human control is required will be a key aspect of these vehicles' safety.[16]

III. Conclusions

Although the concept of a driverless automobile might sound far-fetched, automation technology is advancing swiftly, and certain semi-autonomous functions are already available on current vehicle models. By bringing mobility to individuals who are unable to drive and reducing collisions, congestion, and parking demands, this new technology has the potential to fundamentally alter travel in the United States over time. These effects will result in tangible and verifiable advantages. According to recent studies, even with a 10% market penetration, yearly economic benefits might be in the neighborhood of $27 billion. Considering further advantages and high penetration rates, AVs might help the U.S. economy save over $450 billion a year. Although certain related costs and externalities (such as pollution, employment, and residential changes) are not taken into account by these estimations, it is extremely conceivable that the nature and safety of transportation will alter significantly.

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