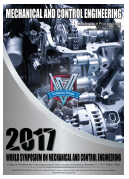
ISBN: 978-1-948012-06-5

Contents List available at VOLKSON PRESS

World Symposium on Mechanical and Control Engineering (WSMCE)



INTERNET OF VEHICLES DATA SERVICE SYSTEM BASED ON CLOUD PLATFORM

Xiaolan Xie[1,2], Qiangqing Zheng[3], Zhihong Guo[4]

[1]College of Information Science and Engineering, Guilin University of Technology, Guilin, Guangxi Zhuang Autonomous Region, China
[2]Guangxi Universities key Laboratory of Embedded Technology and Intelligent Information Processing（Guilin University of Technology）,China
[3]College of Information Science and Engineering, Guilin University of Technology, Guilin, Guangxi Zhuang Autonomous Region, China
[4]College of Mechanical and Control Engineering, Guilin University of Technology, Guilin, Guangxi Zhuang Autonomous Region, China
**Corresponding Author Email: 819789214@qq.com*

ARTICLE DETAILS

Article History:

Received 02 october 2017
Accepted 06 october 2017
Available online 11 november 2017

Keywords

Internet of vehicles, BDS, Automotive hardware, Hadoop

ABSTRACT

The technology of Internet of automobile is designed to solve problems in field of transportation about safety, efficiency and environment. The system is based on data supplied by hardware in vehicles, design a mobile client APP and a management system for sellers through cloud computing, mass data distribution technology, which achieve the automobile driving data collection and analysis, fault reminders, track search, vehicle positioning, tips information release and other functions, and also achieve the intelligent analysis of automobile driving data. To some extent, the technology solves the problems such as automobile mileage not clear, hard to locate the automobile location, complicated ownership transfer, unable to self-help troubleshooting, hard to find the nearest repair point and so on.

1. INTRODUCTION

With the development of the Internet and mobile communication technologies, the Internet of Things (IoT) has been applied in the field of intelligent transportation, therefore the automobile mobile Internet of Things, which can also be called Internet of automobile [1]. The Internet of automobile achieve people, automobile and roads' condition to be interactive, by hardware loaded on the automobile special equipment, through radio frequency identification technology, network technology, control technology, wireless communications technology, smart technology and so on. Additionally, Internet of automobile can collect data and attribute taking advantages of Internet technology, thus control the automobile driving in real time. The terminal of Internet of automobile is information transmission equipment, which has intelligent sensing capabilities. The core technologies of Internet of automobile are GPS, electronic map, barcode or QR code, big data, cloud computing, mobile Internet system, which relate to enormous industrial chain [2].

2. TECHNICAL RESEARCH

The system is a combination of integrated software and hardware system, beidou navigation satellite system, mass data fast access technology, data classification technology, remote vehicle data collection and problem-solving mode and message push technology [3].

2.1 Automotive hardware data transmission technology

The technology relies on interactive design of hardware protocols to classify and code the information collected by hardware in automobile [4]. Using the application layer network transmission protocol of HTTP or SMTP and mass data storage system to establish reliable TCP-based connection database, making the automobile hardware information collected to the massive data storage system.

2.2 Establish a cloud serve platform based on intelligent Internet of automobile with Beidou Navigation Satellite System

By using BDS-- Beidou Navigation Satellite System and the terminals equipped in construction machinery vehicles, remote information such as the geographical position, movement, working status and alarm status of construction machinery [5]. At the same time, achieving big data mining, remote monitoring, fault diagnosis and Technical support and push messages through PC, smart phone, multimedia automobile terminal and platform docking form.

2.3 Massive data quickly access technology

Data storage uses HDFS, the core component of Hadoop, as a distributed storage system for files. With the features of high reliability, high universality, high scalability, high transmission rate, high fault tolerance and high-capacity storage, cloud storage service helps to solve the huge data storage problem of enterprises and reduce the cost of implementing distributed file system [6]. Through the integration of a large number of different types of storage devices in the network, the data in the file system can be accessed in the form of a stream to solve the access speed and security issues, and to realize the storage and management of massive data to provide data storage and service access to the outside.

2.4 Cloud computing technology

Compared with the traditional stand-alone software development method, the distributed software development and deployment on the cloud architecture is characterized by being convenient, easy to migrate and easy to expand. Calls and integration by the distributed cloud-based system Storage technology on cloud open platform API are used to meet needs of large-capacity data storage.

2.5 Design and development technology of software and hardware adaptation process of the underlying communication software

while develop the Web-based vehicle backstage management system, explore the use of JavaEE Web technology, MySql database to build backstage management system. With background data Distributed storage on cloud platform, the system performs a high throughput, high concurrency and high throughput data access performance. Development of mobile phone client APP software varies from system to system. In order to ensure the compatibility of the platform, the system focuses on the development of an APP module for data reception on a mobile terminal platform. The system uses a layered design and a SDK provided by Google to develop a mobile client for the Android system, making it a leading automotive remote diagnostic and data analysis of App products.

3. HARDWARE DESIGN

Designing and developing the hardware equipped in automobile to collect 12 basic driving data, such as hardware number, GPS or base station data, time, driving conditions and tire pressure and so on. The module structure is shown in Figure 1, and the hardware circuit board design is shown in Figure2:

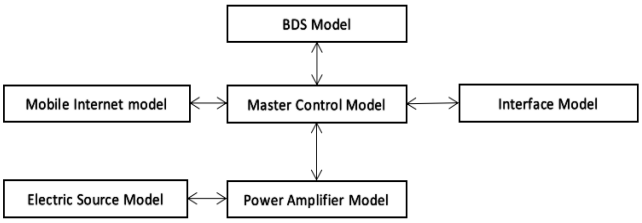


Figure 1: *Module structure*

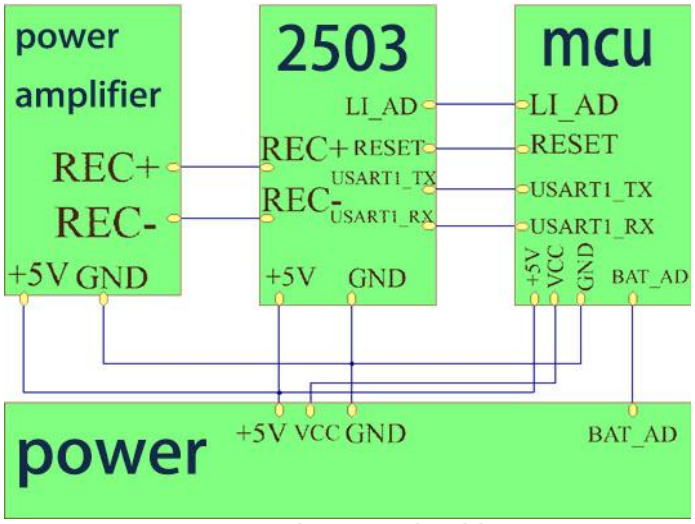


Figure 2: *Hardware circuit board design*

Amplifier module is to achieve voice broadcast function;2503 module is to achieve mobile network and GPS positioning function; MCU as the master unit is to complete the coordination of each module; The power source provides the wide input, ranging from 12V to 90V for input.

4. SYSTEM SERVICE PLATFORM ARCHITECTURE DESIGN

System service platform is divided into four modules, namely automobile hardware information acquisition system, mass data storage system, automotive background management system, mobile App software system. System service platform architecture design is shown in Figure 3:

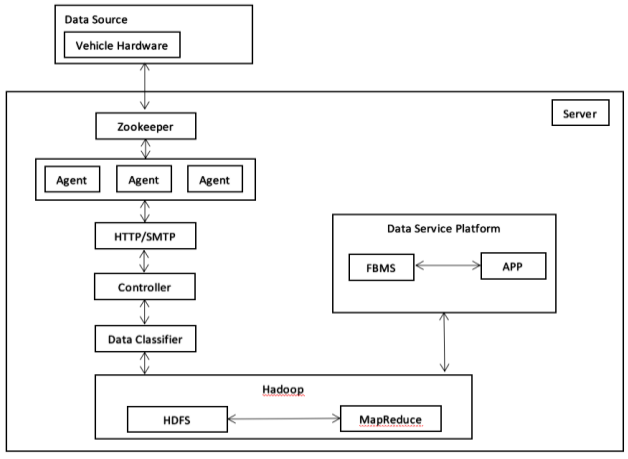


Figure 3: *System service platform architecture design*

4.1 Development of information collecting system for hardware equipped in automobile

Automobile driving data collection is the basis for the realization of automobile service. Through modern technology the development of information collecting system for hardware equipped in automobile can collect data up to 12 kinds, providing basic data for driving data collecting service to analyze. At the same time, the collected driving information is classified and analyzed by modern mathematics and fuzzy theory based on the collected data, and the driving information is transmitted to the server in real time to realize the intelligence of driving information processing, the automation of data statistics, the precision of positioning, the fault information network Integration of driving information, to ensure traffic safety.

4.2 Design and development of automotive background management system

Through the transmitted data from hardware equipped on automobile, achieving fast storage and intelligent data analysis. With the collection of various automobile driving information, analyzing data including track queries, user queries, sales information, which allows customers to grasp the real-time sales of vehicles and the specific location of the vehicle, and quickly query the vehicle trajectory, location, users and other information, and provide tips, repair, common problems and other functions, enhance the user experience of automotive users.

4.3 Design and development of automotive mobile client App software system

The software allows users to view their bound automobile information, including mileage, average speed, battery power, estimated mileage, driving time and other information. Users can also use the software for user registration, automobile binding, automobile transfer and other operations. At the same time, the software can locate the automobile in real time, showing its driving trajectory and other information to enhance the safety of the automobile.

4.4 Automobile service platform demonstration

Using self-developed vehicle hardware for information collection, completing the mobile client APP software, background car management system, mass data storage system. Build a system based on automotive hardware technology and mobile phone APP, providing functions such as after-sales service point search, tips information release, a key feedback, driving data collection, fault analysis/reminder, vehicle positioning and so on. Establish a convenient Information acquisition and communication platform for the owners and service providers.

5. EXPERIMENT

The system integrates electronic information technology and traditional automobile products effectively and can be widely used in vehicle positioning, track search and vehicle fault detection, which can enhance driving safety, help the owner to monitor the vehicle position in real time, and quickly find a maintenance point when a fault occurs.

Based on the automobile hardware, the system uses the modern information technology such as cloud computing technology, mass data distributed storage technology and data classification technology to develop the Internet of automobile service system and build an Internet of automobile service platform based on the hardware. This system based on the combination of hardware and software development of Internet of automobile service system has a certain forward-looking; due to it deployed on a cloud platform, by using the core components of Hadoop, HDFS file system, establish a data storage system and design efficient database, which are especially convenient for real-time positioning and trajectory query module, owing to which this database table is designed at the expense of some storage space at the expense of building a dual traffic information table, it can access data quickly. Comparison of Retrieval Response Times is shown in Figure 4:

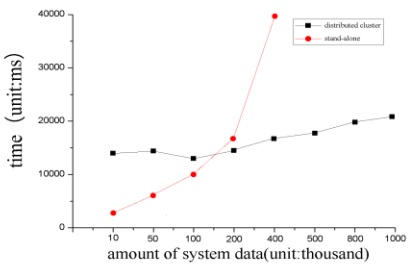


Figure 4: *Comparison of Retrieval Response Times*

Although there are large number of cars and the huge amount of data sent by the vehicle hardware, the distributed cloud platform can solve the problems of high traffic, high concurrency, data high throughput and other issues pretty well.

6. CONCLUSION

The system is aimed at solving the problems such as automobile mileage not clear, hard to locate the automobile location, complicated ownership transfer, unable to self-help troubleshooting, hard to find the nearest repair point and so on, and is to build to eliminate the unfairness between owners and service providers due to cognitive differences in the technical expertise and improper services. The system is designed and developed to provide data acquisition function, further build a internet of vehicles data service system based on cloud platform. These all are developed to achieve automobile driving data collection and analysis, remote reading, fault reminder, common problems, self-analysis and troubleshooting, tips information release, one-button feedback, car big data collection, sales information collection and statistics, which helps achieve the intelligent analysis of the vehicle driving data, which can effectively promote the effective integration of electronic information technology and traditional automotive products, and additionally accelerate the transformation and upgrading of automotive information service industry.

ACKNOWLEDGEMENTS

This research work was supported by the National Natural Science Foundation of China (Grant No.61762031), Guangxi Key Research and Development Plan(No.2017AB51024),Scientific research and technology development project of Guilin(Grant No.2016010202),GuangXi key Laboratory of Embedded Technology and Intelligent Information Processing.

REFERENCES

[1] Gerla, M., Lee, E. K., Pau, G., Lee, U. 2016. Internet of vehicles: From intelligent grid to autonomous cars and vehicular clouds. Internet of Things 16 (2), 241-246).

[2] Salahuddin, M.A., Al-Fuqaha, A., Guizani, M. 2015. Software-defined networking for rsu clouds in support of the internet of vehicles. IEEE Internet of Things Journal, 2 (2), 133-144.

[3] Sagstetter, F., Lukasiewycz, M., Steinhorst, S., Wolf, M. 2013. Security challenges in automotive hardware/software architecture design. Design, Automation and Test in Europe Conference and Exhibition pp. 458-463. IEEE.

[4] Leng, Y., Zhao, L. 2011. Novel Design of Intelligent Internet-of-Vehicles Management System Based on Cloud-Computing and Internet-of-things. 2011 international conference on electronic & mechanical engineering and information technology, 6 (2), 3190-3193.

[5] Li, M., Qu, L., Zhao, Q., Guo, J., Su, X., Li, X. 2014. Precise point positioning with the beidou navigation satellite system. Sensors, 14 (1), 927.

[6] Shvachko, K., Kuang, H., Radia, S., Chansler, R. 2010. The Hadoop Distributed File System. MASS Storage Systems and Technologies (pp.1-10). IEEE