

Manufacture of Simulated Command and Control Communication System Based on VB.NET

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Abstract: In order to apply armored command and control communication radios system more skillfully for voice communication and data transmission, this command and control communication simulation system is designed based on VB.NET. The system makes different parts of the command and control system entities by using Solid Works software, as well as the three-dimensional animation. By using Visual Basic software, this command and control communication simulation system compiles the operation and maintenance of the command and control radios systems; and it can use the wireless audio receiving device to complete the voice communication and the transmission of information and data between the command and control simulation systems by using Visual Basic.NET. Furthermore, the system can use networks to complete the operational training of command and control communication radios systems.

Keywords: visualbasic.net; systems modules; simulation; solidworks

1. Introduction

Our army is equipped mostly with command and control communication systems based on FM radio stations via the frequency-hopping and spread spectrum technologies, data transmission and other new technologies. Applying these new technologies makes the network communications more flexible and the data transmission more powerful. However, with the enhancements of the system, a more complex operation is required and need for a large amount of training. Therefore, in light of reality, as well as the development of networks, this communication system has been developed based on VB.NET. The system will transfer the physical training to the computer, thereby to enlarge the training time and improve the operating skills of the operators, and supplies a better training environment for the operators to operate the command and control communication radios systems more correctly and skillfully.

2 The Establishment of System Module

The simulation system based on computer simulation technologies can effectively enhance the performance of man-machine system and the ability to operate it. [1] In the designing process, the system simulation module should be established firstly by applying simulation technologies, then makes specialized experimental study on it. [2] The system block diagram of the structure is shown in Figure 1.

3 The Manufacture of Simulation System' 3D Entities

Solid Works software is a superior drawing and engine-

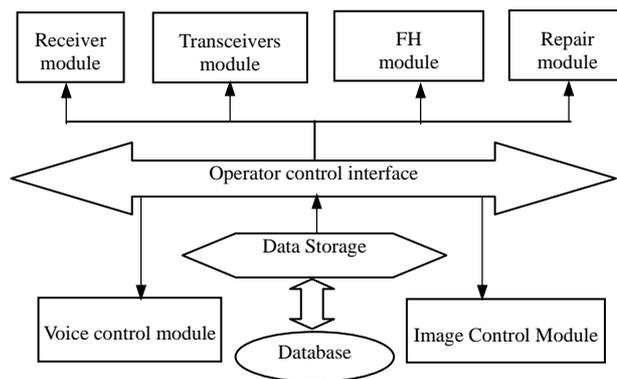


Figure 1. System structure diagram

erring simulation tool, therefore it is used in the designing process.

3.1 Draft Drawing

Carefully observing different parts of the external structure in the command and control communication radios systems, accurately measure the size of each unit, and keep detailed records, in all parts of the draft on the demarcation of the size and geometric relations; calibration of the modules' fillet and chamfer. Reference to the relevant information on the function and purposes, the direction of rotation of the knob and colors of every light, record the characters and digital that is shown on the display.

3.2 Generation of the Simulation Systems Entities

In accordance with the relationships of geometry and logic to generate parts of the production, and all the

knobs, buttons, screws and gaskets can be made to be disassembling and rotating parts. When making external system structures, all the texts and symbols on the plaque are carved out 0.001 mm depth, the ratio of the model and the actual system is 1:1. Different parts of internal module of the simulation system are made in term of the actual relationship with command and control communication radios systems. Every chip, resistor and capacitance on the module are produced according to the actual position measurement of the size to meet the reality and principles, therefore, each component can be dismantled. The chips, capacitors and other models codes are carved 0.001 mm depth. The entities are rendered in the Photo Works environment, by using the same material with the actual system, while the choice of color and lighting angle should be careful.

3.3 Entities Rendering and Assembly Portfolio

After producing different parts of the simulation system and internal module, the assembly process which is an important part of the simulation experience is followed. The generated system components of the simulation system are assembled in the environment of Solid Works, and setting the base of the system for the body parts' "ground", from left to right in accordance with the sequence of transceiver modules, data transmission modules, audio modules to put all the parts together and tighten the locking screws. The amplification is the part of the upper deck on the rack. High-frequency cables will be put on the receiving end of the amplifier input socket, and the other end will be locked on the part of the antenna. Furthermore, phone cable is plugged into the socket on the left side of the audio modules, and speaker can be plugged into the right side.

3.4 Generated Animations of Dismantling and Assembly

In the assembly environment of Solid Works the AVI files of animations such as rotation, bombing and explosion can be generated. After assembling the parts of system, the operator can go into the explosion process, and install the explosion view according to the actual command and control communication radios system, then re-entering into the animation environment to generate component part of internal animation of the dismantling and assembly AVI file. In this process, the operator is able to know more about the different structures and the installation process of the command and control communication radios systems, understanding the functions of the internal composition, their roles and the installation process with a view to achieve the purpose of understanding the system and operate it proficiently. [3]

4 The Establishment of the System Interface

After entering into simulated operation, the interface is

divided into two main parts: the operation of transceiver modules and the operation of audio modules.

4.1 Transceiver Modules

To make the simulation system interface and the transceiver modules in the environment of Visual Basic, and taking the entity of the transceiver modules as the main interface. Firstly, using the following various variables to define the program: to define the button variable: Dim anniu As Integer; to define the cycle variable: Dim str As String; to define the time variable such as Dim time As Integer. Secondly, design the operation process and make the programs. When the mouse move on the location of switches, knobs and buttons, it can change into the shape of hand or the arrow to illustrate that this knob or button here can be clicked. When click the left button of the mouse on all the switches, the switches will turn around clockwise; when click the right button of the mouse on all the switches, the switches can turn around counterclockwise. Its production is achieved in the VB environment through the replacement of the simulated entities. Because of putting the audio controls, the operator can complete simulation results in the state of mute noise player. When the system is in the "off" state, the noise stops to be played. In this step, the "MMControl" is applied, and the designation of audio equipments are like the following: MMControl. DeviceType = "WaveAudio", which is used to designate the open files: MMControl.filename = "c: \ windows \ noise.wav", which is used to open the file: MMControl.Command = "open", which is used to start broadcast: MMControl.Command = "play".

It is very important to simulate the key part of the system, it is necessary to ensure that the input frequency of randomness and safeguard the simulated operation as same as the actual command and control communication radios system, and complete the key dual-use, which can be achieved in the VB environment through the string, cycle and judgment and so on.

The programming languages are like the following: set the initial button variables: "anniu = 1", select conditions: "If q = 0, Then q = 1", or "Else q = 0", the screen should display the case. Press the "frequency selective" button, the value of frequency can be input randomly. The achieved programming languages are: setting the button effective frequency: "Command3.Enabled = True", the time controls ineffective: "Timer 2.Enabled = False", frequency start counting: "str = "" Then j = j + 1 + str str = "1", like the actual system, beyond the scope of the settings the interface will pop up a dialog box showing: the frequency beyond the scope of the actual situation. The programming languages are: MsgBox ("beyond the frequency range "). It needs to input the frequency again. The time controls will be added, if the operator did not press the "ENT" button in four seconds, the frequency will automatically disappear.

The programming languages are: "Sleep (200)" means delaying 4S, if there is no "ENT" button click, then the picture of frequency will disappear: "Picture.Visible = False", press the "ENT" button in four seconds, the frequency value will be deposited. If the frequency is shown on the display, the time controls will not in use: "Timer2.Enabled = False". [4]

4.2 Audio Modules

The interface of audio modules is similar to the transceiver modules. If click the volume knob with the left mouse button, the volume knob will rotate cyclically, adjust the volume. If click the power switch with the left mouse button and since joining the audio controls; the simulation system will play noise when the telephone PTT switch is not pressed. Click the PTT switch with the left mouse button, when press the switch then the noise cease, it means that the simulation systems will communicate to others.

The interface of audio modules is similar with the transceiver modules. Clicking the left button of mouse on the volume knob, the volume knob will rotate cycles to adjust the volume. Clicking the left button of mouse on the power switch, the power switch cycles and because of adding the audio controls, the operator can play noises with the absence of pressing PTT telephone switch. When click the left button of mouse on the PTT switch, the noise is ceased which means the simulation systems is in a state to communicate to others.

With the left button of mouse clicking the "Back" key, the operator can return to the former interface, enter the main interface. With the left button of mouse clicking the "EXIT" key, the operator can close the whole training system. Thus, the whole operations of simulation system are ended.

5 Voice Communication and Data Transmission

Voice communication and data transmission is an important part of the simulation system. VisualBasic.Net can be used to make the voice communication and data transmission interface in order to reflect the operation process of the system more realistically, as well as complete command and control functions. Both sides will use computers as communication tools, while using Winsock controls to achieve communication functions.

5.1 Create Communication Applications

The communication interface of the simulation systems are created by using Winsock controls, it is applied TCP protocol that is also called data transfer protocol, which allows the creations and maintenances of the remote computers to connect for data transmission. The user applications and server applications are required to be set up in communications by using TCP protocol. [5]

In the creation of user applications, the first step is to set up its server computer or IP address (stored in RemoteHost attributes), and the server computer eavesdropping by the port of "RemotePort" attributes (stored in RemotePort attributes), then the "Connect" methods is applied. When creating server application, a eavesdropping port should be established (LocalPort attributes) by applying "Listen" methods. When users need to connect machines, the "ConnectionRequest" incident occurs. In order to complete the connection, the "Accept" methods can be used in the "ConnectionRequest" incident, then, either side of the computers can send and receive data through this system. To send data, the operator can use "SendData" methods. When the data received, the "DataArrival" incident occurs, in this case, the operator can use "GetData" methods in incident "DataArrival" to receive data.

5.2 Peer-To-Peer Communications of the Simulation System

The simulation systems are installed in the two computers as users and servers of communications systems, set their IP addresses and receiving ports. First of all adds a Winsock Control in users' the process named "sckconnect", and set its attributes: RemoteHost = "192.192.192.1", RemotePort = 1200 (that is the user-interception port); then establishing a Winsock control named "sckserver (0)" in the process of the server, as follow LocalPort = 1200, when transferring data, the two simulation systems must be established a connection at first. The program of establishing a connection: "if sckserver.count = 1 then load sckserver (1) sckserver (1). accept requested end if". After the connection, the users and servers use the methods "SendData" and "GetData" to send and receive data. After communication, close the Winsock control: "if sckconnect.state <> sckclosed then sckconnect.close end if". Thus, the command and control communication simulation system completes its communication links. [6]

6 Conclusions

The simulated command and control communication system can be used in the LAN or the Internet for the purpose of completing the wireless communications and data transmission through cables. Furthermore, the long-distance training of simulated command and control communication system can be achieved, and two or more point's communications can be applied through Networks. By taking this simulated system, the geographic distance and communication constraints can be overcome; the training scope can be more extensive. And under the situation of having not good network infrastructures, indoor or smaller places, multiple computers can be used audio receiving devices to complete communications and data transmission.

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