

Research on General Instrument Software Control based on Testing Requirement

Lianzhao Liu ^a, Lei Yu, Zhou Xu, Hui Ma, Daoyou Wang, Huimin Yang

Luoyang Electronic Equipment Test Center of China Luoyang, China

^a 303324708@qq.com

Abstract. In order to improve the development efficiency of testing software and the interchangeability of test instrument, detailed cases on the basis of summarized test requirements, based on demand-driven a new test software development model was designed by UML language. And the class diagram design method in this model was introduced in detail. As a matter of fact, the configuration of equipment testing software should be completed by this model. This model was suitable for the development of other equipment testing software.

Keywords: Testing Requirement; Requirements Analysis; Software Model.

1. Introduction

In order to ensure the accuracy of equipment test data, its technical status must be tested regularly. With the rapid development of equipment technology, there are more and more requirements for equipment test indicators and more and more diversified test requirements. The development of each equipment parameter test software requires a large number of personnel and time, and the development difficulty of special equipment parameter test software is also increasing. Its main performance is shown in the following two points: first, the test objectives are diverse, a variety of test buses coexist, according to the specific test requirements, in the comprehensive cost, indicators, application environment and other factors under the premise of the specification of the test system software and hardware structure, so that it gives full play to the best test performance is the key to the problem [1]; Second system development cost is too high, for a specific test requirements development of special test system cost a lot of manpower and material resources, even in the time and conditions allow successful development of testing system, also cannot adapt to the ever-changing test requirement in the future, must once again the development of new test system for special purpose, cycling caused great waste of manpower and material resources and other resources [2-4]. Therefore, it is necessary to put forward the parameter test software development method for general equipment, establish a demand-driven test software development model, and realize the on-demand combination configuration of equipment parameter test software, so as to further improve the development efficiency of corresponding software.

2. Requirements Analysis

In order to make the test software can be configured freely according to the test requirements, and further enhance the reusability and interoperability of TPS, needs to be sorted out the characteristics of the commonly used test system and test requirements, the test needs refinement, according to the specific tasks of test requirements configuration corresponding test project or test system software, improve test software widely adaptability of different testing requirements [5-6]. Through the analysis and research on the characteristics of common test system and test method flow of various parameters, the common test requirements are further summarized, and the corresponding relationship between different types of test instruments and test requirements is sorted out. The main concern of requirement analysis is the function module of general instrument software, which is the further elaboration and refinement of requirement description. Requirement analysis firstly analyzes the requirement description, and then establishes the model to realize the software goal. The specific test requirements can be divided into five parts, including test instrument type, basic control configuration

requirements, special test control requirements, display mode requirements and data output requirements, as shown in Figure 1.

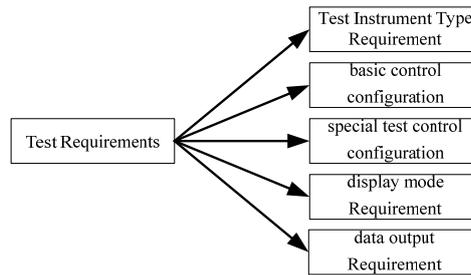


Fig 1. Summary Diagram of Equipment Parameter Test Requirements.

Test instrument type mainly includes signal source, vector network analyzer, spectrum analyzer, digital oscilloscope, power meter, such as common test instrument types, the demand directly affect the test results show that the methods, the basic control, special control load and the output of the test data selection of basic internal choose matching software function module. Taking the equipment multi-parameter calibration system as an example, the test items in different subsystems require the use of a variety of different types of test instruments to complete the test function. Basic control configuration requirements are summarized according to different types of test instruments commonly used set controls, spectrum analyzer as an example commonly used set controls mainly include frequency, sweep width, resolution bandwidth, video bandwidth, amplitude and scanning time. Special test control is loaded to generate special test control for software according to users' special requirements, such as frequency table scanning measurement, multi-control mark measurement, long-term signal monitoring, video result saving and so on. Taking the functional requirements of the multi-points scan special test control as an example, this function generally requires the configuration of multiple frequency points to be written, and then the corresponding signal source, spectrum analyzer and other test instruments are controlled through the multi-points scan button click event to complete the signal generation and test. Test data output requirements mainly include the number of indicators for test data requirements, test points and the calculation of results. As an example, it is necessary to combine the test results of multiple instruments and display the current test data in the form of DataGridView control, so as to realize the database update, report and data export of test data.

3. Prepare Your Paper Before Styling

Demand-driven means that the generation of software depends on the analysis results of user requirements. The demand analysis of users is the core of software and also one of the core steps in the software development process. Demand-driven software generation is illustrated in Figure 2. User requirements are the most basic basis and information source for software design and development. Starting from user requirements, the test requirements are described through the way of custom control combination configuration. The software generated in this way should also be the most able to directly and truly reflect users' expectations for the test software [7].

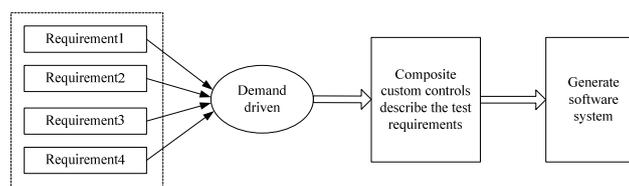


Fig 2. Summary Diagram of Equipment Parameter Test Requirements.

Demand-driven software automatic generation can overcome the current graphical virtual instrument development system often requires the user to have the hardware master the ability to understand or programmer level software design ability. The demand driven generation of virtual instrument software neither requires users to learn complex language programming like programmers, nor requires users to know a lot about the internal structure of the instrument, working principle, etc. Users only need to carry out simple functional requirements to select the corresponding custom controls, to generate test software. This mechanism can greatly shorten the development cycle of automatic control software with different test requirements, and improve the extension ability and application range of the software.

4. Modeling

The process of wrapping source-level functional code or functions into classes that implement a function is called modularity. The process of modularization is the classification and delimitation of the required functions of instrument control. Through modularization processing, the functional modules of instrument control are divided into several categories. Each category is further divided according to the differences in features or functions. In implementation is based on general instrument software combination generated the idea of data flow, all function modules on the screen to reflect, in the form of selection menu when the user to software development, complete function, according to the thought the choice of appropriate representative function module options, to realize the function module of stitching, eventually generated automatically meet the test requirements of test project or test system.

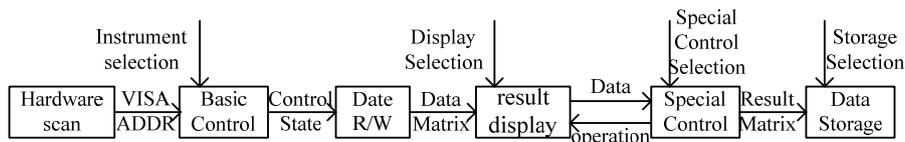


Fig 3. Demand Driven Test Software Development Model Diagram.

Through continuous module decomposition, the data flow in the scheme is automatically controlled according to the general instrument [8-10]. The automatic control process of a general instrument is divided into six basic classes: hardware scanning class, basic control class, special control class, data reading class, result display class and data storage class. The software development model of equipment parameter test based on UML is shown in figure 3. Each base class is designed with standard data stream input and output specifications, so as to meet the requirements of software for flexible configuration of 6 base classes. First, the software USES the hardware scanning class to perform the instrument hardware scanning under the hybrid bus (such as LAN bus, GPIB bus, USB bus, etc.) and obtain the string list of the hardware VISA address. After selecting the communication address and test requirements, users can generate basic control and special test control according to the test requirements, and obtain the required control command string according to the model of the test instrument, so as to realize the state control and test control of the test instrument. Using the control command and test control method obtained in the previous stage, the data matrix displaying the waveform and the required test data are obtained respectively. According to the user's selection of the display mode of test results, the result display class is called to draw the data waveform, and the parameters, point times and data of test results to be saved are obtained according to the test operation; According to the user's data saving and selection mode, parameter type, point order and other requirements, a special test data table or database is established to save and export the required test data.

- [9]. Chen Aiwang et al. Modeling analysis and design of instrument in network virtual laboratory [J]. Computer technology and development,2009(7):195-198.
- [10]. Wu Honggang et al. Research on modeling of intelligent controlled-virtual instrument development system [J]. Measurement and control technology,2008(8):21-23.