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Future Expectations of Sovereign Vehicles

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Abstract: Sovereign vehicles are the smart vehicles of this upcoming era, expected to be driverless, competent, and collision free vehicles. To achieve this aim, automakers have begun to work in this area to understand the depth and overcome the present hurdles in order to achieve the desired end. The first challenge in this strategy would be to absorb current practices in conventional vehicles in order to transfer them to self-driving vehicles through the adoption and implementation of several emerging technologies. This encompasses the goals of autonomous vehicles as well as the challenges of implementing them. The existing Automated vehicles (AVs) controversy isn't about whether or not they should be employed; they're currently in use. Rather, such worries are increasingly focused on how developing technology will impact evolving transportation networks, our social environment, and the people who live in it, as well as whether such systems should be completely automated or remain under human control. This research adds to the body of knowledge by attempting to shed light on future prospects as well as potential roadblocks linked with AV technology. We want to address these concerns and offer some solutions to the difficulties that are currently surfacing.
Keywords: Sovereign Vehicles, Computer Vision, Lidar.

I. INTRODUCTION

A self-driving automobile, also known as an autonomous vehicle (AV or auto), driverless car, or robo-car, is a vehicle which can sense its surroundings and move safely with little or no human intervention. Radar, lidar, sonar, GPS, odometry, and inertial measurement units are among the sensors used by self-driving automobiles to sense their environment. Sensory data is interpreted by advanced control systems to determine acceptable navigation courses, as well as obstacles and pertinent signs.[1]

Self-driving automobile testing have been going on since the 1920s;[2] encouraging experiments were undertaken in the 1950s, and development has continued since then. The first self-sufficient and totally autonomous automobiles debuted in the 1980s, with the Navlab and ALV projects from Carnegie Mellon University in 1984 and the Eureka Prometheus Project from Mercedes-Benz and Bundeswehr University Munich in 1987. Mercedes-Benz, General Motors, Autoliv Inc., Bosch, Nissan, Toyota, Audi, Volvo, Vislab from University of Parma, Oxford University, and Google are just a few of the major firms and research groups that have produced operational autonomous cars since then. Vislab showed BRAiVE, an autonomous vehicle that operated on a mixed traffic route open to the public, in July 2013.[3]

As of March 2018, 52 businesses had received permission to test autonomous vehicles on California's roadways alone. Companies strive for supremacy in this vital industry of increasing transportation capacity, and self-driving cars represent a fast-paced sector of modern technology. The year 2020 has been set as a horizon year for offering commercial AVs to the general market as a result of heated rivalry among automobile manufacturers. Nonetheless, only a small percentage of the general population has travelled in an autonomous car. This lack of first-hand experience might make it difficult for the general public to assess the potential use of such vehicles, for better or worse.[4]

New communication and robotics technologies have had a significant impact on our daily lives, and transportation is no exception. These advancements have paved the way for autonomous vehicle (AV) technology, which seeks to minimise collisions, energy consumption, pollution, and traffic congestion while also enhancing transportation accessibility. The introduction of the self-driving automobile is frequently represented as saving both time and money, as well as lowering the number of accidents. [5]

Autonomous vehicles have a lot of advantages, but they also have some drawbacks. Although the theory has been debunked, it is assumed that the introduction of self-driving vehicles would result in a reduction in driving-related employment. In addition, conditions such as drivers' inability to regain control of their vehicles due to inexperience, etc. pose a significant challenge. Many people enjoy driving and will find it difficult to give up control of their vehicles. Interacting with human-driven vehicles on the same path is also a problem for autonomous vehicles. Another issue with autonomous vehicles is determining who is responsible for damage: the car manufacturer, the car's occupants/owners, or the government. As a result, establishing a legal structure and government regulations for autonomous vehicles is a major challenge. [6]

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II. LITERATURE REVIEW

In these early visions, a self-driving future dependent on external guidance was envisioned. However, by the 1960s, the emphasis had turned to using modern computer technologies to create cars that could fully operate themselves autonomously, without the need for outside assistance. For the first time, researchers at Stanford University created robots that used cameras to see and computers to navigate.

In highly controlled experiments, these early droids followed white lines and avoided obstacles placed in their path. Self-driving wasn't confined to the laboratory for long. CPUs and image-processing techniques improved, so that by the late 1970s engineers at the University of Tsukuba's Mechanical Engineering Lab were able to test the world's first self-driving passenger vehicle, on Japanese roads.

These first AVs used two video cameras to visually identify street markings when travelling at speeds of up to 20 miles per hour. In the 1980s, a professor at West Germany's Armed Forces University, Ernst Dickmanns, retrofitted a Mercedes-Benz van with self-driving gadgets of his own design, kicking off a decade-long partnership with auto giant Daimler. [7]

III. 6 LEVELS OF VEHICLE AUTONOMY

A. No Driving Automation

The majority of vehicles on the road today are Level 0 vehicles, meaning they are operated manually. While systems may be in place to assist the driver, the "dynamic driving role" is performed by humans. The emergency braking system, for example, does not count as automation because it theoretically does not "drive" the car.

B. Driver Assistance

This is the most basic form of automation. The vehicle is equipped with a single integrated system for driver assistance such as steering and acceleration (cruise control). Since the human driver controls other aspects of driving such as steering and braking, adaptive cruise control, which keeps the vehicle at a safe distance behind the next car, counts as Level 1.

C. Partial Driving Automation

ADAS stands for specialised driver assistance systems. Both steering and accelerating / decelerating are controlled by the vehicle. Since a person sits in the driver's seat and can take control of the vehicle at any moment, the automation falls short of self-driving. Level 2 systems include Tesla Autopilot and Cadillac (General Motors) Super Cruise.

D. Conditional Driving

From a technical standpoint, the transition from Level 2 to Level 3 is important, but it is minor, if not non-existent, from a human standpoint. Level 3 vehicles can sense their surroundings and make educated decisions about themselves, such as speeding past a slow-moving car. However, they also need human intervention. If the system fails, the driver must remain alert and ready to take over.

E. High Driving Automation

The key difference between Level 3 and Level 4 automation is that Level 4 vehicles can intervene if things go wrong or there is a system failure. In this sense, these cars do not require human interaction *in most circumstances*. However, a human still has the option to manually override.

Level 4 vehicles can operate in self-driving mode. But until legislation and infrastructure evolves, they can only do so within a limited area (usually an urban environment where top speeds reach an average of 30mph). This is known as geofencing. As such, most Level 4 vehicles in existence are geared toward ridesharing.

F. Full Automation

The "dynamic driving duty" is abolished in Level 5 vehicles since they do not require human attention. Level 5 vehicles will be devoid of steering wheels and pedals for acceleration and braking. They will be unrestricted by geofencing, allowing them to go wherever they choose and accomplish everything a skilled human driver can. Fully driverless vehicles are being tested in a number of locations throughout the world, but none are yet available to the general public. [8]

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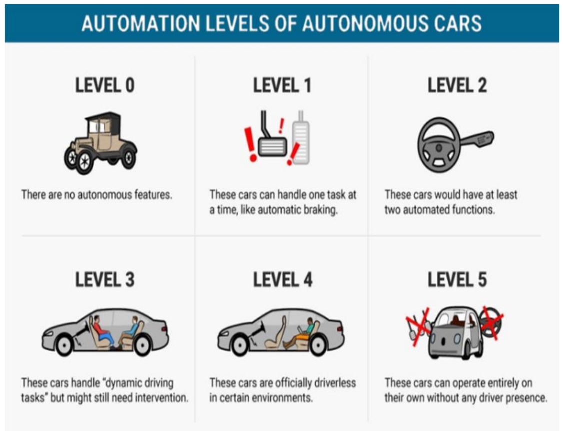

Fig 1: Where's my fully autonomous car? The 6 levels of vehicle autonomy

IV. METHODOLOGY

In general, AVs follow a three-phase architecture called "sense-plan-act," which is the foundation of many robotic systems. Making sense of the diverse and dynamic driving environment is a significant issue for AVs. To accomplish this, the AVs are outfitted with a range of sensors, cameras, radars, and other devices that collect raw data and information from the environment.

These data would then be fed into algorithms that would suggest the best course of action, such as accelerating, changing lanes, or overtaking. To accomplish this, the AVs are outfitted with a range of sensors, cameras, radars, and other devices that collect raw data and information from the environment. [4]

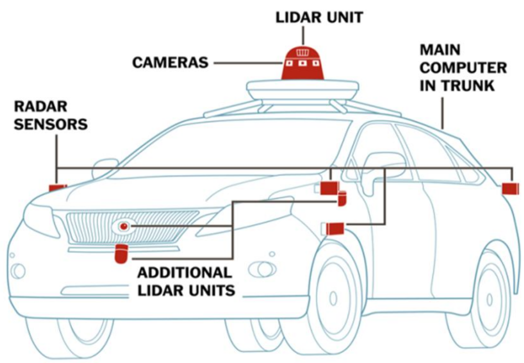

Fig 2: Self-Driving Deep Learning with Lex Fridman Holiday Repeat

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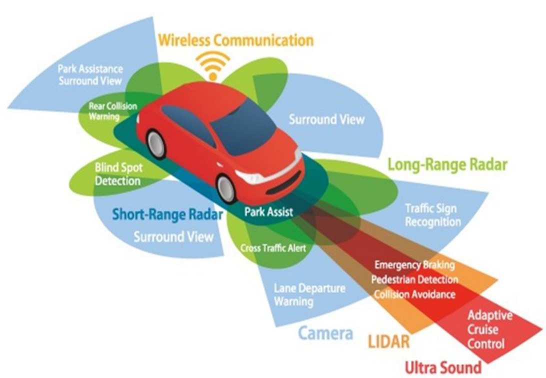

Fig 3: Autonomous-Car-3 | Landmark Dividend

To deal with such a difficult task, a mixture of surveillance technologies is used. This activity is usually accomplished using a mixture of radar, Lidar, and mono or stereo camera systems Footnote.

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V. CONCLUSION

It will take time to make the transition from self-driving cars with varying degrees of autonomy to fully autonomous vehicles. Modern AI technologies and machine learning growth, on the other hand, are rapidly progressing in this direction, and this is what is propelling the industry forward. Top automakers such as GM, Ford, and Tesla are in the final stages of testing their self-driving cars, indicating that we are on the verge of seeing a paradigm shift in the way we commute.

An NHTSA data shows that a 94% of serious crashes are due to human error and there are about 1.4 million road traffic deaths every year according to the WHO those are overwhelming statistics to comprehend. By taking the first steps with technologies like collision avoidance and pedestrian protection we can lower that statistic and with the next generation of autonomous vehicles and their ability to see hear and sense danger we at on semiconductor are helping to save thousands of lives every year we're on semiconductor and the future is here.

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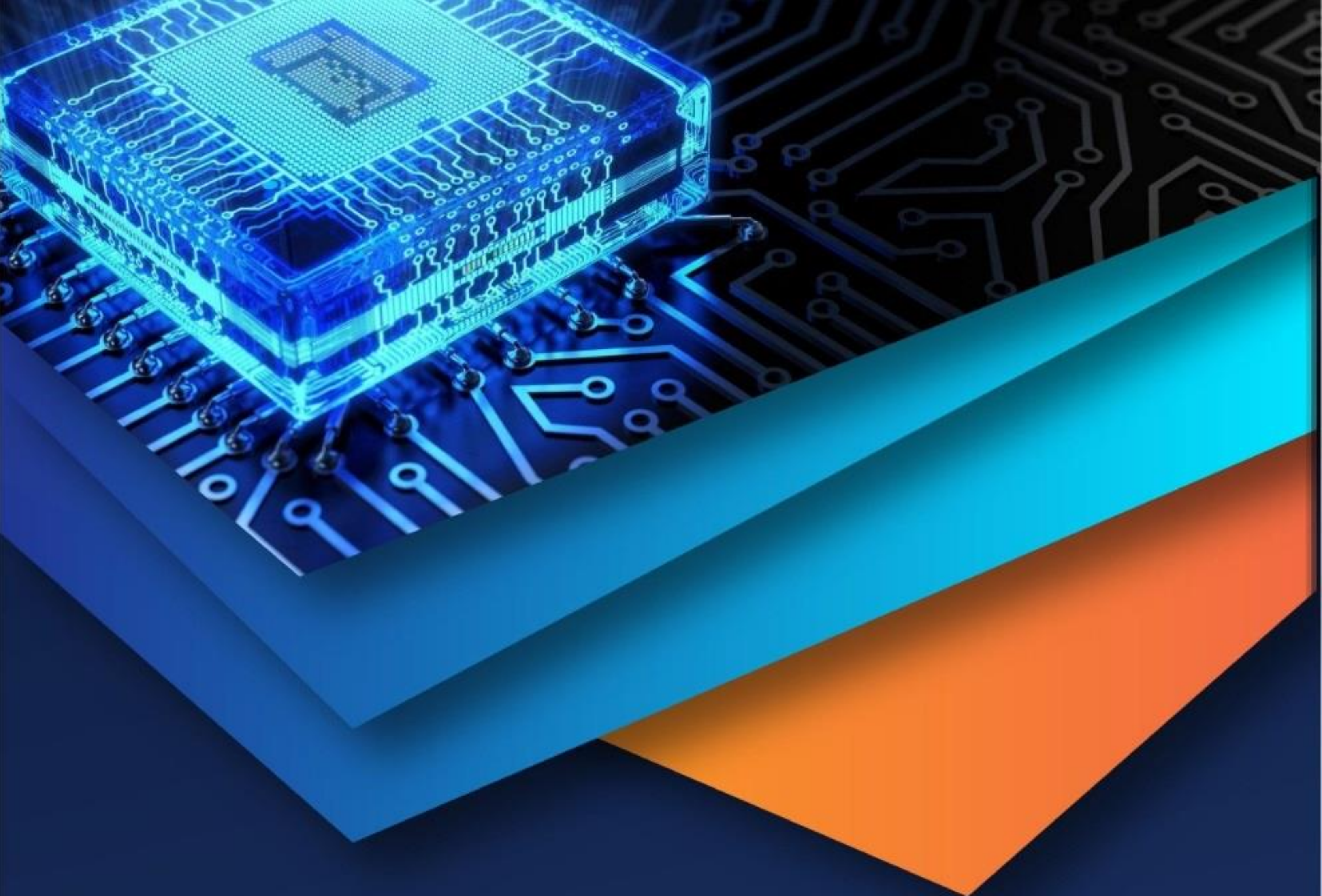

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