Artificial Intelligence: A Key Player in the Future of Automotive Industry

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***Abstract*- Artificial intelligence itself is a combination of data science, machine learning and many other technologies which are the key technologies when it comes to the processes, control systems and products with automatic learning and optimization to be used in the future of automotive industry. This article throws light on artificial intelligence being used as a safety feature in automotive vehicles. In addition, to the safety, implementation of artificial intelligence in vehicles enhances the possibility of autonomous driving. It also includes the ride sharing capabilities with integration of artificial intelligence. Finally, this article demonstrates conceptualization of how the future of transportation takes shape around artificial intelligence.**

INTRODUCTION

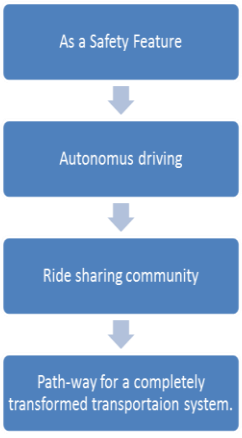
In computer science, artificial intelligence (AI), sometimes called machine intelligence, is intelligence demonstrated by machines, in contrast to the natural intelligence displayed by humans and animals. Colloquially, the term "artificial intelligence" is used to describe machines that mimic "cognitive" functions that humans associate with other human minds, such as "learning" and "problem solving". Data science and machine learning are now key technologies in our everyday lives, as we can see in a multitude of applications, such as voice recognition in vehicles and on cell phones, automatic facial and traffic sign recognition. The analysis of large data volumes based on global positioning system, driving pattern recognition, and learning algorithms provides insights into the behaviour of processes, systems, nature, and ultimately driver, opening the door to a world of fundamentally new possibilities. In fact, idea of autonomous driving is already a promising future.

There are many components contributing to the functioning of self-driving automotive vehicles. These vehicles incorporate advanced technological systems such as autonomous braking, lane keeping and changing assist, collision alert and prevention, navigation and mapping. All together, these systems, as well as high performance programmed computer extensions, are integrated into one complex vehicle. Recent developments in autonomous cars and trucks have made the innovation and implementation of self-driving commercial trucks possible, though these possibilities are still in the initial testing phase.

This article provides an overview of the improved capabilities of ride sharing community such as peer-to-peer ridesharing with the help of artificial intelligence. It outlines the applications of to be expected in this industry very soon. Virtually controlling the digital platform and the autonomous vehicles, artificial intelligence could handle the transportation system with impressive co-ordination in coming days.

IMPLEMENTATION OF ARTIFICIAL INTELLIGENCE AS A SAFETY FEATURE IN AUTOMOTIVE VEHICLES

The concern for safety of drivers and passengers did arise from the moment the first car was introduced to the public. With a lot of technological advancement, research and developments, manufacturers started implementing safety features.



INITIAL SAFETY FEATURES

Seatbelts In the year 1959, Volvo group introduced the first safety feature i.e., seatbelts. While the seatbelt is arguably the single most important piece of safety equipment, enhanced features help seatbelts do their job more efficiently and effectively.

In addition to seatbelts, front airbags have been standardised on all new cars since 1998. Most vehicles had airbags even before then. Crash sensors placed around the vehicle body is connected to an onboard computer detects a frontal collision and triggers the bags. The bags get inflated with Nitrogen gas in a few milliseconds and then immediately starts deflating. Most of the airbag systems now detect the presence of a passenger, weight, and seat position for the driver and front passenger, and deactivates or de-powers front airbags as appropriate to minimize the chance of injury to drivers positioned close to the wheel.

Primitive to airbags and seatbelts, many more safety features developed in the following years such as, head restrainers, anti-lock braking system, side-collision monitor, traction control etc.

BRAKE ASSIST

Brake assist systems have sensors which detects when a driver initiates a panic braking (different from ordinary gradual stops) and applies maximum force on the brakes. In co-ordination with anti-lock brakes, the system enables threshold braking without locking up the wheels. Experimental and practical studies have shown that most drivers, even in panic situation; sometimes don't apply the brakes as hard as they could, so Brake Assist intervenes, enables vehicle to reach the shortest possible stopping distance and avoid collision.

The advanced version of this is the AEB. Automatic emergency braking which utilises the forward collision warning sensors to predict a close encounter in front of the vehicle and apply brakes even if the driver fails to recognise the threat of potential collision.

ADAPTIVE CRUISE CONTROL

Adaptive cruise control (ACC) is an available feature for cruise control system in road vehicles that automatically adjusts the vehicle speed on highways to maintain a safe distance from vehicles in front. Adaptive cruise control works on the arrangement of radar based system. It is called by 20 different names as of 2019, which describes the same mechanism and functionality. In stop and move highway traffic, some vehicles automatically bring the vehicle to a complete stop and start moving when the vehicle ahead starts moving, this feature is not available in cruise control system. Some vehicles which are equipped with additional features like lane keeping assist will also allow the car to stay within the lane markings while in adaptive cruise control hence requiring the driver to do very less and stay safe.

Artificial intelligence being introduced to enhance the adaptive cruise control system in a minor level such as, GPS data connectivity can signal the system of geographic features such as a freeway off ramp, unattended path etc. A camera system enabled with computer visual sensors could notice front vehicle behaviour such as brake lights and/or a turn signal. This observation could allow a following car to interpret a turn signal by an exit as not requiring the following car to slow down, recognise the approaching speed as the leading car will exit. Multiple sensor systems could also notice and take consideration of traffic signs/signals and not violate the traffic law, example, maintaining road speed limits, violate a red light signal while following a vehicle that crossed before the signal turns to green.

TELEMATICS

Combining Global Positioning Satellite (GPS) technology and cellular telephone, several major automotive manufacturers are offering an automated service as feature that is providing a high level of security and convenience to the drivers. These systems enable the driver to communicate with a central dispatch centre at the touch of a button on the dashboard or a connected smartphone. This centre knows the GPS location of the vehicle and can provide road conditions, route directions, alternative paths or emergency aid on request. If an air bag deploys, the Telematics system automatically notifies the dispatch centre, it locates the vehicle, and summons emergency service, if the driver does not respond to a phone-based inquiry, the doors automatically open to let the injured driver out or someone from outside can easily reach out for aid.

Plus, most automotive manufactures these days have smartphone apps that will start, unlock, your car. Turns ON cooling or heating system and adjust driver settings of seat and steering before he arrives and it also beeps the horn to help find your lost car in that large parking lot.

AUTONOMOUS AND AI DRIVING FEATURES

The rising trend of self-driving cars is largely driven by the move towards an Autonomous car that both directed towards addressing the main existing safety issues and maybe creating new concern for new problems. The driverless car is expected to be safer than existing cars, by eliminating the potentially single most dangerous element - the driver. When it comes to driving a car with artificial intelligence, it offers two levels of functionality and those are driver assist and fully autonomous mode.

DRIVER ASSIST

The automotive industry knows that we are not comfortable letting Artificial Intelligence take the steering to itself, they first wants to put it in the passive driver i.e., co-pilot's seat.

Artificial Intelligence blends itself seamlessly by powering advanced safety features for virtually connected vehicles and this helps drivers, automotive manufacturers, and traffic regulators get comfortable with Artificial Intelligence as the driver before it actually gets its own license to drive.

By monitoring numerous connected sensors, Artificial Intelligence can identify dangerous encounters. It can then signal/alert the driver, or take emergency control of the car in order to prevent the accident from occurring. Automatic emergency braking assist, cross-traffic detectors, pedestrian detection, blind-spots monitoring system, and driver-assisted steering can help prevent accidents, and hence save lives of drivers, passengers and maybe pedestrians in the process.

DRIVERLESS AUTOMOBILES

The development of mechanical aspects needed to control a vehicle's steering, braking, and speed has been within reach for nearly an accelerating century. The main reason autonomous cars are not jamming the streets already is because, until now, they did not have a complexity processing brain.

The amount of processing system and controlling power needed to drive a vehicle is enormous. Despite the power of modern high performance computers, conventional computer programs simply are not capable enough to take up the task. The important factors of driving a car involve more than just following a set of traffic rules, or a programmed algorithm; it involves learning and decision making.

To put it in other words, it requires Artificial Intelligence and while a number of car manufacturers and automotive start-ups are working on developing Artificial Intelligence based applications for the future of automotive industry.

Autonomous driving cars combine many kinds of sensors and control systems to recognize their surroundings. Some of them are GPS, radar, Lidar, tachymeter, sonar, odometry, image sensing chips and inertia measurement units. Advanced control systems are capable of interpreting sensor's information to identify optimal navigation paths, obstacles.

There are numerous systems that aid the self-driving-car control the transmission of a vehicle. Systems that have scope of improvement include the inbuilt car navigation system, the vehicle location system, the map matching system, the global path planning, the environmental perception, the laser based sensor perception, the radar based sensor perception, the computer visual sensor perception, the vehicle stability control, the perception of vehicle's speed and direction, the vehicle control method.

Driverless cars require some form of control over the machine for the purpose of visual object recognition. Autonomous cars are currently being developed with deep neural computer networks, a type of deep machine learning architecture with many complex computational stages, in which neurons are simulated from the virtual environment that activates the entire network. The existing neural network depends on an extensive amount of data collected from real-life driving scenarios and study performed on the accident events, enabling the complex neural network to "learn" how to execute the best course of action and avoid any kind of unwanted close calls at its best.

ROLE OF AI IN RIDE SHARING COMMUNITY

In simple words, ridesharing community is a community that has a common platform to where the owners of a vehicle share the journey with another person in order to save fuel, cost and also decrease the traffic jam. Real-time ridesharing or peer-to-peer ridesharing also known as instant ridesharing, dynamic ridesharing, ad-hoc ridesharing, on-demand ridesharing, and dynamic carpooling is a service that makes an arrangement for one-time shared rides. Such carpooling system generally makes use of three recent technological advance advancements:

- Global positioning system navigation devices to analyse a vehicle's route and arrange the shared ride.
- The traveller's smartphone to request a ride conveniently
- Social networking system to establish a connectivity and accountability between the car drivers and ride sharing passengers.

These technological aspects are coordinated through a complex network service which can instantaneously handle the prediction of ideal route and match shared rides using an optimization algorithm.

When autonomously driving cars are introduced, there is no need of the owner of the car or the driver to be physically present during the entire process of ridesharing. Artificial Intelligent can seamlessly use best of both worlds that is self driving cars and ride sharing network system to eliminate even minimal requirement of a human interference to take decisions.

CONCLUSION

Artificial intelligence has already made its way into our everyday lives, and is no longer a mere subject of science fiction. At current scenario, Artificial Intelligence is used primarily in the following applications:

- Analytical data processing.
- Domains in which qualified decisions based on big data.
- Monotonous activities that still require constant attention.

As we have learnt in this article about the technological advancements and development of artificial intelligence in automotive safety, autonomous cars, and the involvement of Artificial intelligence in peer-to-peer ridesharing neural network system. Imagining a future transportation system where artificial intelligence takes care of every step of your journey from the moment you wish to go somewhere till you reach the destination on time and safely. All this feels like a beautiful futuristic fiction but by looking at the pace artificial intelligence is developing every day, there is no doubt that our future transportation system will take shape around the concept of artificial intelligence.

REFERENCES

[1] https://arxiv.org/ftp/arxiv/papers/1709/1709.01989.pdf
[2] https://www.techopedia.com/definition/190/artificial-intelligence-ai
[3] https://www.britannica.com/technology/artificial-intelligence
[4] https://www.tractica.com/research/artificial-intelligence-for-automotive-applications/
[5] https://en.wikipedia.org/wiki/Peer-to-peer_ridesharing