NVIDIA Autonomous Driving Literature Survey

NVIDIA is a leading provider of hardware and software tools for autonomous driving systems. The company offers several services and products on its DRIVE platform that are intended to help create and deploy self-driving cars. NVIDIA's autonomous driving frameworks and techniques are based on Deep Neural Networks (DNN)

Some of the key frameworks and models include:

- DRIVE Hyperion: DRIVE Hyperion is the in-car solution, a vehicle architecture that includes sensors, DRIVE AGX for computing, and software tools necessary for robust self-driving and intelligent cockpit capabilities. Currently, we can implement Level 2+ and Level 3 highway autonomous solutions.
- DRIVE SDK: NVIDIA DRIVE SDK comprises the foundational DRIVE OS and DriveWorks SDK. This provides the environment for the modules to work as well as tools and APIs for the developers to implement the autonomous solutions.
- DRIVE Sim: It is a cloud-based computing platform capable of generating a wide range of real-world scenarios for AV development and validation.
- DRIVE Map: A high-precision mapping platform for autonomous vehicles
- DRIVE Perception: DRIVE Perception is utilized for tracking, classifying, and object detection on the road.
- DRIVE Localization: DRIVE Localization ascertains the vehicle's position and orientation on the road using information from the sensors
- DRIVE Planning: DRIVE Planning takes into account the vehicle's current state, the surrounding environment, and traffic laws to plan a safe and efficient path for the vehicle to follow.
- DRIVE Control: This feature is for controlling the vehicle. It regulates the steering, braking, and acceleration of the car to stay on the intended course.

NVIDIA's deep learning frameworks and models for autonomous driving have several strengths, including:

- They are very accurate, even in challenging conditions such as low-light or foggy weather as they are not just relying on the camera inputs.

- They are robust to changes in the environment, such as construction zones or unexpected obstacles.
- They are scalable, as they can be trained on large datasets of real-world driving data using the DRIVE SIM.

However, NVIDIA's deep learning frameworks and models also have some weaknesses, including:

- They can be computationally expensive to train and run.
- They can be susceptible to adversarial examples, which are images or videos that are designed to fool machine learning algorithms.

Overall, NVIDIA's deep learning frameworks and methods for autonomous driving are very promising. NVIDIA's DRIVE platform is being used by several automakers to develop and deploy self-driving vehicles.

Comparative Analysis of NVIDIA's Frameworks and Methods to Other Companies

NVIDIA's deep learning frameworks and methods for autonomous driving are similar to those used by other companies, such as Tesla and Waymo. However, there are some key differences. Tesla uses a vision-only system for autonomous driving, i.e. they majorly rely on cameras to detect the surroundings, while NVIDIA and Waymo use a combination of sensors, including cameras, lidar, and radar. Tesla's vision-only system is less expensive to implement, but it is also less accurate and robust than NVIDIA's and Waymo's multi-sensor systems.

Waymo's approach to autonomous driving is similar to NVIDIA's in that both companies use a combination of sensors and deep learning. However, Waymo focuses on developing its custom hardware and software, while NVIDIA focuses on developing a platform that can be used by other companies.

Conclusion

NVIDIA's autonomous driving frameworks and methods are used by several prominent companies to develop and deploy self-driving vehicles. NVIDIA's end-to-end learning framework enables automakers to train autonomous driving models directly from sensor data, while its DRIVE Sim and DRIVE Map platforms enable automakers to develop and test autonomous driving software in a realistic and safe environment.

NVIDIA's autonomous driving technology is helping to make self-driving vehicles a reality. The company's DRIVE platform provides automakers with the hardware and software they need to develop and deploy self-driving vehicles safely and efficiently.