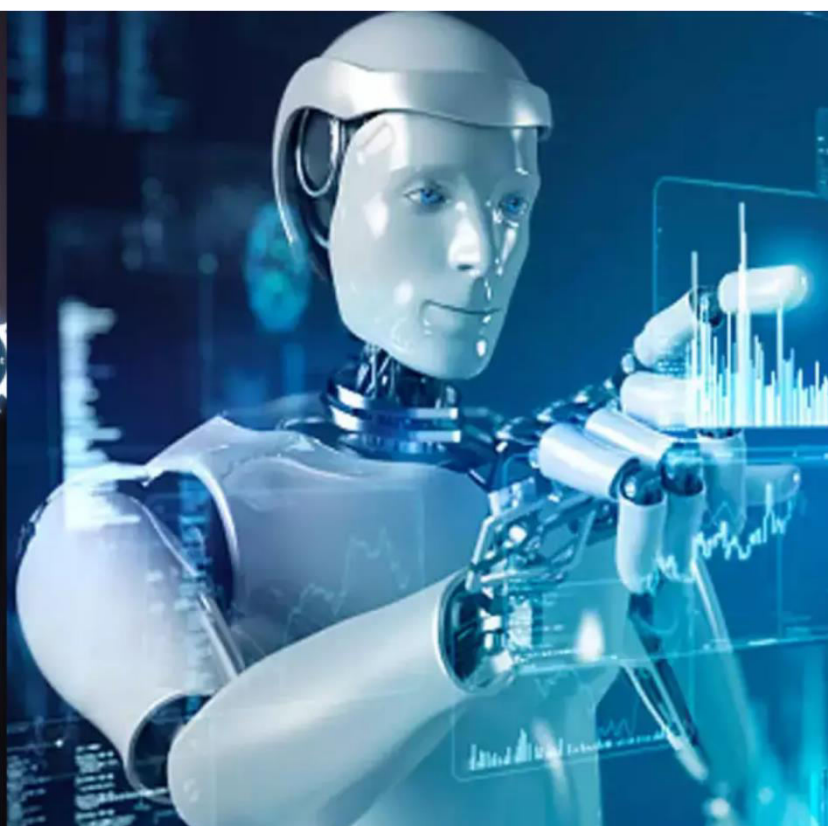




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Analysis of Traffic Safety on NH 216: A Case Study for Chirala Ongole Bypass

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ABSTRACT: Road traffic accidents on the Chirala bypass road have become a major safety concern, posing risks to both commuters and pedestrians. This study focuses on analyzing existing traffic conditions, identifying probable causes for accidents and propose effective safety measures to reduce accidents,. Through a combination of data collection, accident analysis, and on-site observations, key contributing factors—such as over-speeding, poor road infrastructure, inadequate signage, and lack of enforcement—are identified during preliminary survey.

KEYWORDS: Road safety, Speed data analysis, Accident analysis

I. INTRODUCTION

Road transportation is one of the most essential modes of transportation in India, contributing significantly to the movement of people and goods. It acts as a backbone for trade, commerce, and social interactions, playing a crucial role in the development of any region. With the increasing population, urbanization, and growing vehicle ownership, road traffic has been rising rapidly, leading to a significant surge in road accidents across the country. The situation is more alarming on highways and bypass roads where the speed of vehicles is higher, and the safety measures are often inadequate.

The Chirala Bypass Road(NH216), located in the Bapatla District of Andhra Pradesh, is one such important roadway that connects major routes and helps in diverting heavy vehicle traffic away from the busy Chirala town. This bypass road is primarily intended to reduce congestion within the city, ease traffic flow, and provide a smooth passage for long-distance and commercial vehicles. However, over the years, the bypass has become prone to frequent road accidents, causing severe damage to life and property. This increasing number of accidents has raised serious concerns about the safety of road users, particularly drivers, pedestrians, and local residents living near the bypass.

The Chirala Bypass Road carries a wide range of vehicles including heavy trucks, passenger buses, private cars, two-wheelers, and auto-rickshaws. While the bypass is designed to facilitate faster movement of vehicles, the lack of adequate traffic management systems, poor road conditions, and insufficient safety infrastructure have turned it into an accident-prone stretch. Several factors contribute to these accidents, including over-speeding, reckless driving, lack of proper signage, inadequate lighting, and insufficient enforcement of traffic rules.

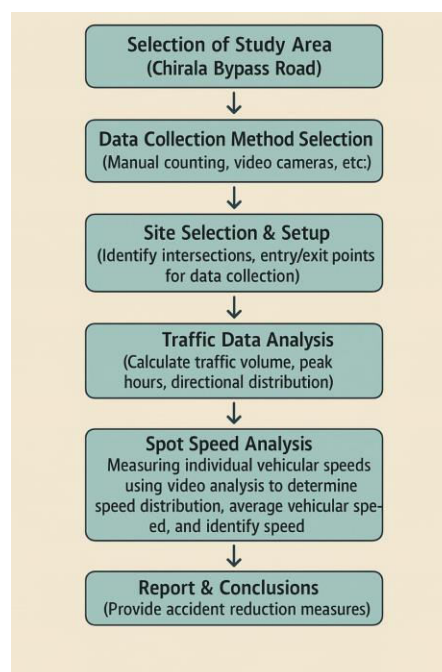
II. LITERATURE SURVEY

Speed is fundamental to road safety, with considerable evidence highlighting its profound role in fatalities, injuries, and road crashes. According to Sharpin et al. (2021), there is a 40% chance of a pedestrian fatality if hit by a vehicle traveling at 50 km/h, compared to a 13% chance at 30 km/h. Furthermore, Karndacharuk and McTiernan, 2019, Karndacharuk and McTiernan, 2019 highlighted that speed limits equal to or less than 30 km/h can also reduce the injury risk and death of car occupants. As indicated in literature, people have a 90% chance of surviving after being hit by a vehicle going at 30 km/h, but less than 50% at 50 km/h or higher.

Abdulaziz (2018) introduced a new concept called TARS (Traffic Accident Reduction System) based on Intelligent Transportation Systems (ITS). The system focuses on maintaining traffic flow efficiently while reducing accidents. TARS uses sensors, communication systems, and real-time data to identify accident-prone areas and alert drivers in advance. The study concluded that the system showed better results in comparison to traditional accident reduction methods. The use of such smart systems helps predict possible accidents and control traffic, ensuring better road safety. Another important review was conducted by Rao (2018), who performed a Road Safety Audit on the expressway connecting Noida to Greater Noida in Uttar Pradesh. The audit focused on identifying reasons for frequent accidents and suggesting remedial measures. Major causes found were over-speeding, lack of proper signage, poor lighting, and absence of pedestrian facilities. Overall, these studies highlight that road safety cannot be achieved by infrastructure alone. There is a need for a combination of engineering solutions, smart technologies, and strict enforcement of traffic rules. The introduction of systems like TARS, continuous road safety audits, and the use of Intelligent Transportation Systems can greatly help in reducing accidents and saving lives. For expressways like Samruddhi, adopting these recommendations will improve traffic flow and ensure safer travel for commuters.

III. METHODOLOGY

Traffic safety study involves a structured methodology to understand present road conditions by using data collected at site. There are various methods to collect volume and speed data for study site, however with limited budget and time frame we chose to use video data collection for reverification of data when needed. After data collection, the information was analysed to extract meaningful understandings. This includes calculating peak hour volume, and determining directional distribution, spot speed data. These metrics help understand traffic patterns and safety concern at the study site. The final step involves compiling the findings into a report and drawing conclusions. Based on the analysis, specific measures for accident reduction and traffic management technique were recommended. These may include various enforcement strategies for speed reduction, enabling informed decision-making for enhancing road safety and efficiency. As shown in figure a below methodology was used for the study.

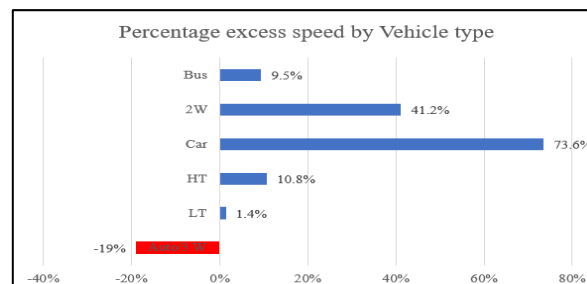
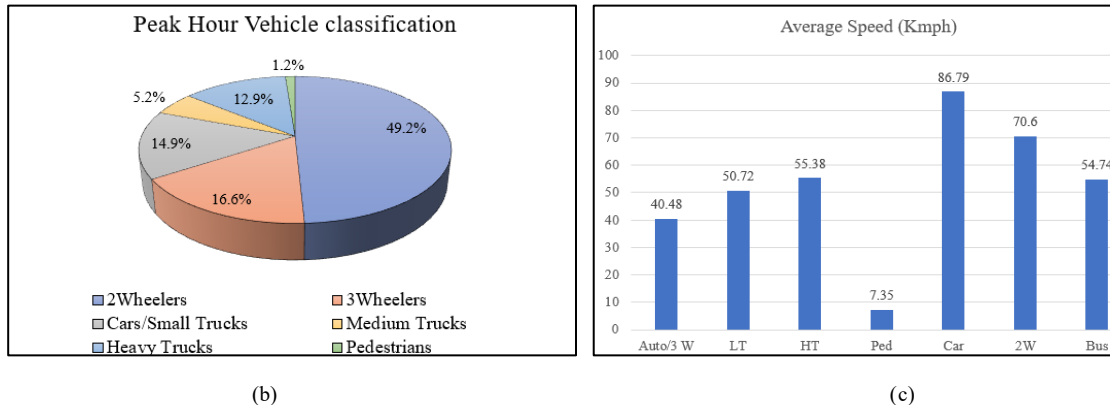


(a)

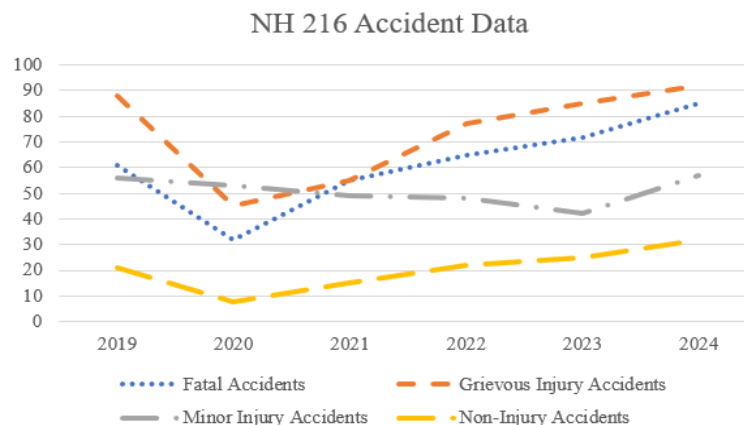
IV. EXPERIMENTAL RESULTS

The traffic composition at study site indicates majority of traffic is two- wheelers (2W), Figure a indicates the mix of vehicle classification at study location, which constitute 49.2% of the total traffic. This suggests that motorcycles and scooters are the preferred mode of transport, possibly due to ease of manoeuvrability and affordability. Large

trucks (LT) and medium trucks (MT) vehicles together make up 18.1%, showing a moderate presence of commercial, Cars, autos and small trucks make up 31.5%. This could indicate a mix of personal and business-related travel in the area. Pedestrian traffic was about 7.4%. Figure b indicates average speed in kmph. The highest average speed is 86.8 kmph for passenger car which is 73.6% above posted speed limit. Autorickshaws(3W) were overloaded and has 19% below posted speed limit as shown in Figure c.



Each year the population is increasing by at least 2.5% at study site. This will reflect an increase of vehicle ownership and respective traffic movement. A study by Schroeder et al. (2013), performed cluster analysis identified three distinct groups of drivers based on self-reported behavioural tendencies: 30% non-speeders, 40% occasional speeders, and 30% regular speeders. During the study it was observed the cars and 2 wheelers has highest propensity for accidents due to high speed driving conditions. Figure e illustrated below shows the accident data for past 6 years, on average the accident rate is increasing. Apart from motorized vehicles the pedestrians were also severely affected while crossing the road or due to traffic violation of lane changing using shoulder while aggressive driving conditions.



V. CONCLUSION

Accidents are increasing in frequency and severity, particularly on highways, over speeding is one of the major causes for the majority of fatal and non-fatal accidents. Considering problems of a developing country like poor infrastructure, and next to no enforcement, we propose the IoT based speed monitoring and ticketing system for traffic violators which will aid in the capture of a vehicle's image/video as well as its licence plate number, which will be sent to the traffic control authorities.

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