Global Journal of Engineering Design & Technology

Extended Abstract

Navigating a Driverless World

Kumar K

Abstract

In the recent years there has been a tremendous advancement in the autonomous sector resulting in development of autonomous car or driverless cars. The research paper focuses on features of this car and on its practical implementation in developing countries. The points taken into account include issues for its implementation in developing countries as they differ from that of developed countries. The paper includes security features of the car, the problems faced due to the geographical conditions among various areas as well as cultural background (social issues), high speed internet connectivity, fully mapped global terrain, ability to fetch real time traffic data through internet, non-availability of standardized road network and weather interference are the key issues that will be reviewed and their solutions suggested in this paper.

Keywords:

Driverless; Net neutrality; Automated guided vehicle; ISP; GPS

Introduction

It is difficult to understand that the basic function of an automobile hasn't changed in the past 106 years [1]. An autonomous car also known to many as a driverless car or a self-driving car or a robot car challenges this. It is a vehicle capable of driving through the streets and roadways, fulfilling its transportation capabilities of a traditional car without any assistance from human. It is specialized in sensing its environment through imbedded equipment and navigates from one point to other without human input. It is fundamentally defined as a passenger car with main impetuses being safety on roads [1]. An autonomous car may also be referred to as autopilot, auto-drive car, or automated guided vehicle (AVG). In cities where traffic is of great concern the situation has improved well enough. The scenario of free flowing traffic at any time of day has not been achieved yet in these cities. This problem is solved majorly by extending the roads and doing more road construction. However due to increasing density of automobiles accidents have also increased. Autonomous vehicles however has promising solution that guarantees to solve these problems by virtually eliminating traffic congestions, minimizing road accidents. It seems that self-driving vehicles may be futuristic and we are not that much technologically advanced for this to happen. But the reality is they are in prototype phase already. Their components include 360 degree sensors, lasers, learning algorithms and GPS to navigate streets in a supreme precise fashion.

Navigation and Decision Making

Powered by an electric motor with around a 100 mile range, Google's driverless car uses a combination of sensors and software to locate itself in the real world combined with highly accurate digital maps. A GPS is used, just like the satellite navigation systems in most cars, to get a rough location of the car, at which point radar, lasers and cameras take over to monitor the world around the car, 360-degrees [5]. Data from these sensors are used to render other cars are rough blocks with shifting, amorphous edges. The car doesn't need to know the perfect shape since it will never be close enough to test the accuracy of its borders. The software can recognize objects, people, cars, road marking, signs and traffic lights, obeying the rules of the road and allowing for multiple unpredictable hazards, including cyclists [5]. However these all depend on the standardization of the road network available. It may happen to handle situations like: Big potholes, waterlogging on main roads, broken barriers/dividers [6]. Without the sign boards and proper lane division, the car would have significant difficulty in understanding the traffic movement and decision making. Taking this into account with the existing road networks in developing countries like India with world's second largest road network with 4,689,842 kilometers (2,914,133 mi) in 2013. However, qualitatively India's roads are a mix of modern highways and narrow, unpaved roads, and are being improved. As of 2011, 54 percent - about 2.53 million kilometers

System model

In a four way junction and each road having eight

Kumar K*
NMIMS University, India,vsh.kumar1@gmail.com

lanes, i^{th} lane cars are generated by Poisson's distribution. In the i^{th} lane, cars are generated by Poisson distribution with expected number (arrival rate) λ_i every time slot. All assumptions are made such that collision avoidance is achieved perfectly. In each direction the first lane is for turning left, last lane for turning right and middle ones for going straight Connect

Security and Privacy

Computer drivers are vulnerable to something that human drivers are not - hackers. Information exchanged between cars or between a car and a remote computer will be vulnerable to security breaches intended to steal data or to disrupt cars' ability to navigate and make good decisions. The challenge increases with increase in number of vehicles from few hundreds to thousands and to millions to protecting data on that scale will be enormous.

Conclusion

The paper has presented that even the current obstacles are eminent, there are certain solutions present for them and even though the market penetration will not be much for first few years but later on it will set an example like smartphone industry. Just in the USA, the car puts up for grab some $2 trillion a year in revenue and even more market cap. Business opportunities created dwarfs Google's current search-based business and unleashes existential challenges to market leaders across numerous industries, including automobile industry, insurance sector, energy industry companies and others that share in car-related revenue.

References

1. **Technology Quarterly (2012) the economist look - no hands** Allister H (2013) HS2 is already obsolete: David Cameron should be preparing the UK for self-driving cars.
2. Littman T (2013) Planners are futurists with a practical bent.
3. Littman T (2015) Victoria Transport Policy Institute - Autonomous vehicle implementation predictions implication for transport planning.
4. The Guardian (2014) Google's self-driving car: How does it work and when can we drive one BST.
5. Quora SN (2011) Will driverless cars enter into countries other than major developed countries?.
6. Rahul K, Kevin W (2013) Planning autonomous vehicle in the absence of speed lanes using an elastic strip. IEEE transactions on intelligent transportation systems.
7. Chanwoo P, Jungwoo L (2011) School of Electrical Engineering and Computer Sciences - Seoul National University, Intelligent Traffic Control

Kumar K*
NMIMS University, India,vsh.kumar1@gmail.com