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A REVIEW ON TECHNOLOGICAL ADVANCEMENT IN AUTOMOBILE: SMART VEHICLE

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ABSTRACT

This paper presents a study on the behavior of smart cars by considering them as autonomous intelligent agents. In particular, a smart car could behave as autonomous agent by extracting information from the surrounding environment (road, highway) and determining its position in it, detecting the motion and tracking the behavioral patterns of other moving objects (automobiles) in its own surrounding space, exchanging information via internet with other moving objects (if possible) and negotiating its safety during travel with the other moving objects. The ideas presented here are based on traffic rules that a smart car has to know and the way to negotiate its safety by studying the other cars driving behavior like an autonomous agent. A smart-vehicle system involves sensor-based systems, which continuously evaluate the surroundings of the vehicle, display relevant information to the driver and might even take control of the vehicle.

The first part of this paper looks into the technologies related to smart cars and modern technologies to improve safety. These technologies are broken down into four broad, distinct classifications of devices such as collision avoidance, imaging technology, rear mounted radar, self driving cars, computer program allows car to stay in its lane without human control, cars that communicate with each other & the road.

Collision-avoidance systems protect the occupant by preventing accidents. Imaging a1ids enhance vision of humans in improper visibility situations. The next part of the paper deals with the latest technologies developed by the manufacturers all over the world, to make a vehicle "SMART".A smart vehicle not only takes care of passengers traveling in it but also of those using roads and other vehicles.

Keywords: Autonomous, Enhance Vision, Improved Safety, Intelligent Agents, Modern Technologies, Smart Cars.

I. INTRODUCTION

Just as the human brain coordinates memory, senses, thinking, and physical reaction during driving, a vehicle needs a coordinating system to integrate the various capabilities of information, safety, and automation technologies. This coordinating system is the defining feature of a human-centered intelligent vehicle. Without it, the vehicle is simply a container for potentially overlapping or conflicting technologies. In a smart vehicle, drivers will have access to more information than they are traditionally accustomed. This includes information on road and weather conditions, route directions, vehicle diagnostics, anti-collision warnings, the driver's physiological status, etc. As a result, the vehicle itself must do some information filtering, a process called "data fusion." Data fusion, however, is a complicated task, which involves suppressing non-critical information -- such as "the nearest fast food restaurant is two blocks to the left" -- when a safety-critical message -- such as "brake immediately" -- is relayed to the driver. Data fusion must also consider how many messages a driver can receive within a given period without becoming overwhelmed or distracted.

II. SMART TECHNOLOGIES

2.1 Collision Avoidance

Collision-avoidance systems will expand the paradigm of traffic safety from protecting the occupant of the vehicle to preventing accidents altogether. General Motors and Delphi Delco Electronics system are currently testing one type of collision avoidance system on Buick Leases. While many technical details are being kept under raps , the new system promises to determine the potential for collisions based on data about the car’s movement, the current driving environment and previous driver reactions obtained from radar, laser range-finders and other onboard sensors [1]. The system responds to potentially hazardous situations by sounding a warning or, in the more pro-active concept versions, automatically adjusting cruise control settings to compensate for and avoid the danger.

Fig. 1: Collision Avoidance.

Various systems combines an eye tracker, which checks where the driver is looking, and differential global positioning system, which is designed to allow the system to keep track of its location both on the planet and in relation to other similarly equipped vehicles. In addition to all that, the system also integrates video equipment to monitor road conditions and a laser rangefinder to aid in keeping track of other vehicles, combining everything into one sleek package. These equipment can be used in order to signal to the driver that other vehicles are occupying "blind spots" by displaying a red triangle on rear and side-view mirrors. Unfortunately, this early version can only pick up moving objects, but they are working hard to overcome this limitation.

John Pierowicz and his team at Veridian are working on a device that warns drivers of upcoming stop signs. Their device integrates 3 separate radars to detect traffic signs; a unit and a map database of the roads determine relative position, a Heads-Up-Display, and a secondary braking system. Whenever the vehicle determines that it is approaching a sign in an unsafe way, it gives a physical cue on the Heads-Up-Display. As of right now, Viridian's system is only programmed to deal with stop signs, but they hope that it can be modified to assist drivers merging onto major roads and maybe even to allow it to work with stop lights the same way it does with stop signs. They're also contemplating modifications to allow the system to brake automatically on its own whenever it activates, rather than only issuing a passive warning Other safety innovations that are now in testing include automatic collision notification systems, which will immediately signal for help if a vehicle's air bag deploys ,and drowsy-driver warning systems that will keep drivers from falling asleep at the wheel.

2.2 Imaging Technology

Another area of study is how to enhance the vision of humans in situations where they may not be able to see very clearly. Few companies are testing a concept similar to that used in Night Vision Goggles, where sensors process differences between roadside temperatures and those of objects ahead [2]. The sensors send this information to a central computer, which converts the information and uses it to put together images of the surrounding roadside that are updated several times a second; this processed composite image then shows up on a screen built into the dashboard.

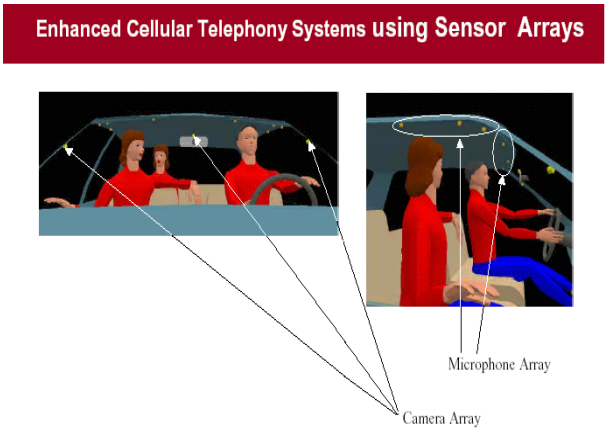

Fig. 2: Image Detection Using Cameras & Sensors.

2.3 Rear-Mounted Radar

Backing out of a parking space in a busy lot can be an adventure. Although rear-pointing radar has been around for a few years alerting drivers to unseen objects immediately behind them -- a fence, wall, tree or another vehicle – new Radar technology searches for approaching cross traffic. When it "sees" traffic approaching while you're backing up, it sounds an alarm [3]. Chrysler's version is available in its minivans and is called Cross Path Detection System. It includes visual indicators in the outboard mirrors. Ford's system is called Cross Traffic Alert. Offered in the just-released 2010 Fusion and Mercury Milan, it also has outboard mirror alarm indicators.

Fig. 3: Rear Mounted Radar.

2.4 Self Driving Cars

In the technology world, the latest advancement is only as good as the next thing coming down the line. The auto industry is constantly bringing us new technologies, whether it be for safety, entertainment, usefulness or simply for pure innovation. Many new car technologies are either specifically built for safety or at least have some sort of safety focus to them. The idea of a self-driving car isn't a new idea. Many TV shows and movies have had the idea and there are already cars on the road that can park themselves [4]. But a truly self-driving car means exactly that, one that can drive itself, and they're probably closer to being a reality than you might think.

In California and Nevada, Google engineers have already tested self-driving cars on more than 200,000 miles (321,869 kilometers) of public highways and roads. Google's cars not only record images of the road, but their computerized maps view road signs, find alternative routes and see traffic lights before they're even visible to a person. By using lasers, radars and cameras, the cars can analyze and process information about their surroundings faster than a human can.

Fig. 4: Interior of a Self driving car.

If self-driving cars do make it to mass production, we might have a little more time on our hands. Americans spend an average of 100 hours sitting in traffic every year. Cars that drive themselves would most likely have the option to engage in platooning, where multiple cars drive very close to each and act as one unit. Some people believe platooning would decrease highway accidents because the cars would be communicating and reacting to each other simultaneously, without the on-going distractions that drivers face.

III. COMPUTER PROGRAM ALLOWS CAR TO STAY IN ITS LANE WITHOUT HUMAN CONTROL

"We develop computer vision programs, which allow a computer to understand what a video camera is looking at -- whether it is a stop sign or a pedestrian [5]. For example, this particular program is designed to allow a computer to keep a car within a lane on a highway, because we plan to use the program to drive a car," says Dr. Wesley Snyder, a professor of electrical and computer engineering at NC State and co-author of a paper describing the research. "Although there are some vision systems out there already that can do lane finding, our program maintains an awareness of multiple lanes and traffic in those lanes."

Fig. 5: Computer Programming Car.

Specifically, Snyder and his co-authors have written a program that uses algorithms to sort visual data and make decisions related to finding the lanes of a road, detecting how those lanes change as a car is moving, and controlling the car to stay in the correct lane."This research has many potential uses," Snyder says, "such as the development of military applications related to surveillance, reconnaissance and transportation of materials."This computer vision technology will also enable the development of new automobile safety features, including systems that can allow cars to stay in their lane, avoid traffic and gracefully react to emergency situations -- such as those where a driver has fallen asleep at the wheel, had a heart attack or gone into diabetic shock. This can help protect not only the car that has the safety feature, but other drivers on the road as well.

IV. TECHNICAL DETAILS OF TECHNOLOGY USED IN SMART VEHICLE

4.1 Charging The Bmw I8

In addition to various assistance services and options for flexible mobility, the comprehensive service package 360° ELECTRIC also offers an innovative charging concept. The BMW i8 can be charged at home very conveniently with the BMW i Wall box or the charge cable – and, if required, also with sustainably generated

electricity with solutions from BMW Green Energy. A growing number of public charging stations are available on the roads, with access being obtained easily and conveniently using the Charge Now card. The BMW i8 can easily find the nearest charging station thanks to innovations such as the fully connected BMW i Connected Drive services for navigation.

At home you can charge the BMW i8 very easily with a BMW i Wall box Pure or Pro. These charging stations, which are mounted on the house or garage wall, not only complement the unique design of the BMW i8 vehicles optically, but also charge the BMW i8 much faster than is possible with the charge cable supplied as standard – consequently, with the Wall box Pro, the BMW i8 is can be charged to 80% of its full capacity in less than two hours.

The installation service offered by BMW i will be glad to carry out an on-site check to see whether the BMW i Wall box Pure or Pro can be mounted on your house wall and connected to your electricity supply. Qualified electricians from the BMW i installation partner will also take care of delivery, installation and commissioning on request. Using the online quick-check, which you can access via the link below, you will be able to find out in advance whether is it possible to install the BMW i Wall Sbox in your home. And because BMW i advocates complete sustainability in e-mobility, a green electricity contract with a selected BMW i Partner can also be arranged for you on request, or you can generate your own energy with a solar carport organised by BMW i.

4.2 Depending on the Local Electricity Infrastructure: Green Energy

A green energy contract gives you the ability to purchase electricity for charging your BMW i8 from regenerative sources – so that not only every journey, but also every charging procedure is completely emission-free. With the product portfolio of BMW Green Energy, you can take advantage of these options very easily and conveniently from one source: from the switch-over to sustainably generated electricity from wind or hydro-electric power to your own energy production through 'My Green Energy' solutions at your home (e.g. with a solar power plant). Your BMW i Partner can arrange for a premium solar carport for generating your own electricity.

Table 1 Consumption and Range and Charge Time

CO2 emissions in g/km	49
Consumption combined in l/100 km	2.1

Electric range in km	37
Electric range (mean customer value) in km	25-35
Maximum total range in km	600
Gross capacity of lithium-ion battery in kWh	7.1
Charging time of high-voltage battery in h at 16 A (Wallbox) (80 %)	2
Maximum speed on purely electric power in km/h	120
Maximum speed in km/h	250

Acceleration from 0–60 km/h on purely electric power in seconds	4.5
Acceleration from 0–100 km/h in seconds	4.4
Elasticity from 80–120 km/h in seconds (4th gear)	3.4
Elasticity from 80–120 km/h in seconds (5th gear)	4

4.3 Google Self-Driving Car

One of Google's driver-less cars. Google's self-driving car was once just a pet project, but it has since bloomed into one of the company's largest endeavors. Now, Google's autonomous fleet has logged over 190,000 miles, is street-legal in Nevada, and it may or may not have gotten into its first crash. But what we don't know is just how the automated system manages to stop at a red light or keep from careening into us--until now. Stanford University professor Sebastian Thrun, who led the development of the Google's self-driving car, and Google engineer Chris Urmson revealed the secret workings of these autonomous vehicles in a keynote at the last month. The talk divulged how the system works, and Sebastian dn Chris s IEEE International Conference on Intelligent Robots and Systems howed footage of how it sees the world. At the "heart of the system" is the Velodyne 64-beam laser range-finder that's mounted onto the car's roof. The device scans and records laser measurements to create a 3D model of the world around it that it then correlates to high-resolution maps. From this, it creates routes that avoid obstacles and obey traffic rules.

The vehicle is also equipped with radar, GPS, an inertial measurement unit, and other sensors that keep the vehicle on course and provide it with 360-degree situational awareness. More interestingly, the car is programmed to be extremely courteous--it'll yield to any pedestrian crossing the street and it strictly adheres to road rules. At the same time, it can also be aggressive toward other vehicles that aren't obeying the right-of-way rules by easing into the intersection to assert that it will be turning first.

V. FUTURE SCOPE

5.1 Cars That Communicate with Each Other and The Road

In the technology world, the latest advancement is only as good as the next thing coming down the line. The auto Industry is constantly bringing us new technologies, whether it be for safety, entertainment, usefulness or simply for pure innovation [6]. Many new car technologies are either specifically built for safety or at least have some sort of safety focus to them. Some of the latest car innovations we've found are some truly exciting technologies that could revolutionize not just the automotive industry but human transportation in general. So what's in store for future cars? Well, we don't know for sure, but based on what's currently being tested and what's on the road today, we have an idea of some new technology that will most likely make it into production. Some of it will help keep us safe, some will give us information like never before and some will let us kick back and just enjoy the ride.

Fig. 6. Cars that Communicate with Each Other

Fig. 7: Car that Communicate with Road.

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5.2 Smart Highways

A number of manufacturers are working with highway designers to make the roads smarter. Tie in onboard computers with cars and people will have a more elaborate "cruise control" function. Eventually, lines of cars will be able to travel along without human control, perhaps at very rapid speeds in close proximity. A car would merge into a special lane at specific access points and then be whisked along in a train of cars. Punch in your exit and the car leaves the line at that point and normal driving control is returned to the driver. This technology is still many years in the future, but testing is already going on in such places as Tokyo and San Diego.

5.3 Driver-Vehicle Interface Will Become Increasingly Sophisticated

The integration of individual in-vehicle technologies will be reflected in coordinated and streamlined information displays and controls. Over time, the vehicle will become increasingly sophisticated in how it communicates information to and accepts commands from the driver. This sophistication will stem from the use of voice recognition, head-up displays, and vision-enhancement technologies that can relay information and commands and can also allow the driver to keep both hands on the steering wheel. Voice recognition software is already becoming increasingly common in Japanese in-vehicle navigation systems although it is still quite expensive for the average consumer.

VI. CONCLUSION

Smart vehicals makes driving safer and comfortable. as an engineer we must try to reduce fatalities caused by accidents. slow reaction times, distractions, mis-judgments, all are costly reasons due to which accidents occur, there would be much less fatalities if we provide automations as well as safety features. Our job is to introduce new safety and automation technologies smart vehicles that are advanced in various features like safety, efficiency, and economy. the development in technologies will prove invaluable in man's search for safer, comfortable and an enjoyable drive.

REFERENCES

[1] A New Threat Assessment Measure for Collision Avoidance Systems. Yizhen Zhang, Erik K. Antonsson and Karl Grote.

[2] ISSN 2248-9967 Volume 4, Number 1 (2014), pp. 1-10 © Research India Publications http://www.ripublication.com/iraer.htm Night Vision System in BMW, Aniket S. Ahire.

[3] A low-cost MMIC based radar sensor for frontal, side or rear automotive anticipatory precrash sensing applications, Intelligent Vehicles Symposium, 2000. IV 2000. Proceedings of the IEEE .

[4] How Does a Google Self-Driving Car Drive? Geek Tech ,By Kevin Lee, PC World.

[5] Concurrent visual multiple lane detection for autonomous vehicles. Gupta, R.A. ; Dept. of Electr. Eng., North Carolina State Univ., Raleigh, NC, USA ; Snyder, W. ; Pitts, W.S.

[6] Shiho Tanaka, et al, vehicle detection based on perspective Transformation using rear view- camera.