Development of Pure Electric Vehicle Fault Diagnosis System Based on Virtual Reality Fusion Technology

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Abstract. At the present stage, pure electric vehicles are developing rapidly, and all aspects of pure electric vehicles have been developed comprehensively. However, there are still some problems in the fault diagnosis system of pure electric vehicles. The fault diagnosis system of pure electric vehicles can not meet the needs of consumers. Therefore, at the current stage, the development of fault diagnosis system for pure electric vehicles is a problem. The appearance of virtual reality fusion technology can help the development of pure electric vehicle fault diagnosis system. This paper mainly discusses how to develop the fault diagnosis system of pure electric vehicle based on virtual reality fusion technology.

Keywords: Pure Electric Vehicle, Virtual Reality Integration Technology, Diagnosis System

1. Advantages of virtual reality integration technology in intelligent manufacturing

There is no unified definition of virtual reality fusion technology in academic circles. A widely used definition is to establish a virtual model in physical space, use this virtual model to collect data from physical objects in the real world, and monitor and track the state of these objects. Another relatively simple explanation is that virtual reality fusion technology is to convert objects in the physical world into digital entities collected in the virtual world.

The functions of real control and virtual control need to be discussed from various aspects. First of all, digital twins need certain control functions to form an available CPS. On the other hand, the actual controlled virtual machine needs to form the effect of synchronization with the virtual digital virtual body which exists under the digital drive in the digital world. However, in the real world, virtual control things need to ensure that the running state of the machine is within the normal range, and the means of regulation is the components of the digital virtual machine. In the whole process of regulation and control, the real world and the virtual world blend with each other, and the physical entities and virtual information entities interact with each other. This can effectively improve the speed of resource optimization and the level of resource allocation, which belongs to the research part of the information society that has been paid more attention to at the present stage.

The manufacturing process of intelligent virtual reality fusion technology is of great significance. First of all, the process of intelligent manufacturing can gradually improve the management level of industrial production sites to a certain extent. In the process of industrial site management, the use of
virtual reality fusion technology can materialize the interaction between workers and machines, and give timely characteristics to optimize the level and process of interaction. This makes this technology have good research significance.

The research on virtual reality fusion technology in China is still in its infancy, although it is still insufficient, but it is also gradually reflecting its advantages. First of all, the project of virtual reality fusion technology in China that is easy to understand is China's high-speed rail construction project. In 2015, China carried out a major technological transformation of the high-speed rail project. As a result, it is obvious that the revamped high-speed rail has not only improved in terms of speed, but also greatly improved in terms of customer evaluation and revenue. This shows that China's virtual reality fusion technology has reached a practical level.

On the whole, with the rapid development of China's manufacturing industry, especially after the reform and opening up, China's manufacturing industry has undergone several major transformations. These different stages of development have brought vitality to China's manufacturing industry. The first transformation is digital manufacturing, at this stage, the machines of China's manufacturing industry began to use computer technology, and the use of digital technology centered on this technology also indicates that China's manufacturing industry is developing in a new direction. to generate new vitality and momentum. The second stage is networked manufacturing. China's manufacturing industry began to shake hands with the Internet and join forces, thus achieving a major breakthrough in technology, providing a shot in the arm for the development of China's manufacturing industry. The third stage is also what we are going through now. China's manufacturing industry has entered the stage of networked intelligent manufacturing. Now is not only the information age, but also the era of artificial intelligence. A variety of artificial intelligence technologies are developing rapidly, including a variety of algorithms, deep mining and cloud computing and other technologies have been applied in various aspects. These technologies also add wings to the development of China's manufacturing industry and help China's manufacturing industry to carry out a new era of development. Artificial intelligence technology is better than precision, so it can help reduce the waste of resources, meet the needs of saving, and ensure that the allocation of resources is within a reasonable range[1].

2. The current use of software and hardware in the teaching of pure electric vehicle maintenance

At this stage, the development and use of automobile software based on virtual reality fusion technology has become more extensive. In particular, the maintenance software of pure electric vehicles and the simulation teaching software about engines provide great help for the teaching and development of China's automobile industry. In fact, the practical teaching of some physics aspects of the engine treadmill has been widely used in colleges and vocational schools, and the use of software has been deeply rooted in the hearts of the people. But relatively speaking, the hardware and software of virtual reality fusion technology still operate independently, and there is no opportunity to combine them. As a result, in the teaching process of the automobile industry, it is difficult for students and engineers to combine the instructions on the virtual software with the physical objects in real life and what they are going to do. This has brought some difficulties for the teaching development of the automobile manufacturing industry.

In other countries, the acceptance and popularity of virtual reality fusion technology has been very extensive, and the utilization rate of this technology in teaching is very high. Especially in Germany and other developed countries, virtual reality fusion technology has been widely used in all aspects, and has produced great benefits, which is highly sought after by engineers and professional teachers[2]. As mentioned earlier, in China, the development and start of virtual reality fusion technology is relatively late, so it is still in an initial stage of development. Although the use of virtual reality fusion technology has begun to take shape at this stage, it will take some time to achieve the same technology popularity as Germany and other developed countries. As far as China's technological development is concerned, there are several dilemmas that must be solved. First of all, the combination of the virtual
world and the real world is not close enough, there is still a gap between the two, it is difficult to become a whole. China's virtual reality technology is more focused on dividing objects into independent individuals and combining them in the process of use and in the space of application. After use, the distance between the two will return to the original state. This leads to the problem of fault in the combination of virtual reality technology.

In addition, China's virtual reality fusion technology needs to use an information channel to transmit the information between the virtual world and the real world. However, projects related to virtual reality technology in China often have the problem that communication channels are difficult to use, which leads to frequent failures in data transmission. This defect also hits the real-time performance of the data. The virtual data used in the technology is not the data generated in real time, but the data that is delayed for a period of time after the virtual machine is generated. Finally, due to a variety of difficulties and the above defects, China's virtual reality fusion technology can obviously see the embryonic form of development, but it is only an embryonic form. The technology has not formed a certain climate in China, and the application scale is still very small.

3. Planning and implementation of virtual reality integration technology

With the development of electronic technology, in fact, electronic technology should be integrated with the actual operation of a technology[4].

The whole training software system of pure electric technology is mainly composed of a number of small components. It includes remote control module, transponder, multimedia simulation teaching software, embedded software and the overall training platform of the engine. These software systems are usually used in fault diagnosis and maintenance of automobile industry. The development of the whole system is also based on the combination of virtual reality technology, that is to say, the development of the system and software will be combined in two different engine learning environments in the virtual world and the real world, and then teach the students in the synthetic environment[5].

From the point of view of software and hardware, the training software system of pure electrical technology is mainly controlled by multiple software and hardware. First of all, the hardware system mainly includes computer, network, projector and other multimedia infrastructure. All the multimedia facilities can ensure the organic integration of the virtual world and the real world of teaching, so as to make teaching more real.

Secondly, compared with the hardware system, the development of software system is the top priority. If the hardware system belongs to the real world, then the software system belongs to the virtual world. The whole software system simulates the virtual data on the basis of different engines, and simulates the virtual environment. This process can achieve a high degree of integration between the virtual world and the real world. In this process, the system predicts and simulates the data of the engine every moment, and simulates the engine operation in real life. And the software system supports students and teachers to troubleshoot and repair the faults that may occur in the process of automobile repair simulated by computer. In addition, the simulation of the software system can also

![Figure 1. Structure distribution of electric vehicle.](image-url)
be used to remotely control the use of auto parts, the operation of the acceleration and deceleration system of the car and the fault lights on the whole car to be more in line with real-life settings. On the teaching platform in the past, the fault of the car is often artificially set by teachers, which sometimes produces a kind of false feeling, which is not consistent with the failure in real life. The faults simulated by the simulation software can be relatively in line with the reality, create an immersive feeling for students, and make the learning process more precise. In addition, software does not take up space in real life. As long as there is a computer, download the software to the computer, everyone can use it. In the past teaching, because there is usually only one or a small number of cars for students to use, there are often many scenes in which students have to take turns to operate the same equipment. The fusion technology of software system and virtual reality provides an effective method to solve this problem[6].

![Figure 2. Structure diagram of electric vehicle.](image)

4. Conclusion
With the rapid development of China's economy and the continuous improvement of the level of science and technology, pure electric vehicle technology, which is widely welcomed abroad, is also developing continuously[7]. In recent years, the technology has gradually got rid of the difficulties of practical operation, and gradually entered the process of industrialization and economization. As far as the current situation is concerned, the physical basis of automobile fault diagnosis technology is mainly the traditional engine vehicle. For pure electric vehicles, the fault handling and maintenance technology is still in the initial stage, and there is not much research. The development of fault diagnosis of pure electric vehicles in China still needs unremitting efforts. Among them, the pure electric vehicle fault diagnosis system based on virtual reality fusion technology provides a solid support for the professional development of pure electric vehicle fault maintenance, which is worth vigorously developing and popularizing.

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References
[1] Wang Chunhua. Common fault diagnosis and maintenance technology analysis of new energy vehicles [J]. Automotive engineer, 2020 (07): 58-59.
[2] Fan Zhiqiang. Research progress on the mechanism of runaway heating induced by internal short circuit in lithium battery of electric vehicle [J]. Times automobile, 2020 (11): 85-86.
[3] Zhou Bingwei, Xu Mingchen. Fault diagnosis of battery management system for electric vehicles [J]. Heilongjiang science, 2020,11 (10): 76-77.
[4] Cheng Hao, Bai Guojun, Wang Jilei, Zou Xinghua, Jiang Liqin. Research on standardization of battery management system for electric vehicles [J]. Automation instrument, 2020,41 (05): 19-22.
[5] Wang Xulong, Xu Yu, Li Yichao. Development of comprehensive fault detection training...
platform for electric vehicle drive motor system [J]. Automation application, 2020 (04): 148-150.

[6] Liang Yongfa. Research on fault diagnosis of lithium battery management system for electric vehicles [J]. Times automotive, 2020 (08): 60-61.