An Overview of the Application on Big Data Technology in Intelligent IOV

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Abstract. The traditional automotive industry is currently moving towards intelligent and informational technology. IOV (Internet of Vehicles) technology is the latest technology which can adapt to the future. At present, IOV technology faces many unresolved technical problems, and one of the core technologies is big data technology. This paper introduces the application of big data technology in intelligent IOV, and introduces various aspects of big data technology in IOV.

1. Introduction
With the development of automotive technology, the automotive industry is moving towards intelligent and informatization. With the application of information technology and communication technology, the level of the IOV[4] has been greatly improved. At present, the vehicles and vehicles interconnection, the interconnection of people and vehicles, and the interconnection of roads and vehicles have been realized, which greatly improve the efficiency of vehicle operation, and also optimize the transportation system to promote the development of intelligent transportation. The IOV is a huge interactive network of information such as vehicle location, speed and route. Through GPS, RFID, sensor, camera image processing and other devices, the vehicle can complete the collection of its own environment and state information; through the Internet technology, all vehicles can transmit their own various information to the central processor; through computer technology, the information can be analyzed and processed to calculate the best route for different vehicles, and to report the road conditions. At present, research on BIG DATA technology of IOV is one of the important research directions.

2. Problems faced by the IOV
At present, the research work on key technologies of the IOV is at a critical stage as a whole. The technology faces many challenges. Driverless car technology is not accepted by consumers. Ordinary consumers prefer to drive car by self instead of computers. There is no unified standard in IOV technology. The nodes of the Internet are PCs and the nodes of mobile terminals are smart phone; the network of the IOV is the same as the mobile Internet, but it lacks the unified standards of the industry resulting in poor communication between vehicles; to develop a complete and efficient vehicle system, the technical difficulty is very large, and its complexity is far more than mobile phone systems; security issues are difficult to guarantee, when the car accesses the network, the problem will follow. To this end, it is very necessary and urgent to establish relevant collaborative research. Actively carrying out research on key technologies of the IOV will provide strong intellectual, technical and talent support for promoting and accelerating the development of the intelligent transportation industry.
3. Key technology of the IOV

As far as possible, technologies such as electrification, car networking, and autopilot are already in existence. To realize the vision of future transportation, on the one hand, car manufacturers and governments, urban planners, and infrastructure experts must work together to create an appropriate application environment. On the other hand, information technology is also needed to support the establishment of urban virtual information infrastructure. In the future, we should focus on the development of key technologies for the IOV.

3.1. Sensor technology

The application of sensor technology in the IOV is mainly the sensor network of the vehicles and roads. The sensor network of the cars can be further divided into an in-vehicle sensor network and an off-vehicle sensor network. The in-vehicle sensor network provides vehicle status information, such as remote diagnosis, which is needed for analysis and judging the condition of the vehicle; the off-vehicle network is used to sense the external environment of the vehicle, such as anti-collision sensor information. The camera is used to enhance safety and information as assisted driving. The sensor network of the road refers to a network of sensors placed on the road and on the roadside to sense and transmit real-time information of the road, such as traffic flow, vehicle speed, and intersection congestion. Integrating vehicle conditions and road conditions information will be an important technical direction for IOV.

3.2. Vehicle intelligent terminal technology

Like computers in the Internet and mobile phones in the mobile Internet, the vehicle terminal is the medium for the owner to obtain the ultimate value of the car network, and is an important node in the car network. At present, many car navigation entertainment terminals are not suitable for the development of IOV, and the reason is using a non-open, non-intelligent terminal system platform. For example, Google's Android is naturally born for web applications, and is designed for touch operation. It has a good experience which can be customized with rich in applications and has formed a mature network ecosystem.

3.3. Smart parking technology

The deep integration of the Internet and parking projects, the new business "smart parking" has developed rapidly in the past two years. Urban smart parking includes two aspects of hardware construction and software construction. Among them, the hardware expands the parking space of the city through the construction of the three-dimensional parking equipment; the software integrates the urban parking resources through the construction of the Internet software system. It should be said that smart parking not only optimizes the parking management link, but also reduces the parking time cost, which is the development trend of solving the parking problem in the future.

3.4. Speech recognition technology

No matter how good the touch experience, for the driver, the touch terminal system is not safe during driving, so the Speech recognition technology is particularly important, it will be the booster of the development of IOV. Speech recognition technology can be the most suitable application for the fast moving space of the car. Mature speech recognition technology relies on powerful corpus and computing power. Therefore, the development of in-vehicle voice technology depends on the network. Because the storage capacity and computing power of the vehicle terminal cannot solve the speech recognition technology of non-fixed commands, it must be to adopt cloud recognition technology based on server technology.

3.5. Cloud computing technology

In addition to the above-mentioned speech recognition using cloud computing technology, many applications and services must be provided with server-side computing and cloud computing
technologies. Cloud computing will be used in the IOV to analyze and calculate road conditions, large-scale vehicle routes intelligent traffic dispatching, and vehicle diagnostic data based on large cases. The IOV, like the Internet and the mobile Internet, must adopt service integration to achieve service innovation and provide value-added services. Through service integration, it is possible to obtain more suitable and valuable services for in-vehicle terminals, such as call center service and auto insurance business integration, remote diagnosis, on-site service reservation integration, location service and merchant service integration.

3.6. Communication technology
The IOV relies on two aspects of communication technology: short-range wireless communication and long-distance mobile communication technology. The former is RFID and 2.4G communication technologies such as WIFI and the latter is mainly mobile communication technologies such as 4G, and 5G. These two types of communication technologies are not unique technologies of the IOV. Therefore, the focus of technology development is mainly on the application of these communication technologies, including short-distance wireless communication applications such as highway and parking garage automatic payment, wireless device interconnection, and VOIP applications.

4. Internet of Vehicles Key Technology
The transportation industry is the big data industry, and the traditional static data is not big data, such as the basic information of people, cars, and roads. The rapid rise of the IOV, the popularity of 4G and 5G wireless networks, the amount of industry data has begun to increase in number. Big data still faces many problems in the development of intelligent transportation industry, IOV urgently need high-speed data mining analysis methods to conduct real-time and reliable analysis of traffic data to provide real-time traffic information for cars, and also provide information support services for traffic management departments.

4.1. Map Reduce Technology Based on Hadoop Framework
Hadoop is a software framework for distributed processing of large amounts of data, and Map/Reduce is Hadoop's core computing model, which abstracts the parallel complex computing process on large clusters into two functions. Hadoop implements a distributed file system (HDFS). HDFS is highly fault-tolerant and is deployed on low-cost hardware. And it provides high transfer rates to access application data, suitable for applications with very large data sets.

4.2. Data Warehouse Technology
The data warehouse is a structured data environment for decision support systems (DSS) and online analytical application data sources, researching and solving problems such as obtaining information from databases. Data warehouses are characterized by topic-oriented, integration, stability, and time-varying. Its main function is to systematically analyze and organize the data storage architecture unique to the organization through the online transaction processing (OLTP) of the information system. In order to facilitate various analysis methods, data warehouse can be used to many scenes such as online analysis processing (OLAP), data mining, and support for the creation of systems, decision support systems and executive information systems (EIS) to help decision makers quickly and efficiently analyze valuable information from large amounts of data. It facilitate decision making and rapid response to external environmental changes to help build business intelligence.

4.3. Central Data Register Technology
The central data registry system is the basis for unified management of platform data and integrated traffic information services. It includes data representation and interaction related to traffic information, traffic information services, data dictionary and message templates suitable for integrated traffic environment, and definition rules for traffic data items. It also include registration and management mechanisms, etc.
4.4. GIS technology
GIS application technology is the supporting technology of traffic geographic information system. It can provide efficient information inquiry function and massive storage function for traffic information service, including taxi, bus, comprehensive traffic video and other data. Web GIS providing excellent user experience. The engine allows users to enjoy browser-based traffic information services.

4.5. Big data preprocessing
The big data pre-processing technology further processes the data of the access platform according to specific business rules which include checking the validity of the accessed data and cleaning the big data. The big data standardization processing technology takes the cleaned data from the database and converts the data format of the external system into a standard format defined by the platform according to business rules.

4.6. Data fusion technology
Big data fusion processing technology refers to multi-source traffic information fusion method, combined with feature fusion technology and multi-target tracking Information fusion technology to improve the robustness and reliability of information systems. Multi-source traffic big data information fusion is divided into three levels: the basic level is data level fusion, which only completes data pre-processing and simple association; the second level is feature level fusion, which is based on the characteristics of existing data to predict traffic parameters; The third level is state level fusion, and the traffic state is judged based on the current traffic flow information. The basic processes of traffic flow information fusion include multi-source information extraction, information preprocessing, fusion processing, and target parameter acquisition and state estimation.

4.7. Distribution and subscription technology
Massive traffic big data has the characteristics of large amount of data, frequent updates, and high timeliness. It often requires real-time data from other systems to support its business logic. For example, the GPS data of vehicles, the current road condition analysis of urban roads, the queuing monitoring analysis of toll stations, the satellite positioning network monitoring system, the monitoring and analysis system of the operational vehicle safety supervision system require data shared by external units.

5. Conclusion
IOV technology is currently developing rapidly, and big data technology, as one of its core technologies, has an important impact on the development of IOV. With the development of big data technology, the IOV is innovating in the direction of intelligence, platform and integration.

Acknowledgments
This work was financially supported by the Applied Research Project of Education Department of Sichuan Province (18ZB0280).

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