# Research on the Development Direction of Computer Software Testing Methods in the Era of Big Data

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**Abstract.** With the development of Internet, Internet of things and cloud computing, the era of big data is accelerating. In this background, higher requirements are put forward for the testing of computer software. Based on the data background, the author of the database system software testing to start a brief discussion, hope this research can play a role in promoting the development of computer software testing.

**Keywords:** Big data era · Software testing · Computer technology

## 1 Introduction

Big data refers to the data set that cannot be captured, managed and processed by conventional software in a certain period of time. It has the characteristics of large amount of data, many types of data, low value density of data and fast data processing speed. The era of big data originated from McKinsey, which pointed out that data has spread to various industries and fields. Later, Alibaba founder Jack Ma also proposed that people will enter the era of big data in the future. With the continuous progress of the times and the continuous development of science and technology, in the era of big data, hardware products are becoming more and more complex, and the scope of application is also expanding. In this context, the scale of software system is expanding, and the complexity is increasing. In order to ensure the quality and operation safety of software, the development and application of software testing technology is very important [1].

## 2 Challenges of Software Testing in the Era of Big Data

### 2.1 Oracle Problems Become More and More Prominent

The purpose of software testing is to find out the wrong operation of the software, and Oracle is to make a special judgment on whether the testing process has passed the verifiability. In the era of big data, whether it is trend analysis or graph computing, software testing has become more difficult. Big data processing mode is divided into physical mode and chemical mode [2]. Big data processing in physical mode refers to


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continuously reducing the scale of big data and fully cleaning some fixed basic attributes of data on the premise of ensuring the value of big data. This process includes many data processing methods, which can effectively realize the physical processing of big data. It can also be seen that in the physical mode, there is no problem in the big data processing test oace itself. However, in the chemical mode, there are two problems to deal with big data: one is the most important prediction; the other is fast algorithm. These two problems increase the difficulty of Oracle to a great extent, which makes Oracle extremely difficult. For example, when calculating personalized recommendation statistics, through the analysis of personalized data, we can recommend products or commodities that meet the needs of users, but it also means that half of users may not like this commodity. The chemical processing of big data can only calculate the user's liking for a certain kind of commodity, and cannot further analyze it. The appearance of this problem shows that the accuracy and correctness of the results have an essential deviation, which makes Oracle more difficult to determine [3].

### 2.2 The Traditional Test Platform Cannot Meet the Needs of Big Data Processing

The traditional method of software testing is to use the controller to coordinate the local, and to test the server pressure by sending the service request to the server. This method is very practical for the system with few servers, but after entering the era of big data, especially the emergence and wide application of cloud computing technology, the number of users of application server is increasing, its demand is also increasing, and the number of concurrent users of the system is constantly rising, which makes the system access increase rapidly. At this time, in order to ensure that the system can carry this huge amount of user access and run normally, it is necessary to test the server system. The server system test can start before the system goes online, and the test content can be fully tested first [4]. However, the traditional LAN testing method is difficult to meet the testing requirements of the server, resulting in a lot of software testing problems: first, the number of physical machines of the load generator is difficult to achieve dynamic expansion; second, big data drives cloud computing, now cloud computing adopts a large number of distributed clients, increasing the workload of software testing; third, due to the promotion of big data, the number of physical machines of the load generator is difficult to achieve dynamic expansion, The test of load generator state limits the test of system performance and increases the risk of test failure. Fourth, at present, the synchronization problem between the controller and load generator used in software testing in China is becoming more and more complex, which seriously affects the test effect of load generator [5].

It is defined as the sum of the effective sample values. These effective sample values are extracted in the corresponding interval of the maximum linear density. The estimated normal values are shown in Eq. 1:

$$R_0 = \frac{1}{m}\left(\sum_{i=i_0}^{i_0+v}\sum_i rs\right) \tag{1}$$

Because of the equal interval sampling, the sampling time is equal, and the change trend can be determined by the increment of R. Therefore, there are:

$$K_{ij-ij+1} \times K_{0j-j+1} \geq 0 \tag{2}$$

It can be transformed into the following formula, as shown in Eq. 3:

$$\left(R_{ij} - R_{ij+1}\right) \times \left(R_{0j} - R_{0j+1}\right) \geq 0 \tag{3}$$

When one of them is 0, the further determination depends on the relative increment of amplitude [6].

## 3 Development of Software Testing in the Era of Big Data

### 3.1 Adjust and Optimize Oracle Memory Area

Oracle's memory area can be divided into SGA and PGA. SGA provides buffer for Oracle database, and can realize resource sharing and data log buffering. Whether the allocation of SGA regions is reasonable directly affects the performance of database system, which is very important for the performance of database system. The database buffer can store the searched data. If the data request sent by the database user enters the data buffer, the database will directly return the received data to the user, so as to reduce the user's retrieval time [7]. If the data request sent by the database user does not enter the data buffer, it needs to use a special server to read from the data file, then convert it to the data buffer, and feed it back to the user through the data buffer, which obviously prolongs the data retrieval time. In order to ensure that users can quickly receive the data they need, it is necessary to improve the performance of the database system. Resource sharing includes two parts: database buffer and data dictionary buffer. Database buffer is used to store executed code or execution plan information, and data dictionary buffer is used to store data objects and database user permissions of database related systems. Reasonable allocation of space shared by data in these two parts can effectively improve program execution efficiency [8]. The data log buffer is used to store the modification information of the database system. If there are many log write failures in the data log buffer, it indicates that the capacity of the data log buffer is insufficient, which affects the storage of the data log and ultimately affects the formation of the database. Therefore, we must constantly adjust and optimize [9].

### 3.2 Regularly Defragment the Database

In the actual operation, the operation of the database is uninterrupted, and the operation of the relevant data is changing all the time, resulting in disk fragments in the database. Disk fragmentation is divided into three levels: table space level, index level and table level. The steps to clean up the disk fragmentation of table space level are as follows: first, export the data in the database by using table space reorganization and command operation, then delete the data in the table space by using runcate, and finally import the valid data by using mport program import mode, so as to clean up the disk fragmentation of table space level. There are two ways to clean up the disk fragments at the index level: the first is to minimize the related index data at the table space level; the second is to re create the index by transforming the relatively low frequency columns, so as to clean up the disk fragments in the index. The method of cleaning up disk fragments at the table level is simpler than that at the table space level and index level. It only needs to

reasonably configure and set the size of the system data block, and at the same time, it can effectively clean up the disk fragments by applying the relevant pcefree data parameters (see Fig. 1).

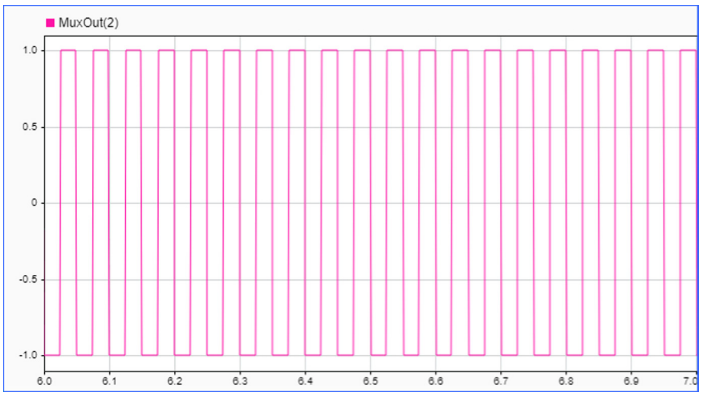


**Fig. 1.** Simulation for Regularly defragment the database

### 3.3 Improve the Accuracy of Software Test Data

The main reason for the poor effect of software testing is that the fuzzy understanding of data storage and the sending of useless duplicate requests cause the appearance of error information, which makes the accuracy of data information decline. Therefore, if we want to apply the database, we should first test the software used in the database several times, ensure the quality of software testing and the accuracy of data, and try to reduce the impact caused by data errors. In addition, relevant researchers should deeply study software testing technology. In the past, most software testers used a single software testing technology to test the software performance, and the test results were limited. Nowadays, software products have been widely used in people's production and life [10]. If the traditional single software testing technology or method is still used, the result will be too one-sided to ensure the safety and reliability of software operation. Therefore, software testing staff should further study software testing technology, flexibly use various testing technologies and methods, and appropriately use intelligent data processing technology, so as to continuously improve and perfect software testing system, gradually eliminate one sidedness of software testing, and apply diversified testing technologies in all aspects to ensure the accuracy of software testing data and information, So as to improve the efficiency of software testing and effectively avoid the "pesticide" phenomenon [11].

The software meets the requirements of relevant platforms; the software functions meet the requirements of product design and operation. Based on this, in computer software testing, we should adhere to the principle of scientific and practical. In terms of scientificity, testers should realize that there are differences in software functions and development platforms [12]. To test different software, they need to adopt more appropriate methods according to the specific situation of the software. For example, in

order to detect the software running environment and structure, white box testing method can be used to quickly locate the problems in the software structure (see Fig. 2).

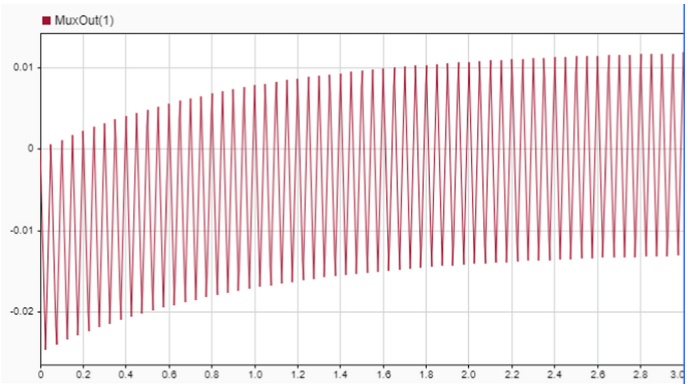


**Fig. 2.** Simulation for Improve the accuracy of software test data

## 4 Artificial Intelligence

Artificial intelligence technology is the product of the development of science and technology in our country. The main purpose of creation is to replace human by computer, use computer program to imitate human thinking, so as to replace human, reduce the use of human resources, and improve work efficiency and accuracy. Artificial intelligence is mainly the use of technical means to make electronic devices have the basic skills and characteristics of human beings [13]. In practical application, it is generally used to improve the efficiency and quality of work, or some work that can not be completed by human beings. This technology has appeared, which has brought a good role in promoting the social development of our country. Taking some large-scale production work as an example, the traditional production work requires a lot of staff to operate the machinery, overhaul the equipment, and check the qualified products. Artificial intelligence technology can replace these artificial, realize the mechanical automation in the real sense, improve the work efficiency to a great extent, and reduce the allocation of human resources, Further reduce the cost of human resources. With the passage of time, China's artificial intelligence technology has been improved and improved, it can not only replace human to complete the task, after the program system is determined, it can also control the machinery to carry out production work independently, and operate according to the design instructions [14].

The characteristic of artificial intelligence technology is that it has very high information processing ability. After getting the information, it can analyze the information content. Artificial intelligence can choose the working mode independently through information instructions, so as to carry out automatic operation. In the face of some wrong information, artificial intelligence can judge the information, prevent the impact on the work due to information problems, and send feedback information to the operator

to determine the authenticity of the instructions, so as to further ensure the quality and efficiency of work.

## 5 Computer Network Technology

Computer network technology realizes resource sharing and mutual communication [15]. It is the combination of modern communication technology and computer technology. It has certain information processing ability and plays a very important role in social economy. In order to encourage the development and training of computer talents, now computer network technology has corresponding majors. The computer network itself connects computers in different regions according to the network protocol. The connecting media can be optical fiber, cable, satellite, etc. the computer network technology itself has the function of sharing software and data, and also has certain data processing and maintenance ability for sharing data resources. Computer network technology first includes two aspects, one of which is the computer, which is often called the computer. The system setting of the computer itself is a modern electronic equipment that can automatically and efficiently process data according to the program operation. Now it has been widely used in people's daily life. The computer itself is composed of software and hardware, The common computer styles in life are notebook, desktop and so on. For network technology, it is through physical connection to connect multiple computers to form a data line to form a LAN, so as to achieve the purpose of resource sharing and communication between computers.

## 6 Advantages of Artificial Intelligence in Computer Network Technology in the Era of Big Data

Now our country's science and technology level has developed mature, each technology has also made good achievements, the development of artificial intelligence technology has also reached a certain level, if the computer network technology and artificial intelligence are combined, we can design the robot system, and realize "artificial intelligence" in the real sense. At the present stage, artificial intelligence technology in China can also be called mechanical intelligence technology, which is more applied in industrial production. Through intelligent technology to control machinery, reduce labor force, make mechanical equipment intelligent, and replace employees to do some dangerous and complex work, it can not only effectively ensure the safety of employees, It can also replace human resources and reduce production expenditure. At the same time, in the era of big data, artificial intelligence can also improve work efficiency. Artificial intelligence technology can instruct machines and robots to ensure that robots and equipment can work according to the wishes of employees. In the process of development, artificial intelligence technology is a combination of various technologies. Artificial intelligence technology involves many aspects of knowledge, The same is true of computer network technology. In the process of combining the two, the effect of the two promotes the development of computer technology in China to a certain extent. Computer network technology with the help of artificial intelligence technology, the work content that computer network technology needs to be responsible for will become complex, at the same

time, the processing ability of computer network technology will also become faster and stronger, on the contrary, the improvement of computer network technology will also help the application of artificial intelligence. First of all, after the combination of AI technology with computer network technology, AI technology will have better analysis ability, especially for those uncertain data, and the analysis process will be more stable. Secondly, AI technology has characteristics, and its integration with other devices can play a better work effect. AI technology also has excellent learning ability, Can keep up with the development of the times, conform to the trend of the times, in dealing with nonlinear ability also has a good effect. The advantages of network technology in the era of big data are shown in Fig. 3.

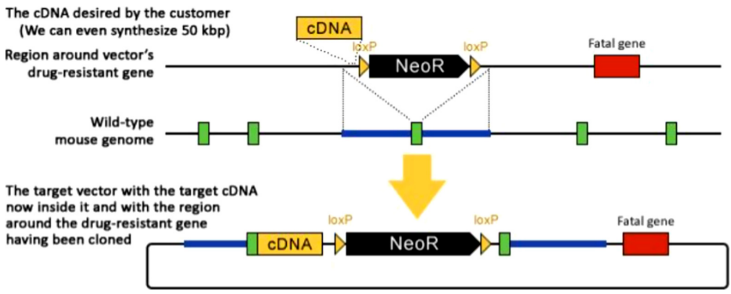


**Fig. 3.** Advantages of network technology in the era of big data

## 7 The Specific Application of Artificial Intelligence in Computer Network Technology in the Era of Big Data

Under the background of big data era, the development direction of computer network technology is constantly changing. It is in the position that computer network technology can better serve the society and the masses. Integrating artificial intelligence technology into computer network technology can achieve better application effect. Computer network technology in the process of integration can use its own expert knowledge base to build a more perfect management system, through the management system to achieve the role of management computer. Through the artificial intelligence technology, we can combine the two. When the computer network technology encounters problems, we can let the expert system automatically analyze and solve problems, so as to realize the role of automatic protection of computer network security. In this process, the computer internal system is mainly used for network management, and the corresponding evaluation system can be set to rate the management work, so as to continuously improve the application effect of computer network technology and help people solve the corresponding problems. After learning the relevant management information, artificial intelligence will save, describe and use the learning results, and set different technical methods according to different learning contents. When external factors invade the host, artificial intelligence technology can take the initiative to detect and scan the external factors, protect the system security and improve the work efficiency.

The so-called data mining work refers to a series of data information sharing and dialogue on the network, which can be analyzed by artificial intelligence technology. Artificial intelligence technology can make good use of its own technology to set corresponding standards for data application, and store the standards in its own database at the same time. When the computer system is invaded, artificial intelligence technology can extract the data information in the database, and compare the intrusion information with the stored information, so as to achieve the effect of efficient processing of information. The working principle of data mining is similar to this, its main working principle is to find the characteristics of information, so as to realize the monitoring of information, and then effectively learn the information data, and retain the learning results, so as to provide reference for data analysis.

The application of computer network technology and artificial intelligence technology in computer network security is embodied in the computer firewall. Ordinary computer firewall can play a very good role in protection, but this protection is not against some malicious attacks and hackers. In the computer network technology combined with artificial intelligence technology, the firewall technology is more secure than before, and the working effect of firewall is also higher, which can play a good role in protection. With the help of artificial intelligence technology, the firewall also has identification technology, which can well analyze the data information in the external intrusion, analyze and optimize the relevant data, so as to take corresponding strategies to protect the system security. Intelligent firewall can resist the invasion of advanced virus, ensure the security of computer operation, protect the file information and data information inside the computer system, prevent the problem of information loss caused by virus invasion, and reduce the economic loss caused by information loss. The intelligent firewall has its own intrusion detection system. When it is attacked by the outside world, it can form a report of the intrusion information, so that users can accurately understand the security level of the computer. Artificial intelligence will also specify a professional database according to the intrusion information to record the information data.

In terms of computer network security, the management work is mainly carried out from the internal and external aspects. In the internal aspect, it mainly controls the operation form of computer equipment, enhances the safety awareness and network skills of operators, ensures that people can set network specifications in the process of practical operation, and realizes the issuance of equipment instructions, so as to improve the standardization of system operation. Especially in the current era of big data, users must have a solid theoretical foundation, It has the ability of independent risk identification, and further restricts and controls its own operation behavior. In the external aspect, it is mainly to set the security protection for the operating environment of the computer equipment, such as regularly cleaning the working environment of the computer equipment, line maintenance treatment, moisture-proof treatment, etc., so as to ensure the continuity and integrity of the equipment in the process of operation. At the same time, in order to prevent the data loss problem caused by the device in an emergency, the data information in the physical server of the computer device should be synchronized in the cloud environment to establish a virtual data repository. Through the real-time synchronous data storage, a data backup mechanism should be established,

so as to effectively avoid the data damage problem during the operation of the computer device.

As a kind of information encryption technology, digital signature itself presents the characteristics of data docking, which can further prevent the problem of data mis-transmission in the process of system processing. Generally speaking, the information transmission mechanism with digital signature technology as the main body can be divided into line encryption and endpoint encryption. Through the transmission of different channels and information sources, the system has the point-to-point transmission attribute of information. In the process of data encryption, the attribute of the file can be further confirmed to ensure that the ciphertext can be transmitted in the form of encryption transformation and encryption, It is based on the user's legal mechanism to define the user's current information instruction behavior and ensure the user's current data reading behavior through permission audit, so as to avoid the phenomenon of ultra vires, match the digital information with identity authentication and enhance the transmission quality of data information.

## 8 Conclusions

In a word, the coming of big data era brings many challenges to software testing, which affects the development of software testing technology to a certain extent. In order to better solve the problems of software testing in the era of big data, as software testing staff, on the one hand, they should constantly adjust and optimize Oracle memory area; on the other hand, they should regularly clean up database fragments; in addition, they should improve the accuracy of software testing data to ensure the quality of software testing, ensure the safe operation of software, and promote the further development of software testing technology, Promote the rapid progress of China's software industry.

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