Research on Software Technology Universality of Automatic Test System Based on Work Process

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Abstract: Automatic Test System (Automatic Test System) is a system that automatically measures, processes, and displays test results in an appropriate manner. This system greatly improves labor productivity. Therefore, research on the versatility of automated test system software technology is also gaining importance. Therefore, the author has carried out related research on the application of the universality of the automatic test system software technology in the work process. It mainly introduces and analyzes the versatility of automatic test system technology. Thus, the realization of its software is discussed. It is found that with the development of computer technology and the improvement of testing content, the software technology of ATS has been further developed, and has gradually replaced the traditional manual testing technology, realizing the transformation from special testing to general testing. In addition, the development and design of ATS software technology has become the mainstream of market development.

1. Introduction

Automatic Test System (ATS) generally refers to a general term for a type of system that uses computer control to automatically perform excitation, measurement, data processing, and display and output test results for the product under test [1]. With the rapid development of modern science and technology and the increasing complexity of test content, automatic test technology has developed rapidly and has replaced manual testing [2]. And completed the transition from dedicated testing to general testing, the development and research of the universality of automatic testing system software technology has become mainstream, and also achieved certain results. The versatility of automated test systems is one of the research hots pots [3]. At present, the technology based on IVI is mainly used in the instrument driver layer to solve the generality of automatic test system. With the development of science and technology and the improvement of the complexity of testing content, manual testing technology has not adapted to the development requirements of the times, and automatic testing technology has developed rapidly [4]. The main aspect of automatic testing technology is to develop and research the software universality of automatic testing technology. At present, the technology of testing software universality is not perfect, so the analysis and research of software universality is very important, and it has important practical significance [5]. Especially for aviation, aerospace and military electronic systems, due to the high digitalization, high density and high reliability and maintainability, higher requirements are put forward for automatic fault detection of electronic systems in the working process [6]. The fault detection of electronic system is very important both at home and abroad.

With the development of science and technology, especially the development of Electronic Science and technology, the electronic system becomes more and more complex, and the requirement of reliability and maintainability of electronic system becomes higher and higher. The next generation ATS has the typical characteristics of openness, standardization, networking and intellectualization, which can meet the requirements of horizontal testing in the future [7]. With the rapid development of science and technology, the complexity of high-tech products such as aerospace equipment and military weapon systems is increasing. Traditional manual inspection and maintenance methods can not meet the support requirements of modern equipment. The Automatic Test System (ATS) is gradually becoming a necessary guarantee for the reliable operation of complex systems and equipment [8]. It can be seen from these three stages of development that

each technology update and the introduction of new standards have essentially improved the performance while pursuing the versatility of instruments and test systems as much as possible [9]. For example, the integrated control system of the aircraft as an important control unit, its technical content and functional requirements are complex [10]. Testing the integrated control system to verify that its functions are up to standard is critical to the success of the aircraft's final test flight. The automatic test system is necessary to detect faulty components of the electronic system and replace the faulty components to ensure the correct and stable operation of the electronic system.

2. Current status of software technology universality of ATS

For the versatility of the hardware technology of the automatic test system, the design principle is to maximize the resource allocation of the system itself. In the case of the combination of the test unit requirements, the system hardware platform can be built with some suiTable equipment. For the versatility of the automatic test system hardware technology, people have different understanding and understanding of this composition. The versatility of the automatic test system software is based on the software development environment, the system common test language, and the software technology. The universal language of automated test software technology is to express test information in a standardized language. The application is widely used in the ATLAS language. In the test system, the test of this language can be realized. At present, ATLAS is the most widely used general testing language. ATLAS language can ensure the realization in automatic testing system. Therefore, the realization of the universality of ATS software technology mainly focuses on the development environment of ATS software and the instrument control software technology of ATS. From the whole development process of test software technology, the research on the generality of ATS software technology mainly focuses on the instrument control software technology of ATS. However, in addition to instrument control software technology, it is more important to provide a software platform (also known as ATS software environment) for the development and operation of test programs.

The software architecture consists of four parts: system software development environment, test program development environment, test and data transmission environment and test execution environment. The relationship framework between ATS software architecture and system is shown in Figure 1.
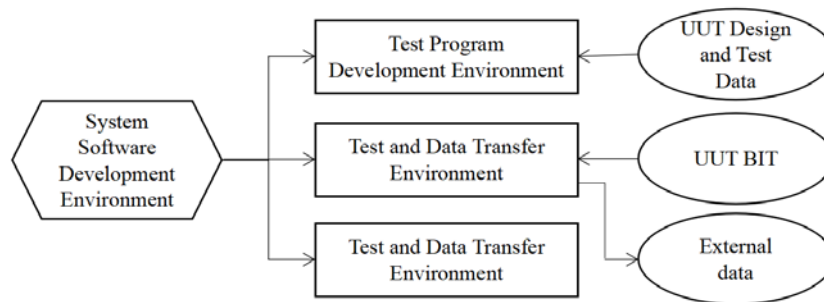

Fig.1. ATS Software Architecture and Its Relation with External Systems

From the beginning of 1960s to the end of 1990s, ATS software mainly focuses on the development of instrument control software technology. ATS software technology is based on ATS software development environment, ATS general test language and ATS instrument control software technology. ATS general test language is a standardized language to express test information. The realization of generality is also very important, mainly in the development environment of ATS software and ATS instrument control software system. At present, the instrumentation control software technology of automatic test system has been developed rapidly, and the universal technology is becoming more and more mature. In the specific design of the system, the system is first divided into structures. Structure division is to divide the system into multiple functional

modules. Each functional module performs some relatively independent functions, and each functional module is a loose connection. There is no unified concept for the understanding of the versatility of automatic test hardware, and people have different understandings of this concept. In recent years, instrument control software technology has also achieved certain development, and the realization of universality has become increasingly mature. At present, the biggest problem facing the universal implementation of automatic test system software technology is the realization of the universality of the automatic test system software development environment.

The application of the signal runs through the entire life cycle of the test application. The Signal Test Definition Criteria (STD) is the standard for ATS signal modeling and description. The tools in the ATML toolbox are shown in Table 1.

Table 1 ATS Software Platform Tools

ATML tool	Purpose
Test description tool	Test setup, grouping and sequence steps, evaluation of test results, test limits, etc.
Test description tool instrument description tool	Specify the function information of the instrument and the selection of the instrument, etc., and implement the description of the synthetic instrument.
UUT description tool	Define and describe a UUT
Test configuration tool	Define all hardware, software, and documentation when testing a UUT on a particular ATS
Adapter tool	A unique description of the interface between the UUT and the test station
Test bench tool	Describe a specific automated test bench
Test result tool	Information such as measurement results, workbench information, and environmental conditions generated by the UUT test
Diagnostic description tool	Broken information sharing supports the analysis of diagnostics and the execution of diagnostic steps
Signal tool	Provides virtual signal components for graphical representation testing needs

3. Realization of General Software Technology of Automatic Test System

The realization of software technology universality of ATS depends on the realization of software interface standardization, that is, to solve the problem of functional interface. For the generality of software resources, people have different understandings about different components of ATS. The platform of system software has the ability to generate programs automatically, which requires the platform to test for different units in order to generate programs automatically. Hierarchical design gives the method of module division. When dividing the system, not all the modules of the system are partitioned very carefully at one time, but are refined step by step from top to bottom according to the idea of hierarchy. However, at present, the automatic test system still has many limitations such as limited application range, high development and maintenance costs, lack of interoperability between systems, and difficulty in integrating new technologies for test and diagnosis into existing systems. After completing the functional interface task, the control instrument is also encapsulated, which is divided into the encapsulation of the switch resources and the encapsulation of the test resources. Encapsulation of the switch resources enables automatic switching of the test channels to control the automatic connection and disconnection of the corresponding channels. To achieve the portability and readability of the test, it is necessary to close the system unit. Due to the complexity of the system software, the acceptance information is also limited. After the test function is established, this function needs to be closed. This makes it easy to use test techniques.

The automated test software technology platform is applicable to a variety of software systems,

which is the main form of software versatility. However, under the current technical level, the test platform is still not perfect, mainly due to the impact of the test software development environment, so it is necessary to study and promote the development of this platform. The test resources are encapsulated in order to achieve readability and portability of the test program, given the complexity of the test work and the limited variety of test signals. After the instrument control function is established, it is necessary to package the test function general function for the test program to call at any time. We package the common signal, which enables the automatic test system to implement the signal-oriented software platform, and then realize the versatility. The inspection and positioning of the test system is also a very important part. The test is to check the location of the fault and fault of the electronic equipment. It should be noted that the types of electronic devices are different, the circuit structure and the functions of the devices are different, so manual detection and different research processes are required for detection. The versatility of the automatic test system software technology is mainly reflected in the application software platform can be applied to various hardware systems, facing different test units. The automated test system software development platform is capable of automatically generating test programs, but due to limitations in the development environment. The current software development platform has yet to be improved.

4. Conclusion

In summary, at this stage, there are still some technical problems in the development of automatic test system software from interface standards to design implementation. To achieve the versatility of software technology, the core is to develop tool software that can be used to build test system structure and describe test process, so-called software development platform. Due to the numerous demand pushes, the automatic test system technology has also developed greatly, and is in the process of transition from a dedicated automatic test system to a universal automatic test system. Open hardware and software architecture is always the trend of various solutions. The modularity and openness of the hardware platform is the basis for realizing the versatility of the automated test system. Because there are many problems involved in the realization of ATS universality, and there are many related studies on ATS, but they are not deep enough. At the same time, there are many problems in this paper because of the time relationship has not been involved. Therefore, efforts should be made to raise the focus of software development platform research in the field of testing and to promote the development of software development platform technology. Combining with the development mode of general automatic test system based on database, the application of signal-oriented database structure, switch system configuration and encapsulation of system instrument function based on COM can also solve the general problem of database-based test system. In conclusion, with the further development of computer technology, instrument technology, software technology and artificial intelligence testing technology, electronic testing instrument will have a bright future.

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