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IMPLEMENTATION OF ARTIFICIAL INTELLIGENCE WITHIN AUTOMOTIVE INDUSTRY OF CHINA

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ABSTRACT

In the past several decades, it has been observed that due to increase demand within the sector of advanced logistics and urban mobility, the population of the vehicles has been increasing steadily. One outcome of this increase in the population of the vehicles is the growth in traffic congestion. In every big city, including those that are important metropolitans, such as New York, Los Angeles, and Beijing, people have to bear increase problems due to high traffic congestion. According to the statistics of 2015, around forty-three major cities of China are facing the problem of prolonged time of travel, which is more than 1.5 hour per day during every rush or peak hours.

Other problems of this high traffic congestion include increasing rates of accidents that are also putting a drastic effect on the development of the economy. So, therefore, these increasing problem of traffic congestion requires an effective solution as immediately as possible. One way to deal with these problems is the implementation of AI (Artificial Intelligence) technology within the vehicles on which various organizations are currently working. So this report will provide a detailed overview of the application of AI technologies within the automotive industry of China to overcome the problem of traffic congestion.

Keywords – Artificial Intelligence, Automotive, China, Traffic Congestion, AI-Enabled Vehicles

INTRODUCTION

In the past five years, both the purchase of vehicles and the rate of accidents due to high traffic congestions have increased dramatically in China. According to one estimate, in every minute, at least one person loses his/her life because of traffic accidents around the world (Wen, Sun, & Zhang, 2014). Moreover, besides these high traffic congestions and accidents, there are various problems that people have to face every day. For instance, finding the right spot for parking in metropolitan cities during rush hours is getting more difficult for people every day (Yan-ling, Xin, & Ming-chun, 2016).

According to one estimate, more than twenty minutes are spent by the people in China to search for the right parking spot, which is highly annoying and meaningless for them (Liu et al., 2012). Another problem which is increasing due to high traffic congestions is related to the growing rate of pollution in the environment. As the number of automobiles is increasing, their emission of CO2, CO, NOx, SO2, particles of dust, noise pollution and smog have increased substantially, which are even surpassing the pollution levels that are generated from industries and are highly harmful to both the health of the people and the environment (Zhong, 2015). However, by utilizing the technology of artificial intelligence, it is possible to create more efficient vehicles within the automobile industry of China so that these above-mentioned problems can be reduced or eradicated completely (Soomro, Miraz, Prasanth, & Abdullah, 2018).

ARTIFICIAL INTELLIGENCE

John McCarthy was the person who first coined and defined the idea of Artificial Intelligence. John began his research in 1995, according to John, every aspect of human learning and every characteristic regarding ones intelligence can be analyzed and described enough to be put together in a machine (Rajaraman, 2014). Humans all around are intelligent enough to make decisions based on their experiences and the need of the hour. The concept of artificial intelligence was to make this quality of humans morph into machines so that they could make intelligence-based decisions as well. Artificial intelligence refers to strong and smart systems that are capable of investigating the problems smartly and then make decisions based upon their experience and the situation (Russell & Norvig, 2016).

The concept of intelligent systems can be divided into the following two categories:

Strong Artificial Intelligence: This refers to intellectual and logical computer processes where the systems are capable of self-learning. This is possible if the system is programmed right, good enough that makes the computer intelligent enough to make the system optimize and analyze its own behavior based upon previous decisions and their consequences (Serov, 2013).

Weak Artificial Intelligence: A system is said to have weak artificial intelligence when it is only capable of making reasonable investigations. The system does not self-learn and is not skilful enough to make smart decisions. Such systems only look intelligent but cannot function up to the standard (Nordlander, 2001).

Rich data plays an important role in making the systems intelligent. As human also need exposures to gain experience and thus become intelligent and bright, similarly the machines need data in order to become intellectual and human-like. The data helps them in processing and extracting out the essential information (Sun & Wang, 2017). In addition to data collection which is important for the development of intelligent software and systems for the sake extracting useful information out of it, data is also important to:

- Learn
- Understand and interpret information
- Behave adaptively
- Plan
- Make inferences
- Solve problems
- Think abstractly
- Understand and interpret ideas and language

ARTIFICIAL INTELLIGENCE WITHIN AUTOMOTIVE INDUSTRY

Artificial Intelligence has taken over the entire world quickly. The applications of artificial intelligence can now be noted among all the ordinary things. While it has integrated itself into every ordinary field and transformed into something extraordinary, the AI didn’t forget to touch the automobile industry. AI does a lot more than just making the vehicles driver-free.

This is because it has updated the entire automobile industry and has introduced the concepts and techniques that were once just imagination (Hofmann, Neukart, & Bäck, 2017).

Implementation of AI technologies within the automobiles utilized both modern and pragmatic methods to create efficient and smart vehicles that can function like humans or even like super-humans (Abduljabbar, Dia, Liyanage, & Bagloee, 2019). Within these AI technologies, algorithms like the network of deep neural can be created to replicate the ways by which brain carry out its functions, and they are also trained through applying computational intelligence to analyze and use a large amount of data to perform different tasks (Wang, Liu, Duan, & Zhang, 2017). These smart automobiles utilize the techniques of artificial intelligence, like path-planning, map-building, and environmental perception and combine these techniques with driving services related to multi-scale auxiliary, as well as with other related functions, in order to help automobiles in making smart decisions. These techniques are based on the implementation of machine learning or computational intelligence, artificial intelligence and automobiles that are automatically controlled (Li, Cheng, Guo, & Qiu, 2018).

WHY CHINA NEEDS AI-BASED AUTOMOBILES

As the economy of China is experiencing rapid development, it is getting increasingly important for the country to utilized intelligent automobiles. Along with the increased and sustained rise in the ownership of different types of automobiles, the problems of high traffic congestion, accidents and pollutions are growing substantially in almost every major part of the country (Lu, 2012).

For instance, every year, an increase in the number of fatal accidents due to high traffic levels are observed to result from operating errors that are made by humans. Moreover, it is expected that the rate of these lethal accidents will continue to grow in future if appropriate measures are not taken. Utilizing modern techniques of artificial intelligence can help to deal with these problems effectively (Haibo et al., 2012).

There are four important factors that are making it necessary for China to create artificially intelligent automobiles. These factors are explained as follows:

1. **Strategic Requirements:** Even though China is considered as one of the leading developing economies all over the world, but it still lacks behind in creating innovative technologies within the sector of automobiles, for example, electric vehicles. Despite this, recent developments in the technologies and techniques related to AI are providing tremendous opportunities for China to take initiatives by creating more AI-enabled automobiles (He, 2017).
2. **Transforming Business Models:** The combination of automobiles and IT has set the entire industry over a new track which is moving at a maximum pace towards the success and entirely technology-based future (Gusikhin, Rychtyckyj, & Filev, 2007). As advanced technologies related to communication are developing rapidly within the country, new modes pertaining to the models of business, for example, sharing of cars and use of applications like DiDi and Uber, within the industry of automobiles are gaining high acceptance and popularity.

All these emerging models of business requires the application of techniques related to AI in order to facilitate and arrive on effective decisions. Since the methods of application and the entire industry are transforming daily, certain business model transformations needed to keep the industry strong and robust (Wells, 2015).

3. **Artificial Intelligence 2.0:** New trends have been observed to emerge since the development of China AI 2.0, which include multi-modal technologies related to data fusion and hybrid intelligence that can help to provide a strategic advantage to the country. Moreover, creating new techniques related to AI for automobiles will also complement these strategies effectively (Pan, 2016).
4. **Societal Needs:** In China, the situations of the traffic are quite unique. For instance, in metropolitan areas, the scenarios of driving are very difficult and complicated for the drivers to make effective decisions while driving their vehicles. This has significantly increased pressure on China to adopt AI-enabled automobiles that can help the drivers to react to these changing and complicating environment of driving appropriately (Zhang, Yau, & Chen, 2013).

TECHNICAL SOLUTIONS AND INNOVATIVE ACADEMIC IDEAS

It has been observed in various parts of the world that the educational institutes have engaged themselves in the research work regarding the advent of Artificial Intelligence. Even though the concept of artificial intelligence has been in the world for quite some time, but the sudden boom has influenced people all around the world,

and that is why all the developing and the developed countries and continuously researching and expanding their knowledge upon the concept of artificial intelligence. Institutes have introduced artificial intelligence as a proper course, and therefore every day new inventions and ideas are coming forward which are being refined and revised continuously (Shabbir & Anwer, 2018). China has always been in the top countries who adopt technological changes and strive to improvise in them. China is working hard upon this concept and has set up the objective to excel in this technology course as early as possible since China has always stayed up front in the automation industry (Fischer, 2018).

In various research and educational institutes, the technology related to automotive intelligent is increasingly utilizing the latest achievements that have been made within the realms of artificial intelligence. At the start of 2015, Uber and the University of Carnegie Mellon covertly created institutions related to research and development that were centered on advanced technology in Pittsburgh to create and research on automobiles that are driven automatically (Reig et al., 2018).

Furthermore, in order to create fully automatic technologies within automobiles, Toyota Corporation, during the same year, also provided approximately $50 million to both Massachusetts Institute of Technology and the University of Stanford (Curry, 2017). Moreover, during the initial quarters of 2016, Cambridge University created the PoseNetSystem and SegNetSystem that helped to make significant breakthroughs within automobiles around the self-positioning and object-perception (Badrinarayanan, Kendall, & Cipolla, 2017).

During the same year, Oxford University also created a company called Oxbotica that creates unmanned software (Wong, 2018).

CHINA'S STRATEGY IN DEVELOPING AI-BASED VEHICLES

Automobiles based on Artificial Intelligence 2.0 is considered as the emerging development that the automobile industries are experiencing, and it is based on achieving new objectives related to the new environment where there is a varying and large amount of information (Li et al., 2016). This information related to the new environment includes the wide acceptance of connected automobiles, utilization of cross-media sensors in automobiles, large data that consist of multiple dimensions, and so forth. These new objectives are referred to as anthropomorphic interaction and learning field of driving within the thinking process which is similar to human beings (Potkonjak, Vukobratović, Jovanović, & Medenica, 2010).

Three years plan related to the implementation of Internet+ AI, made in China 2025, development plan related to thirteen five auto industry, and AI 2.0 are some of the strategic plans that were suggested by the Academy of Chinese Engineering (Li, 2018). During the year of 2016, in an opening ceremony held at Jiading, the first pilot demonstration area of National Intelligent Connected Automobile (Shanghai) was opened for testing connected and intelligent automobiles after getting approval by the Industry Minister (Li et al., 2016).

This area for the demonstration was situated in Internal City of Automobile at Shanghai that comes under the control of Shanghai Anting Town, within the district of Jiading. In order to conduct the overall test on demonstration of intelligent traffic, as well as on smart-connected automobiles,

an area having a length of around 90 square kilometres has been designated (Wang, Ma, Yin, & Yang, 2014). Within the restricted area where tests were conducted, in the first period around twenty-nine scenarios of functional tests were created. Moreover, it is estimated that around 100 of these scenarios related to the test will be created in the three year period. This will also help to discover the realization of automatic parking, bus priority, automobiles traffic warning and other related demonstration of applications on an open road that will be implemented gradually and will be integrated with intelligent lighting to administer appropriate implementations (Yin & Jiang, 2013).

At the national level, China has been observed to give increased attention to unmanned or automatic driving, by creating modern designs within the vehicle and by developing scientific plans for the industrialization and research related to the technology of unmanned driving (Zhang et al., 2016). This will also include enhancing and revising rules and regulation related to unman driving that will be done as immediately as possible. This will also comprise the provision of a protection system for the creation of unmanned automobiles, commercial implementations, and their testing (Hongbo et al., 2016).

As the control of the driver is increasingly reducing due to advancement in technologies, the attention of laws and regulations are also getting more prejudiced towards manufacturers and developer of automobiles and software, respectively (West, 2016). In the procedures related to the production of automobiles and vehicles, the ministry of information technology and industry of China is trying to create special standards for inspections to check unmanned automobiles. This will also allow them to study their conditions of access,

as well as requirements of the assessments related to the production enterprises that are present in various parts of the software programs made for unmanned automobiles. This also includes the provision of special inspection standards for products (Qu, Wang, & Yang, 2010).

In the sales process, the sectors of businesses are also making effective actions to increase supervision within the market for unmanned automobiles and regulate the sales of unmanned driving vehicles. In the case of the distribution of responsibilities for unmanned automobile accidents, the focus has been shifted on identifying the responsible party for causing the car accident due to the errors made by them (Gogarty & Robinson, 2011).

MERITS OF AI-BASED AUTOMOBILES

The vehicles may have become swifter and intelligent than ever, but underneath the plushy seats is a whole network of thoughts and hard work. The cars have become more sophisticated than ever, and this is because of the integration of artificial intelligence into the automobile industry (Petrovski, Bouchet, & Petrovski, 2013). AI-based automobiles have been observed to offer services related to information sharing so that travelling can be made safe and convenient. AI-enabled automobiles can create electronic maps and reports on the traffic by utilizing the system of global satellite positioning (GPS) depending on the current situation of the roads, like guidance regarding appropriate routes, collision warning, the safety of traffic, situations of complex roads, and traffic congestion (Falcini, Lami, & Costanza, 2017). This will allow it to attain an early forecast of the speed limit in front of the intersection, as well as the implementation of illegal cameras to monitor traffic in order to make the driving experience safe (Hansen, Boyraz, Takeda, & Abut, 2012).

Through using navigation based on satellite positioning and automatic detection, AI-enabled automobiles will be able to identify the stolen automobiles' location and routes by using the technology of GPS, so that vehicles can be tracked, searched and recovered and thieves of the vehicles can be arrested. Moreover, the conditions and performance of the automobiles will also be able to monitor automatically through the utilization of remote expert consultation in various locations that can provide guidance related to the maintenance of automobiles, etc. (Rajasekhar & Jaswal, 2015).

These automobiles will also be able to provide immediate road secure through their smart system of emergency warnings. While driving the vehicle, if an accident on the road occurs, then the driver will be able to contact the car service station or emergency services immediately by just accessing the system of telematics through emergency call button. In case the automobile is in a dangerous situation, then the vehicle's driver will be able to attain warnings and plan of response from the management department of the road traffic to ensure that the driver can be rescued safely, and lives of everyone on the road can be protected (Wang & Xu, 2018).

Artificial Intelligence has cultivated in the concept of driverless cars. The leading automobile companies have started to invest in this technology where the car would work without the need of a driver. The vehicles are designed to be intelligent enough to make decisions like humans by sensing the dangers and precautions as per the need of the hour. Driverless cars would drive cars in the same manner as humans. This is expected to change the entire concept of driving, affecting numerous industries all around the world. From public transportation to the delivery man,

all would shift towards the concept of driverless cars. However, this concept would be put into action after thorough assessments and tests (Yin, Bao, & Yang, 2010).

Since AI helps in learning from experience and this taking the best-suited measures and actions, artificial intelligence has helped in reducing the accident rates and helping the insurers in developing better and improved individual plans. The risk assessment capability has provided necessary analytics that helps in assessing the risk and developing the basis of safer driving records. Many of the companies have started to work upon this technology, reporting enhanced and harmless driving among the fleets (Frese & Beyerer, 2010).

Not only AI has aimed to transform the products of the automobile industry, but the AI has also set an objective of transforming the procedures and methods of manufacturing. With the advent of artificial intelligence into the processes of the automotive industry, not only the process time would be decreased, but a better and finer quality end product would be received. The downtime can be shortened with the use of sensors and various algorithms that would continuously monitor and supervise the equipment and manufacturing procedures (Liang, Cai, & Lu, 2011).

CONCLUSION

This report has thoroughly analyzed the literature related to the application of artificial intelligence within the automobile industry of China by reviewing its various models, as well as breakthroughs that have been made within its realms. It is expected that the application of the technologies related to artificial intelligence in automobile industries around the world (including China) will continue to enhance the ways in which vehicles operate by giving them human level intelligence (Li et al., 2016).

Artificial intelligence is no longer a concept, which was once only restricted to movies and novels. It has now become a part of each and everyone's life. We all are using the concepts and applications of artificial intelligence in our lives knowingly or unknowingly (Hofmann et al., 2017). Currently, the technology related to AI is primarily focused towards;

- The analytical processing of data, where qualified and competent decisions are to be made rapidly on a daily basis by using a large amount of data and information (Chen, Chiang, & Storey, 2012).
- Processes and functions, where constant monitoring and supervision is needed (Ghahramani, 2015).

The concept of artificial intelligence comes with its own risk and advantages. There are certain measurable risks that will always be part of artificial intelligence based systems. However, all the risks and advantages should be thoroughly and comprehensively assessed beforehand, and a sufficient number of tests and investigations should be made before the implementation of artificial intelligence concepts into the market especially automation,

as there are many lives that will be depending upon this technology (Hasan, Didar-Al-Alam, & Huq, 2011).

Within China, the current level of modernization and advancements within the information technologies are transforming the designs of the automobiles and to some extent, changing the driving habits of the people by trying to enhance the traffic safety, reducing pollution, conserving non-renewable energy and producing an effective layout for the traffic planning within the cities. These smart automobiles will continue to become more energy efficient, comfortable, safe, personalized, and environment-friendly in the near future. Moreover, the creation of these intelligent automobiles in China will be further supported and reinforced by the technologies that will be more advanced, communicative and perceptive, as well as by the creation of embedded methods (Fischer, 2018).

Currently, the creation of smart technologies related to automobiles in China is mostly focused on assistant driving services, so it might still take a little time before this technology advances in the highest levels of fully automatic or semi-automatic phase. However, the growth of the creation and implementation of modern technologies, accompanied by the formulation of relevant laws and regulations, as well as the increasing acceptance of these technologies by the people will continue to open new avenues for intelligent technologies related to automobiles. This will not only help to increase the production of these smart vehicles, but it will also aid to promote their popularity around the world (Lu, 2012).

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