

ORIGINAL RESEARCH ARTICLE

# Lab VIEW Program Design of Public Traffic Station Broadcasting System

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## ABSTRACT

The development of traffic information for us, is a sign of the development of civilized society. This topic uses the advanced technology idea to provide a transportation information automation solution. This paper introduces the virtual instrument and its development background. Through the study and research of the virtual instrument, the software tool is used to realize the simulation of the bus station display system. The design of this topic is: the use of LabVIEW in a variety of controls to achieve the simulated bus station display station and the car temperature display, the number of current time display. The advantage of virtual instrument is used to realize the display part of the transportation terminal service system based on the operating system. Lab VIEW graphical programming interface, with a good human-computer interface, convenient hardware connectivity, it is very popular for developers; Lab VIEW technology updates quickly, I believe it not only in the traffic information will be great Application, but also in more and more areas to play a greater role!

**KEYWORDS:** Lab VIEW data processing bus station

## 1. Introduction

### 1.1. Introduction to Lab VIEW

Lab VIEW is introduced by the National Instruments Corporation, it is not only easy to develop graphical programming language, but also a widely used in a variety of systems virtual instrument platform, it can be formed with the data acquisition card virtual test equipment, we can Through the graphical language to describe the construction of its test system, easy to configure, simple design, widely used in measurement and control [1].

Lab VIEW includes hundreds of powerful graphical programming languages and text functions for measurement analysis, mathematical operations, and signal processing. Data collection, instrument control, and data display capabilities are seamlessly integrated. At the same time, Lab VIEW has a powerful hierarchical structure, the user can create a VI program as a subroutine call to create more complex procedures, and this call level is no limit. So, Lab VIEW in the engineering application to achieve a powerful function. For example: data control in industrial control, in the case of unattended automatic recording and transmission of test data; physical measurement cannot be separated from the instrument and test methods, Lab VIEW can cooperate with the completion of signal acquisition, data transmission and recording and data display features.

Lab VIEW development platform for the preparation of procedures known as the virtual instrument program, referred to as VI. The VI consists of three parts: the program front panel, the block diagram program and the icon / connector [3]. The front panel of the program is used to simulate the front panel of the real meter, set the input value and observe the output. Program on the front panel, we said the input amount for the control, the output volume for the display. We use a variety of icons to represent the amount of control and display, such as sliding rods, switches, buttons and charts, so that the front panel is intuitive to understand.

Each program front panel corresponds to its own section of the block diagram. The block diagram program is written in the Lab VIEW graphical programming language, and the block diagram program consists of ports, nodes, frames, and connections. Where the port is used to transfer data to the control and display of the front panel of the program, the nodes are used to implement function and function calls, and the frame is used to implement the structured

program control commands, which represent the data flow during the execution of the program. The flow direction of the data within the block diagram [3].

The icon / connector is the interface that the sub VI is invoked by other VIs. The icon is the node representation of the sub VI in the other block diagram; the connector represents the input / output of the node data, just like the function's arguments. The user must specify that the connector port corresponds to the control and display of the front panel [3].

Lab VIEW has multiple graphical operations templates for creating and running programs. These operating templates are free to move on the screen and can be placed anywhere on the screen. There are three types of manipulation templates, Tools templates, Controls templates and Functions templates [3].

Lab VIEW data acquisition and data analysis, data processing and expansion of the various module structures are nested in the system management VI. Data acquisition section with great flexibility, according to the actual situation to adjust to meet the different sensor voltage or current output, but also can change the signal parameters to deal with different objects [9]. Various factors determine the preparation of the acquisition process, the selection of functional modules and other issues, according to the specific needs of the corresponding sub-VI. Data analysis and data processing are responsible for post-processing of data.

System management VI function is to complete the entire test system scheduling and management, including system initialization, system settings, storage and printing and system data acquisition sub VI, data analysis and processing VI, data display and other sub-VI scheduling [11].

## **1.2. Advantages of Lab VIEW**

Typically, the use of Lab VIEW to develop applications faster than the use of other programming languages to 4-10 times faster. This is a major decisive factor in choosing Lab VIEW to develop test and measurement applications. The reason for this amazing speed is that Lab VIEW has an easy-to-use advantage. Lab VIEW provides tools to make it easier to create test and measurement applications.

The specific advantages of Lab VIEW are shown in the following areas:

1. With a wealth of graphical controls, and the use of graphical programming, the engineers from the complex bitter text programming in the liberation.
2. Built-in compiler in the user to write the program at the same time in the background to complete the compilation. So the user in the process of writing the program if there is a grammatical error, will be immediately displayed.
3. The use of data flow model, to achieve an automatic multi-threaded, which can be separated with a processor, especially multi-processor processing functions.
4. Through Lab VIEW, CIN node, ActiveX, .NET or MATLAB script and other node technology, you can easily achieve Lab VIEW and other programming language mixed programming.
5. Through the application generator can easily publish EXE, dynamic link library or package.
6. Lab VIEW provides a large number of drivers and special tools, almost with any interface hardware easily connected.
7. Lab VIEW has built more than 600 analysis functions for data analysis and signal processing.
8. NI also offers a wealth of additional modules for extending applications in different areas such as real-time modules, PDA modules, FPGA modules, data logging and monitoring modules. Machine vision module and touch screen module.

At the same time, Lab VIEW also has: affordable, easy to apply, improve the test results, open and flexible and so on.

The advantage of remote virtual instrument is that it is not geographically limited, the function can be defined by the user, and easy to build, so the use of a very wide range of scientific research, development, measurement, testing, measurement, monitoring and other fields a rare tool. It is mentioned that it can be used in high-risk areas for online data collection and detection [5]. So that the work of the survey staff not only get rid of the geographical location and conditions of the restrictions, but also through the Internet to collect the data automatically transferred to another computer to assess [8].

In addition, the use of Lab VIEW software to achieve a smart electronic scale function, with automatic calibration, accurate measurement, real-time and other advantages. The system is highly scalable, and the next step will expand its functionality, such as adding man-machine conversations, parameter setting, generating report files,

remote measurements, and so on. The system is very widely used, the production and life has a very important practical significance.

In addition, the instrument driver software is a special control of a device software. Lab VIEW has a concept of panel control, especially for the creation of instrument drivers. The front panel section of Lab VIEW can simulate the front panel operation of the instrument. The block diagram part of the software can transfer the command parameters specified by the front panel to the instrument to perform the corresponding operation. When you set up an instrument driver, you do not have to remember the instrument's control commands, but simply enter the simple data from the front panel. If you only have the software to control a single instrument, which for us is not significant significance. Its real significance is that the instrument driver can be called as a subroutine, together with other subroutines to form a huge control program to control the entire system [3]

Finally, Lab VIEW's Advanced Analysis software library includes numerical analysis, signal processing, curve fitting, and other software analysis capabilities. The software library is an important tool for the establishment of virtual instrumentation system, in addition to the mathematical processing functions, but also for the instrument industry designed a unique signal processing and measurement functions. In addition to the Advanced Analysis software library, NI offers a number of additional analysis tools, which enable Lab VIEW with more powerful analysis capabilities include:

1. Joint Time Analysis Toolbox
2. G Math Toolbox
3. Digital Filter Design Toolbox

The Advanced Analysis Library is divided into two sub-templates: the Signal processing sub-template and the Ethics sub-template. With these powerful features, it is easy for us to deal with more problems [7].

### 1.3. Research background and significance

In the high degree of traffic developed, convenient today, urban public transport system in China and the world has a pivotal position. Now most of the bus are used coin, credit card and other tickets, no longer with the ticket. Therefore, the bus station broadcast system is very important. It can let us do not have to see the bus card, you can real-time know where they are now at the same time, know the car temperature, humidity, the number of basic conditions. This system to the bus driver to reduce the burden, improve the driver's attention, to the bus service has brought great convenience. Therefore, this humane system is increasingly popular with the public, and is widely used in public transport system.

Lab VIEW graphical programming method can save most of the program development time, and its running speed is almost unaffected, Lab VIEW is generally characterized by the virtual signal generator, external devices, measured points and database resources into the network, to achieve resource sharing, common Complete the test task. The use of networked virtual signal generator, at any place, any time to obtain measurement data. Compared with the PC as the core of the virtual signal generator, the network of virtual instrument development to produce a revolution, the network of virtual instruments to achieve a single virtual instrument three functions (data acquisition, data analysis, and graphical display ) Separate processing, respectively, the use of independent basic hardware modules to achieve the three major functions of traditional instruments to connect the network cable to achieve the sharing of information resources. 'Network is the instrument' concept of the establishment, so that people clear the future of instrumentation R \ u0026 D strategy to promote and accelerate the development of modern measurement technology means and update.

This topic through the virtual instrument learning and research, the use of software tools to achieve the bus station display system simulation. To achieve the system software design ideas are: the use of Lab VIEW in a variety of controls to achieve the simulated bus station display station and the car temperature display, the number of system time display. The advantage of virtual instrument is used to realize the display part of the traffic terminal service system based on the operating system.

### 1.4. The main work done in this paper

This topic is the use of software tools Lab VIEW programming to achieve the bus station broadcast system. Including site broadcast and site display, and in order to more humane, we add some other content. Such as the initiative to take the seat of the proposal, the starting point of the station greetings, famous attractions, the car temperature, and anti-theft security reminders. Data flow-based programming is a major feature of Lab VIEW programming. Lab VIEW has a graphical editor to generate optimized editing code. Using the application generator, the user can generate virtual instruments, just like a separate executive program.

The use of virtual instrument software in a variety of independent program structure, such as the loop structure, the various functional modules to isolate the package, so that you can ensure that the information between the various modules do not conflict, for the future to achieve more features pave the way

## **2. System design**

### **2.1. Design analysis**

Through the study of this subject, it is found that the focus of this topic is to realize the function of each control by programming. Technical difficulty is the realization of each control, virtual instrument user interface to achieve.

Lab VIEW graphical programming is based on modern software object-oriented technology and data flow technology developed. The data flow program designation means that an object is only executed when all inputs are valid, and the object output is only valid when the object's function is complete. This paper mainly uses Lab VIEW data stream programming to realize the function of each control.

Lab VIEW uses graphical programming methods to provide developers with a lot of convenience. And automatically compile, if the user in the process of writing a grammatical error, he will be immediately displayed. The EXE, dynamic link library, or package can be published through the application builder. Lab VIEW has built more than 600 analysis functions for data analysis and signal processing. NI offers a wealth of additional modules for extending applications in different areas. Because Lab VIEW has a powerful feature, we use Lab VIEW to implement programming, simulation and acquisition of relevant data, real-time display, broadcast bus station information, and the car temperature, humidity, time and other related information, voice prompts and display will become Simple and practical.

### **2.2. System implementation method demonstration**

After the need to solve the problem analysis, the core is 'the use of Lab VIEW tools to achieve the bus station information broadcast and display.' So, where should we come from?

Lab VIEW is an advanced visual programming software, in such a programming environment, we can easily achieve their own wishes. First of all, we must show the information of the site, that is, now the station, where is the next stop, to facilitate the passengers decide whether to get off or get off. In addition, in order to make the passengers more convenient to understand where they are now from their own destination how far away, as well as a few stops can reach the destination, the subject also prepared a voice newspaper system to remind passengers, in the voice of the station when accompanied by some other voice prompts, including active seat, the starting point of the station greetings, famous attractions, as well as anti-theft security reminders and so on.

Second, the bus site shows only let the passengers understand their own action, in order to allow passengers more comfortable in the car through this period of time, it is necessary to show more information in the car, so that passengers understand, so this time The design also adds some other information content display, such as temperature display, which allows passengers to make some precautions for heatstroke cooling. Time display, allows passengers to know real time, and so on.

Therefore, we must use virtual instrument software in a variety of independent program structure, such as the loop structure, the various functional modules to isolate the package, so that you can ensure that the information between the various modules do not conflict, for the future to achieve more features to do Good bedding.

### **2.3. Summary of this chapter**

This chapter has also found the direction of the subject, and has made some description of the scheme and the realization method of the system. It provides a general scheme and idea for the research of the subject through direction guidance, so it can bring great convenience to the research. The design has a general direction, to achieve a variety of functions will have a direction.

## **3. Software implementation**

### **3.1. Programming ideas**

Lab VIEW is the most representative graphical programming development platform in the field of virtual instrument [1]. It is one of the most widely developed and widely used data acquisition and control development

environments in the world. It is mainly used for instrument control, data acquisition, data Analysis, data display and other fields, and applies to a variety of different operating system platform. Unlike traditional programming languages, Lab VIEW uses a powerful graphical language programming, for testing engineers rather than professional programmers, programming is very convenient, human-computer interface intuitive and friendly, Lab VIEW has a strong data visualization analysis and instrument control capabilities and so on The Using the Lab VIEW development environment, users can create 32-bit compilers that provide faster speed for routine data collection, testing, and measurement tasks. Lab VIEW is the real compiler, the user can create a separate executable file, and the file can be separated from the development environment and run separately [4].

### 3.2. Introduction to Lab VIEW language and design methods

Lab VIEW (Laboratory Virtual instrument Engineering) is a graphical programming language, it is widely accepted by industry, academia and research laboratories, as a standard data acquisition and instrument control software. Lab VIEW integrates all the functions of communication with hardware and data acquisition cards that meet GPIB, VXI, RS-232 and RS-485 protocols. It also built a convenient application of TCP / IP, ActiveX and other software standard library functions. Lab VIEW is a powerful and flexible software. It can be very easy to build their own virtual instrument, its graphical interface makes the programming and use of the process are easy to understand. Graphical programming language, also known as 'G' language. When programming in this language, basically do not write program code, instead of a flow chart or block diagram. This kind of programming makes use of the terminology, icons and concepts familiar to the technician, the scientist, and the engineer as much as possible, so Lab VIEW is a terminal-oriented tool. Lab VIEW enhances your ability to build scientific and engineering systems, providing a convenient way to implement instrument programming and data acquisition systems. Using it to carry out the principle of research, design, testing and implementation of the instrument system, can greatly improve work efficiency.

With Lab VIEW, you can generate standalone executable that are a true 32-bit compiler. Like many important software, Lab VIEW offers multiple versions of Windows, UNIX, Linux, and Macintosh.

#### 3.2.1 Graphical programming of Lab VIEW

Lab VIEW graphical programming is based on modern software, object-oriented technology and data flow technology developed [7]. Data flow programming means that only when all inputs are valid, an object can begin execution, the same token, only when the object's function is completed, the object output can be effective. In this case, the sequence of data flow control between objects is not limited to the linear order from the textual programming, and it is not limited to it. Users can quickly connect to the function module to develop their own applications, and even can use multiple data channels to achieve the synchronization operation.

Like traditional text-based programming, Lab VIEW also controls the execution of the flow chart functions, including SequenceCaseStatement, ForLoop, WhileLoop, but they are graphically described as boundary structures, similar to those in traditional linear programming By inserting a code snippet, you can place the icon inside the boundaries of the Lab VIEW graphical structure. LabVIEW uses the graphical editor to produce optimized editing code, and virtual instruments perform their speed fairly compiling C's speed. Using the application generator, the user can generate virtual instruments, just like a separate executive program.

#### 3.2.2 Graphical programming steps

1. Establish the program: first use the Lab VIEW software to build a virtual instrument. With an interactive control of the software system, users can easily create their front panel interface. If the user is not familiar with the flow chart, and in order to achieve the specific function, the user can use the wizard to combine the flow chart to complete the relevant functions.

2. To create a front panel: On the control palette, select the object you want to implement the function and place it on the front panel of the virtual instrument. The objects on the control template include digital displays, displays, players, headers, pressure gauges, thermometers, tables, pictures, and so on. When the virtual instrument is completed, you can use the front panel to control the entire system when working with the virtual instrument, such as moving the slide, turning the switch, input from the keyboard, and so on.

3. Building a graphical flow chart: When designing a virtual instrument, do not worry about the syntax details required for traditional programming, we can build the flow chart ourselves. Select the objects (indicated by icons) from the Functions palette and connect them with lines so that the data is passed. The objects on the palette include math operations (including function calls), advanced data acquisition and analysis methods, and network and file input and output operations.

4. Data flow programming: Lab VIEW with a very sophisticated data flow programming model to the user from the text language linear way to build the program to liberate the way out. Because the order in which programs are

executed in Lab VIEW is determined by the data flow in each tile. However, you can also create a flow diagram of the synchronization operation. Lab VIEW is a multitasking system with multi-threaded functionality and running multiple virtual instruments.

5. Modularization and Hierarchy: Lab VIEW Virtual Instruments enables modular design, so any virtual instrument can run independently and as part of other virtual instruments. We can even create our own virtual instrument icon, which can be designed by the virtual instrument composed of multi-layer system, and can change it, at the same time, and other virtual instruments can also be exchanged and connected to meet our changing application needs.

6. Graphic editing: In many cases, the speed of the program is very important. Lab VIEW is the only graphical programming environment with an editor that produces optimized code that runs at a speed comparable to that of compiling C. If you use the built-in plotter, you can even analyze and optimize the code that is relevant to the run time. Therefore, it is not possible to reduce efficiency due to graphical programming. Instead, the graphical programming is simple, intuitive and efficient.

## 4. Conclusion

In the traffic developed, convenient today, the city bus system in China occupies a very important position. It provides the people with basic necessities of life irreplaceable service, the public's life is also inseparable from the powerful public transport system. Now most of the buses are used coin or credit card ticket way, basically no longer has a flight attendant, so the bus station broadcast system on the bus system has a great effect. It can help us do not have to look at the bus station card, just listen to the ear can know where they are now in order to get off in time, and will not miss the station. At the same time with voice prompts, allowing passengers to understand some of the traffic and other related knowledge and the basic situation of a station, such as a station where shopping malls, what characteristics and transfer routes and so on. Bus station broadcast system can be particularly effective to help the blind and some poor eyesight of the special crowd, but also for the bus driver to reduce the burden, do not always have to report a station to increase the driver's attention, to the bus service has brought a lot The convenience. Therefore, more and more perfect bus station broadcast system in the bus more and more important. It allows us not to see the bus card, you can real-time know where they are now at the same time, know the car temperature, humidity, the number of basic conditions. Therefore, this humane system is increasingly popular with the public, and is widely used in public transport system.

In addition, in order to reflect the user-friendly design of Lab VIEW, in order to allow the driver of a friend in time to respond to the abnormal situation within the bus, in the design, joined the alarm this module, such as when the number of cars, Crowded alarm; when the car temperature is cold, joined the open heating tips; Similarly, when the car temperature is high, with the cold wind tips to tell the driver friends to open the cold wind; think about the future of the bus will join Humidifier and a series of passengers to ride comfortable equipment, so add a low humidity alarm to prompt the driver to open the humidifier. Believe that the future of the bus system will be more and more perfect, more and more humane. More and more convenient to the general public travel.

Lab VIEW has a graphical programming interface, a good human-computer interface, and convenient hardware connectivity and powerful data processing capabilities, it is very popular with developers; Lab VIEW has a very fast technology update, we can be sure that it not only in Traffic information will be a great application, and will be in more and more areas to play a greater role!

## References

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1. LabVIEW User Manual. National Instruments Corporation 2000.
2. Du Tianyan, Zhao bribery. Based on LabVIEW Petri net controller implementation. Journal of Jiangsu University, 2011, 32 (1): 75-78..
3. Computer virtual instrument graphics programming LabVIEW experimental materials. Beijing Zhongke Pan-China Control Technology Co., Ltd. LabVIEW tutorial: 4-8, 47, 64.
4. Yang Zhongren, Rao Cheng, Zou Jian, Peng Zhenlian. Based on LabVIEW data acquisition system. Journal of Chongqing University. 2004, 27 (2): 32-35.
5. Vlad, S. M., Sgarciu, V. DistanceProcess Monitoring using Labview Environment. Automation Quality and Testing, Robotics, 2006 IEEE International Conference, 2006 (5): 214-219.
6. Peng Binghua, Pan Shenghui. Based on the LabVIEW temperature test system. 2009,8 (1): 467-468.
7. Travis, Klein. LabVIEW University Practical Tutorial. Electronics Industry Press: 4-8.
8. Zhao Jinguang. Research and Application of Remote Measurement and Control Technology Based on LabVIEW. Beijing: Beijing Jiaotong University, 2008: 9-10.
9. Lin Ying, Guo Bing, Yang Yi. Integration Technology of Real - time Heterogeneous Monitoring System Data Platform. Journal of Southwest China Normal University (Natural Science Edition), 2005, 30 (1): 87-91.
10. Yang Zhongren, Rao Cheng, Zou Jian, Peng Zhenlian. Based on LabVIEW data acquisition system. Journal of Chongqing University. 2004, 27 (2): 32-35.

11. Research on temperature test system based on LabVIEW REN Deqi, TAN Zhonghua Department of Electronic Information, Chongqing Electronic Engineering Vocational College, Chongqing 401331: 130-132.
12. Zhou Jun. Temperature and humidity remote control system based on LabVIEW. Nanjing: Southeast University, 200.
13. Zhao Yunli, Huang Xiangsheng. Remote Temperature and Humidity Measurement and Control System of Flue-cured Tobacco Room Based on LabVIEW. *Application of Electronic Components*, 2009, 4 (11): 40-43.