Analysis of Historical Accident Data to Determine Accident Prone Locations and Cause of Accidents

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Abstract — **Road traffic accidents is a severe issue which causes great distress and destroys lives of many individuals. In spite of different attempts to solve this problem, it still resides as a major cause of death. This paper discusses several attempts made to identify causes for road accidents. Finally, a system is proposed to analyze historical accident data and subsequently identify accident-prone areas and their relevant causes via clustering accident location coordinates. This system, once developed, can be used to warn drivers and also to aid fully autonomous *automobiles to take precautions at accident-prone areas.**

Keywords — Data Mining; Road Traffic Accidents; Clustering Algorithms; Global Positioning System, Autonomous automobiles

I. INTRODUCTION

As our globe revolves each day, people invent new things. With the growing population and the peace prevailing in most parts of the world, it has given the aid to the raise of a generation of innovators. Certain items which were considered to be luxury, have now become a common commodity among everyone. Mobile phones which were carried in briefcases earlier by few people, now have become a common accessory. Computers which filled rooms and could be afforded by only large corporations, is an accessory most people carry in their backpacks today. Cars also can be included in this category, different varieties of cars, the number of vehicles in the world is increasing drastically. In 2011, it was reported that the worldwide vehicle population topped one billion units [1].

With this rate of innovation, it is the responsibility of the mankind to look back and try to rectify the damages caused by such a creation. This is also an important avenue of innovation. This research will be looking into vehicles which are causing damages to human-kind apart from the numerous benefits it provides.

Road accidents are the main issue that can be associated with vehicles. Although we do not recognize this as a severe threat, road accidents leave a massive trail of severely injured people as well as people who have succumbed to their injuries. Following points are some statistics which shows the threat imposed [2],

- Nearly 1.3 million people die in road crashes each year, on average 3,287 deaths a day.
- An additional 20-50 million are injured or disabled.
- More than half of all road traffic deaths occur among young adults ages 15-44.

- Road traffic crashes rank as the 9th leading cause of death and account for 2.2% of all deaths globally.
- Road crashes are the leading cause of death among young people ages 15-29, and the second
- Leading cause of death worldwide among young people ages 5-14.
- Each year nearly 400,000 people under 25 die on the world's roads, on average over 1,000 a day.
- Over 90% of all road fatalities occur in low and middle-income countries, which have less than half of the world's vehicles.
- Road crashes cost USD $518 billion globally, costing individual countries from 1-2% of their annual GDP.
- Road crashes cost low and middle-income countries USD $65 billion annually, exceeding the total amount received in developmental assistance.

This is an extremely pathetic situation. It is difficult for countries to afford this much of harm to its prime workforce. The above statistics present only the count of deaths. Road accidents also leave people differently-abled which drastically change the future of the victims.

There are many causes by which an accident can occur. As examples, it can be due to drinking and driving, over speeding, dangerous curves and bad weather.

Lack of caution at accident-prone locations is also a major cause of accidents. For an example, if a specific part of a road has less visibility, and as a result, frequent accidents occur, the drivers may not anticipate such a threat unless the person is from that specific area. This is extensively discussed by Esmaeili, A., Khalili, M., and Pakgohar, A. via the paper, "Determining the Road Defects Impact on Accident Severity" [3].

Furthermore, the authors state that 36% of accident share in Iran is related to unsafe roads, while road defects in Europe contributed to 34% of total accidents, which adds up to a large number of casualties.

This paper discusses different approaches to identify accident-prone locations, relevant causes and attempts to address the issue with a proposed solution to identify accident-prone locations via clustering location coordinates and then determining probable causes at each of the identified accident-prone locations. A system is also proposed to warn drivers of accident-prone locations and respective causes identified.