Review on Application of smart vehicles

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Abstract

Modern technological developments has left us wanting for more in every field. Smart vehicles is the answer to this requirement in the transportation fields. Smart vehicles is the integration of sensors and mechanical elements of a vehicle to work together to create a desired outcome for the common goal of ease and comfort. This review paper will discuss some prospects and advantages of smart vehicle technology while analyzing the problems the same can face.

Keywords: IR, Ultrasonic

Introduction

Transportation in simple words may be defined as the movement from one place to the another. There are several means of transportation. These includes via air, land, water, space etc. The credit for development of civilizations can be given to the technological advancements in transportation. Transportation always requires a vehicle. Earliest known vehicle to man were boats and wheeled vehicles pulled by camels in 4000 BC . The common thing about all these vehicles were the fact that they were manually controlled by humans and didn't have the ability to perform tasks on its own. This is where Smart Vehicles step in.

A Smart vehicle may be defined as an embedded system with advanced electronics capable of performing tasks and major operations on its own like parking, self driving, auto energy saving as well as production. The vision of smart vehicles was sustainable development in the transportation sector with improvement in fuel efficiency and environmental effects of vehicles. An example of smart vehicles is the smart car Fortwo[1]. Fortwo due to its unique appearance of front edge trimmed down model is immensely stable and lightweight. The application of the technology of Tridion safety shell solidifies the cars' safety features and it has proved in multiple crash tests. So why is this car called a smart vehicle? This is because it inhibits various properties like Hill start assist, Skid control, Brake assist etc. Addition of a few more features like that of sensors could make this car control itself.

Smart vehicle may be the answer to driverless cars and these can vastly reduce accidents as they are more precise and it would be a surety that they would follow all traffic instructions if properly embedded in them. This can also reduce human discomfort when talking about the case of transportation ever large distances. Shipments to large distances can be carried out by these smart vehicles so that the human need not endure those vast travelling times. The governments across many countries have already invested millions on this concept of smart vehicle because of it being a bundle of scope and convenience. This is an inevitable technology that is going to be implemented within few years of

further development. The changes it will bring will be revolutionary with time it may be the answer to the question of ease of transportation and safety of the same.

Literature Review

Smita Desai and Shreya Desai[2017] in their paper[2] discussed how employing smart vehicles may provide collision warning and collision avoidance facilities. 1.8 million crashes are recorded every year and his number can be easily downsized by application of smart cars. Collision warning will automatically inform the driver about the chance of possible collision. This technology was developed because studies showed that most accidents occur due to the inability of the driver to respond to or judge dangerous conditions. It is believed that eve a second prior warning of imminent collision can help prevent the same by 90%. Hence widespread research is being carried out for Collision warning systems and when developed it can prove to be a major life safer.
Research is also being done on Collision avoidance systems. These systems will automatically steer the vehicle away from the oncoming vehicle if the driver is unable to steer away from the collision. Such systems are developed but aren't fully developed to be employed in practical use. This system uses onboard sensors to continuously detect inputs from the driver, host vehicle position and oncoming vehicle position and transmits the same data to the brake and steering system.
there is a possible downside to this system too. The decision of the driver and the system may be contradictory and this may lead to unfortunate scenarios. Also there might arise a legal issue. As the company can be easily sued if the system fails to avoid collisions. Hence few company may discourage this system.
Jean-Pierre Hubaux et.al.[2004]in their research paper[4] described how smart vehicles will enable smoother transportation. Smart vehicles can help avoid traffic at road tolls. These vehicles can be fitted with specific chips at their plates which will be automatically detected by sensors stationed at the tolls and will deduct the toll amount from the car card account given to the owner of the car hence ensuring almost to no traffic. Also the cars can be installed with sensors that will automatically detect faults while the car is in motion and will automatically indicate the driver to park the car somewhere along the side of the road and examine the fault and can also send information to the nearest garage if there is severity in the fault. Smart cars can be coordinated with traffic lights to ensure smooth running of traffic. This can prevent many traffic jams in cities. Electronic license plates installed in cars can give a real time information about the cars position, its speed etc. Also smart cars can also be fitted with embedded systems which will change light of the tires' sidewall thus indicating nearby vehicles of possible lane or direction change or even braking .The major hurdle in achieving his traffic reduction technology will be that there will only be a few smart cars. rest of the cars will be humanly controlled and will not work according to the way the smart car works . Hence cooperation between human drivers and smart cars will be necessary for proper implementation of these amazingly helpful features.

V. Kepuska and Humaid Alshamsi[2016] in their research paper[5] discussed how smart cars can help in better convenience in parking. Smart cars can be fitted with IR(Infrared) sensors and ultrasonic sensors to detect cars as well as signs and park the car accordingly. The ultrasonic sensors will detect possible cars in front of or behind the car and adjust the car accordingly. The IR sensors will constantly detect signs so that the car can be parked in such a way that it does not intrude into other parking areas. These sensor data is then fed to the cars' central system and the car will move accordingly. This has the potential to save a lot of human time and can also help reduce complexities in parking. The car can then even send a signal to the parking control station that this particular spot has been taken. This will help in management of parking systems.

Autocar, India[2018] in an article[on their website stated the use of smart technology in smart cars to benefit the environment. The American based tire company, Goodwill proposed a model of tires that will be able to produce oxygen. The product named 'OXYGENE' is aimed to provide a safer, cleaner and more sustainable mode of commute. The design integrates mosses living inside the sidewall. The smart design and open structure of this tire will bring in oxygen and water and this will promote photosynthesis and hence the production of oxygen. This can be a huge relief to the ever decreasing oxygen rates and can even help reduce health risks. The design of the tire is so designed that CO_2(carbon dioxide) will be supplied o the mosses which in turn will convert it to oxygen. In an average city like Paris this may prove beneficial as it has the ability to produce up to 3000 tonnes of oxygen while taking in more than 4000 tonnes of unwanted carbon dioxide.

The car can use the energy released by photosynthesis to charge up its embedded components and hence generating is own electricity. This invention if perfected will be a boon to the society as well as the environment.

Harry Pettit[2017] in his article[7] enlightened how smart cars can be effectively used for taxi services. Daimler recently announced their self driving smart car which will function as a taxi. The smart car can be so embedded that the customer can call/book the car via an app. The car automatically arrives to the geomarked location with the help of IR and Ultrasonic sensors. The car will then follow the specific routes with pre specified rate of speed. The front panel of this car can be fitted with displays indicating the customers' name they are intended to pick. Interior is fitted with a display which can present any show the passenger would like to see. The car can be so programmed that when not in use the car will automatically drive to the nearest charging station to get charged up. This technology will change the way the world looks at cab rides. Not only does it increases safety for women but it also is an upgrade on comfort.

Royal College of Art[2018] recently published an article[8] on their website claiming that their researchers have developed a robotic steering wheel technology which can be easily implemented in cars. This steering wheel acts as a navigation system. It can be connected to the map system of any interface like Google or Uber and will indicate the driver of turns via sensors embedded on the steering. For ex- If the driver is supposed o turn left in 200m, the steering wheel will automatically get inflated on the left side thus indicating the driver to turn left. This steering wheel is intended to be more helpful to the cab drivers but also will be helpful to people who often commute. This will reduce the dependency of looking at mobile phones to determine directions and will help the driver focus. This is the perfect example of human and technology working together for the purpose of human comfort.

Conclusion: The opportunities and comfort that a smart vehicle can offer is limitless. Smart vehicle can hence be termed as a sustainable vehicle which may have the potential to give more than what it takes. Not only does it cause ease and comfort to humans, it can also act as a benefactor to the environment as well. Much more investment needs to be done on smart vehicles and further advancements in technology and deeper studies in the field can help create something that will add to the motto of enjoying responsibly.

Reference:

1. "Smart Vehicles Go USA - UnitedAuto Group Selected as Future Exclusive Distributor." http://www.daimlerchrysler.com/dccom/0-5-7145-1-622018-1-0-0-0-0-0-9-0-0-0-0-0-0-0.html

2. 'Smart vehicle automation' Smita Desai and Shreya Desai International Journal of Computer Science and Mobile Computing Vol. 6, [**September 2017**]

4. 'The Security and Privacy of Smart Vehicles' by Jean-pierre Hubaux, Srdjan cˇ Apkun, and Jun Luo Epfl, [**2004**] IEEE

5. 'Smart Car Parking System' by V. Kepuska, Humaid Alshamsi, International Journal of Science and Technology ' [**August, 2016**]

6. Oxygen-producing tyre at Geneva**, [14th Mar 2018]** retrived from url https://www.autocarindia.com/car-news/goodyear-showcases-oxygen-producing-tyre-at-geneva-407736

7.*The 'friendly' driverless Smart car of the future*, MAILONLINE,**[31 August 2017]**

8. Soft Robotic Steering Wheel, [**10 April 2018**], on the url https://www.rca.ac.uk/news-and-events/press-releases/royal-college-art-researchers-have-successfully-created-soft-robotic-steering-wheel/