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DRIVERLESS CAR AUTOMATION USING AI

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Abstract -This paper will cover the conversion of normal conventional cars into the autonomous car (Driverless car), problems associated with it, objectives, requirements and the expected outcome of this step. It will also cover the standards and give the critical comparison between conventional and driverless cars. This AI based car will cause a huge change in people's life, we will research and analyses the various impacts on society, legal and ethical challenges, and important environmental constraints. We will also research on the previous similar technologies and take a look at the way researchers are working to make this technology even better in the future.

***Key Words*: Driverless car, Autonomous car, car, smart car, AI car**

1.1 INTRODUCTION

As the World is progressing, scientists and researchers are struggling to take the human life in more comfort zone. People around the World are now quite much enthusiastic about the launch of autonomous cars. The specialty of this car is its ability to perceive its environment using the modern form of AI, and take decisions without the assistance of any driver. In other words, these cars are equipped with special sensors, processors and another database which is responsible for the operation of this car and doesn't require any driver. It navigates itself following up to the destination point requested by users. Indeed, it is the big revolution in the field of robotics, which is contributing a lot to make this planet safer place. On a technical basis, this car is designed based on the various areas of engineering which includes electrical, mechanical, computer sciences and control engineering etc. Major progression in the autonomous car has started when the Mercedes Benz has launched the vision guided the car in 1980 after this invention it has started a huge focus on the areas of GPS system, radar etc. This has also resulted in the development of the adaptive steer control, power steering and other things that are involved in the humanitarian assistance as well. And now the research is going on to introduce the World with the driverless car which could be much safer, efficient and reliable for the users. Road accidents are one of the major cause of death, as according to report by Desponded et at that nearly 3000 people died daily because of road accidents, among which half of them are not in the car, other than that it has also been reported that if some safety measures are not taken this will grow up to 2.4 million a year making the5thlargest cause of death in the World. This number can be greatly reduced by putting autonomous cars into action which are far more reliable and react swiftly than humans. It will also cause reduction in the traffic congestion, as the efficiency of autonomous car makes it reliable in a way of keeping very small gaps between vehicles, and its outstanding management of speed and time. Following the navigation track without considering any other distraction make sit friendlier than the conventional cars operated by drivers.

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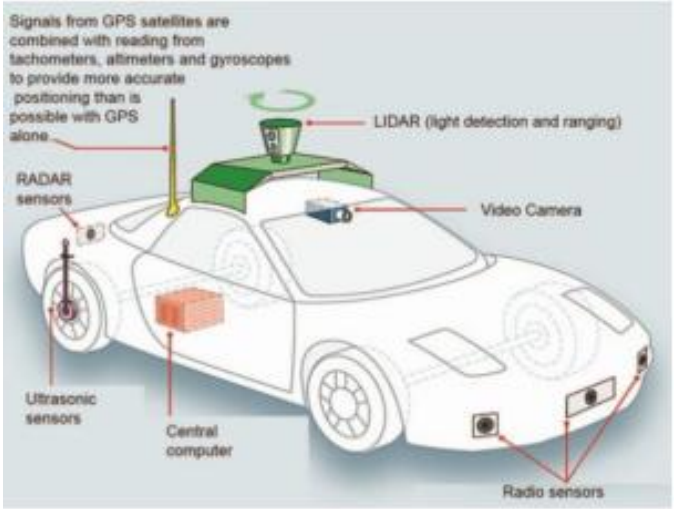

Figure 1.1: Perception devices

1.2 Historical Aspects

The invention of the real autonomous car goes back to 1926 when the radio the control car was introduced by the Houdini radio control in NYC. It had an antenna which was responsible for transmitting the signal and controlled by another car following it, and a motor connected to the antenna was responsible for car operation. This concept was improved by the scientists of Nebraska in 1958, when they laid circuit down under the highways which were a source of detection for the autonomous car about the availability of other car and even guide it for steering control, acceleration and break .In 1960, transport and road research laboratory in the UK has tested driverless car, which was based on the magnetic cables that were laid under the roads. The driverless was tested at the speed of 130 km/h without any change in speed and ignoring the weather conditions, it resulted in far more effective performance than the human control. By the time of 1980s Germany has succeeded in designing the Mercedes-Benz Robotic car based on the vision-guided, and it could go up to the speed of 63km/h without traffic. The best technology in this area was used by the US when they launched autonomous land vehicle (ALV), where they were based on the computer vision and based on the LINDR and autonomous control the robotic car could go up to the speed of 36km/h, Mercedes-Benz autonomous car by Discmans' covered the journey of around 1,590 km from Germany to Denmark by using the special computer Vision, microcontrollers and circuit design to act swiftly in real time. Throughout the journey, it was able to achieve the speed of 175km/h, and it performed a number of man oeuvres in a busy traffic to overtake the other car. An ARGO project launched by the University of Parma in 1996, in which the car was followed according to the painted lines on the highways. It was tested for the distance of around 1,900 km over the speed of 90km/h in Italy, and over 96% of its journey, it was operated fully autonomous. It was based on the stereoscopic vision and occupy two video cameras to understand the surroundings.By2000 autonomous public transport system started in Netherlands which is named as PAKSHUFFLE. . By the course of time, several attempts were made, and all the new modified forms are always better than the existing ones and even currently the work is still in progress to use this system in a better format in the future.

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Figure 1.2: First driverless car by general motors

1.3 Fully Self-Driving Automation

The AI-based specialized cars can perform all its trip without any occupant and it is more considerate for the people who are not able to drive or may be due to other factors unable to cope with driving. Although engineers are putting lot more effort to make it as accurate as possible, this technology doesn't give that performance so that it can be trusted blinded to put it on the road. Google is quite a confident to commercially launch these cars by the time of 2018.

The survey has been done by the Cisco, the major objective of this survey was to figure out the people's confidence of adopting these autonomous cars. They included around 1500 people from 10 different countries having a long-term driving experience, and they figure out the report which suggested that half of the consumers in the World will soon trust these autonomous cars.

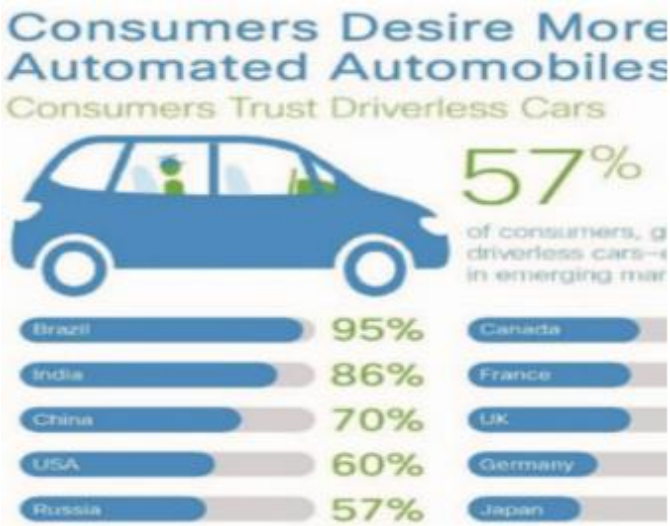

Figure1. 3: Cisco survey for autonomous vehicle

2. SYSTEM ARCHITECTURE

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The design phase satisfies the requirements of the system. The design of a system is probably the fore most crucial issue warm heartedness of the software package. It`s a serious impact on the later part, notably testing and maintenance the output of this part is that the style of the document this document is analogous to a blueprint of answer and is employed later throughout implementation, testing and maintenance. The design activity is commonly divided into 2 separate phases System Design and Detailed Design. System Design conjointly referred to as top-ranking style aims to spot the modules that thought to be within the system, the specifications of those modules, and the way them move with one another to supply the specified results. At the top of the system style all the main knowledge structures, file formats, output formats, and also the major modules within the system and their specifications square measure set. System design is that the method or art of process the design, components, modules, interfaces, and knowledge for a system to satisfy such as needs. Users will read it because the application of systems theory to development. Detailed design, the inner logic of every of the modules laid out in system design is determined. Throughout this part, the small print of the info of a module square measure sometimes laid out in a high-level style description language that is freelance of the target language within which the software package can eventually be enforced. In system design the main target is on distinguishing the modules, whereas throughout careful style the main target is on planning the logic for every of the modules.

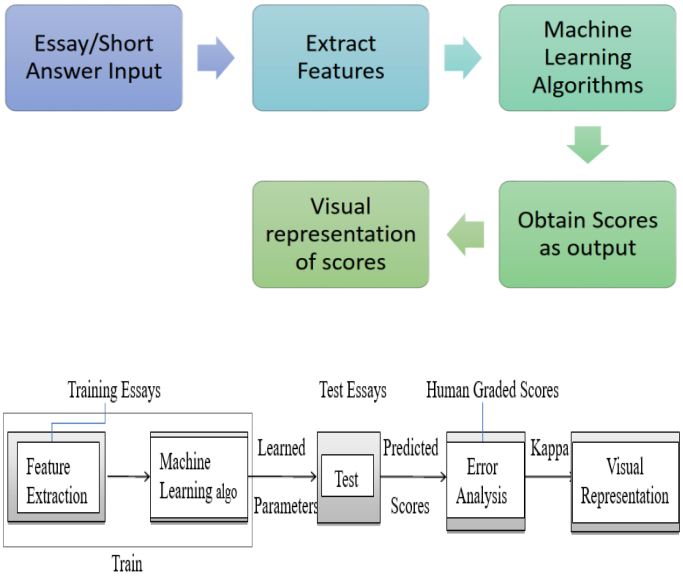

Figure 2.1: Architecture diagram

The above system represents the layered architecture of the system. Various levels of architecture are explained below.

Training Input: The system takes various the input training sets of essays and extracts featuresfrom the essays. The features are then passed to various machine learning algorithms for the classifier to learn and generate patterns and this way the classifier is trained.

Input: The essay to be evaluated is then passed to the classifier.

Output: The evaluated essay is given a score is compared to the humansgraded score. The error in the scores is calculated and error rate is called Kappa.

Visual Representation: User could pass some queries to generate reports for generating visuals of various students or questions depending on the queue series passed by the user.

3. TESTING

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Testing is the process where the test data is prepared and is used for testing the modules individually and later the validation given for the fields.

3.1 System testing

Testing has become an integral part of any system or project especially in the field of information technology. The importance of testing is a method of justifying, if one is ready to move further, be it to be check if one is capable to with stand the rigors of a particular situation cannot be underplayed and that is why testing before development is so critical. When the software is developed before it is given to user to user the software must be tested whether it is solving the purpose for which it is developed. This testing involves various types through which one can ensure the software is reliable. The program was tested logically and pattern of execution of the program for a set of data are repeated. Thus the code was exhaustively checked for all possible correct data and the outcomes were also checked.

3.2 Module testing

To locate errors, each module is tested individually. This enables us to detect error and correct it without affecting any other modules. Whenever the program is not satisfying the required function, it must be corrected to get the required result. Thus all the modules are individually tested from bottom up starting with the smallest and lowest modules and proceeding to the next level. Each module in the system is tested separately. For example the job classification module is tested separately. This module is tested with different job and its approximate execution time and the result of the test is compared with the results that are prepared manually. Each module in the system is tested separately. In this system the resource classification and job scheduling modules are tested separately and their corresponding results are obtained which reduces the process waiting time.

3.3 Integration testing

After the module testing, integration testing is applied. When linking the modules there may be chance for errors to occur, these errors are corrected by using this testing. In this system all modules are connected and tested. The testing results are very correct. Thus the mapping of jobs with resources is done correctly by the system

3.4 Acceptance testing

When the user fined no major problem with its accuracy, the system passers through a final acceptance test. This test confirms that the system needs the original goals, objectives and requirements established during analysis without actual execution which elimination wastage of time and money acceptance tests on the shoulders of users and management, it is finally acceptable and ready for the operation

4.1 Challenges involved with Autonomous Cars

Without any doubt, it is clear the various advantages of this driverless car like giving the source of mobility for non-drivers and decreased the driving stress for the driver, but along with these useful effects, there are numbers of challenges and difficulties that are involved in the implementation of this technology. Following are some of the major issues associated with the driverless cars

1. Cost

Various cars manufacturers had to spend a huge amount of money for designing these autonomous vehicles. The example Google can be considered where they are paying around $80,000 for one of their AV model, which is totally unaffordable by the ordinary company or the person. According to the future predictions, it is estimated that this price will come down to the half, which is still more to be afforded.

According to the recent survey done by the JD power, which concluded that in the future 37% of the people will choose autonomous car as their next vehicle

2. Infrastructure

Although many big companies like BMW, Audi, Nissan etc has done a commitment to introduce driverless car, the infrastructure like roads is not up to date to that level where these cars could be compromised to launch. According to one report, it will take another 10-15 years to develop a certain type of infrastructure. Companies are really focusing to invest such a big amount with something in return

3. Replacing Conventional Cars

This is one of the biggest challenges which is being faced by the experts, replacing old conventional car would be required to increase the efficiency of the autonomous cars. If the old cars are left over under the same platform then this may lead to unpredictable results for the autonomous car and compromises the security during its interaction with the other cars.

4. Security Concerns

Security and privacy are always being the biggest issue associated with the electronic system. Autonomous cars are based on the AI system, where it also requires a source of Internet for managing and information exchange, and this is the compromise medium which can be abused by the hackers. The second major concern is the involvement of terrorist activity where this platform of the driverless car can give a favorable place where they can perform their suicide mission. And as this car is depending on GPS system, so anyone can get itself into it to use it for the bad purpose

5.1 CONCLUSION

Transportation professionals have a important roles to play in autonomous vehicle development and deployment. We can help define the performance standards they must meet to legally operate on public c roads. We should evaluate the risks and opportunities they present, and develop policies to ensure that their deployment supports strategic community goals including congestion reduction, public safety and health, and improved opportunity for disadvantaged people. Once they become more common they may affect road, parking and public transit planning decision

Recent announcement that autonomous vehicles will soon be commercially available raise hopes that these technologies will quickly solve many transportation problems. Some advocates predict that by 2030 such vehicles will be sufficiently reliable and affordable to displace most human-operated vehicles, providing many benefits to users and society overall. However, there are good reasons to be skeptical. There is considerable uncertainty concerning autonomous vehicle benefits, costs, travel impacts, deployment speed and consumer demand

Driving a vehicle on public roads is complicated due to the frequency of interactions with other, often-unpredictable objects including vehicles, pedestrians, cyclists and animals. Most objective experts acknowledge that significant progress is needed before autonomous vehicles can operate reliably under all normal conditions, including mixed urban traffic, heavy rain etc. Autonomous operation will probably add significant equipment, maintenance and mapping costs.

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