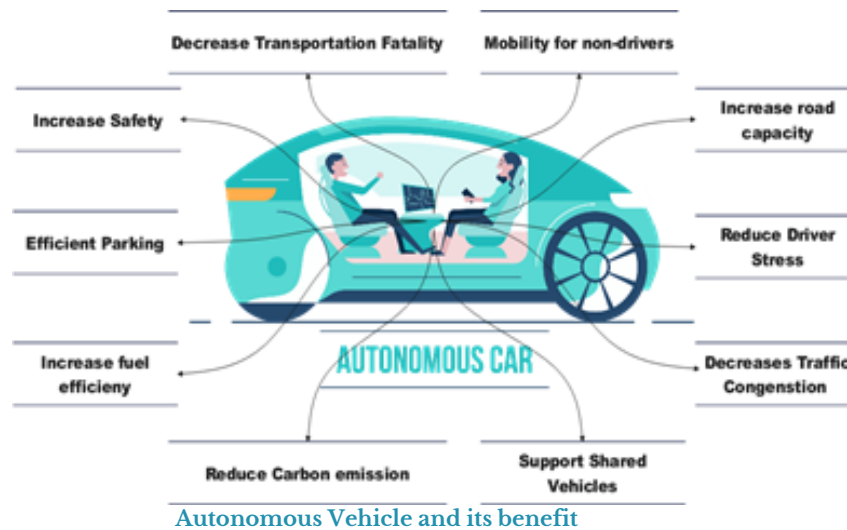


Autonomous Vehicle - Pavement Interaction



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Traffic accidents cause 1.33 million deaths per year, according to the WHO (June 2022). The primary reason for these accidents is human errors. These errors can be caused by speeding or distractions (such as the use of cell phones, not wearing seatbelts, helmets, etc.). The field of Autonomous Vehicles (AV) or 'self-driving' vehicles has seen tremendous advancements in recent years, aided by developments in artificial intelligence and communication technologies. It is widely acknowledged that autonomous vehicles (AVs) possess significant potential to revolutionize the field of transportation in the future. In the context of Pavement Geotechnics research, it is imperative to consider the present state of the road infrastructure. There is a concern regarding their ability to accommodate the growing AV traffic adequately. Does the existing road infrastructure possess sufficient design features to effectively ensure the safety of autonomous vehicles (AVs) as well as human-driven vehicles (HVs)?



Autonomous vehicles (AVs) exhibit distinct characteristics compared to human-controlled vehicles (HVs) in terms of their operational capabilities, encompassing the ability to perceive their environment, establish internet connectivity, adhere to traffic regulations, utilize GPS navigation systems, make prompt decisions, and prioritize the safety of pedestrians and occupants. With the sustained and substantial allocation of resources towards autonomous vehicles, the realization of fully autonomous and self-driving vehicles is imminent. The current scenario presents a tremendous opportunity in India that requires smarter solutions, especially for transportation and logistics. Indian automakers such as Mahindra & Mahindra and Tata Motors are spearheading the development of autonomous vehicles. Minus Zero, Flux Auto, Swayatt Robots, and ATI Motors are startups working on autonomous driving technologies for unstructured Indian roads. Minus Zero aims to create a shared mobility culture and achieve Level 5 autonomy by 2023. Flux Auto focuses on democratizing autonomous trucking, Swayatt Robots focuses on adversarial traffic dynamics, and ATI Motors develops an autonomous industrial vehicle. Leading Indian institutes like IIT Hyderabad have partnered with the DST NM-ICPS, Gov. of India

to become a global hub for next-generation smart mobility technologies with a mission to accelerate the adoption of autonomous navigation and next-generation smart mobility technologies for intelligent transportation and agricultural applications in India and worldwide.



Autonomous Vehicle Startups in India

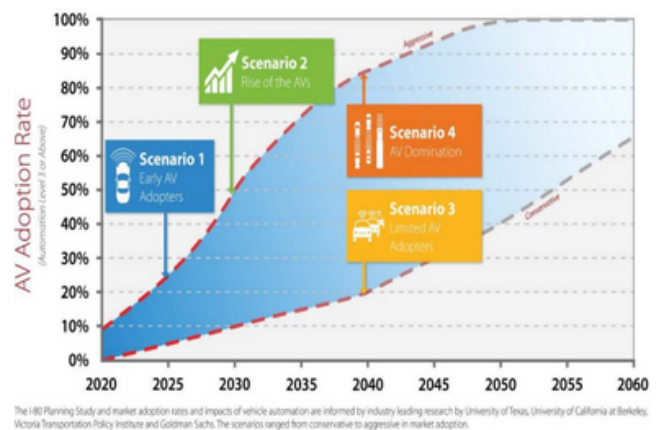
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CAVs (Connected Autonomous Vehicles) exchange real-time information about traffic conditions. This is accomplished through Vehicle-to-Vehicle (V2V) technology, which allows vehicles to communicate with one another, as well as Vehicle-to-Infrastructure (V2I) technology, which involves information exchange between vehicles and the traffic management centre. The research focuses on the uncertain impact of CAV traffic on road infrastructure. CAVs prefer to stay in the centre of the lane for safety and fuel efficiency. This results in AV traffic channelization or platooning in a lane. It is speculated that as AV penetration rates increase, channelized traffic emerges, the concentration of wheel loads in individual narrow wheel paths rises, inter-vehicle distances decrease, constant speed and fewer start and stop operations occur, and premature pavement failures may occur.

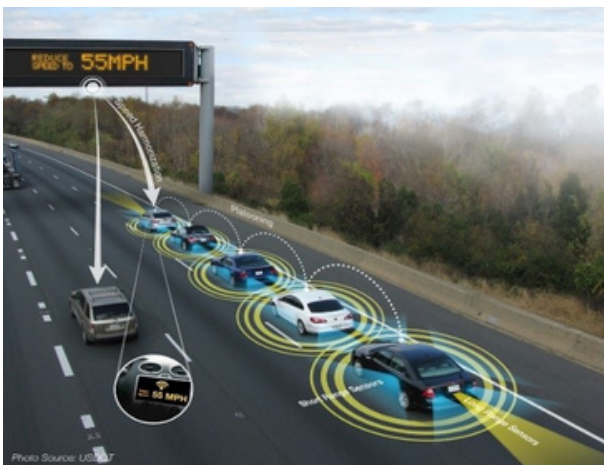


Autonomous EV trial on TiHAN Testbed at IIT Hyderabad

Researchers at IIT Hyderabad intend to closely examine the market adoption rate and future utilization of autonomous vehicles (AVs) on roadways using various surveys in order to further study the AV traffic impact on pavement structures.



Future market adoption rate of AVs by leading research institutes and industry



Channelization of AV traffic in a lane

Consequently, the foremost focus of researchers in the field of pavement geotechnics revolves around the impact of Autonomous Vehicles on the durability of existing pavement designs, as well as the formulation of novel guidelines for developing pavements that are compatible with AV technology.



Impact of AVs on Pavement Structure due to platooning

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