A Design Method of Logistics Support Simulation Support Software

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Abstract: In the process of system of systems simulation, logistics equipment support simulation is an important part. To meet the needs of logistics support simulation, this paper proposes a design method of logistics support simulation support software, and implements corresponding software based on this method. This method includes logistics support simulation initialization and data receiving module, logistics support equipment simulation module, logistics support command simulation module, health support simulation module, transportation simulation module, fuel and material support simulation module The logistics support simulation data output and record module is composed. Based on this method, the logistics support simulation problem can be solved. Combined with the actual project application, good results have been achieved.

Keywords: Logistics Support, Simulation Support, Health and Epidemic Prevention, Field First Aid.

1 INTRODUCTION

Logistics equipment support simulation is a common field in the system of systems simulation. At the same time, it is also a difficult problem because it involves a wide range of disciplines, multiple equipment and complex process. Logistics support, as the basic work of system of systems simulation, has been widely studied at home and abroad. The existing research is roughly divided into two categories, one is to study the performance of support equipment [1, 2], the other is to combine advanced computer technology and artificial intelligence technology [3, 4], but they have not achieved particularly good results. Aiming at the actual needs of system simulation, this paper proposes a design method of logistics support simulation support software for logistics support equipment simulation, logistics support command simulation, medical support simulation, oil and material support simulation and other problems, and implements the software based on this method, and carries out relevant applications in combination with actual projects. The following are introductions.

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2 LOGISTICS SUPPORT SIMULATION INITIALIZATION AND DATA RECEIVING MODULE

1) If the computer startup information released by the evaluation control module is received, start the computer, and release the response information after startup.

2) If the data distribution information released by the evaluation control module is received, the received data is stored in the computer hard disk and the response information is released.

3) If you receive the startup program and data initialization information released by the evaluation and control module, start the simulation system and read the relevant data, and release the response information after the above work is completed. Call the plane normal vector simulation basic model, calculate the normal vector of each surface defined in each equipment entity, call the fault simulation basic model, simulate the fault time of the combat unit, store the time in a fault data file, and add a data item (the time required to check the fault of the combat unit, take 3 minutes).

4) If you receive the Federation information released by the evaluation and control module, complete the Federation operation.

5) If the clock synchronization information released by the evaluation control module is received, adjust the time of the computer to be the same as that of the evaluation control computer. If the time service information released by the evaluation control module is received, store the operation time at the beginning of the simulation in the computer hard disk and release the response information.

6) If the simulation start information is received, release the response information to the simulation management computer and run the software.

7) If the simulation end information released by the evaluation control module is received, the operation of the simulation system will be terminated.

8) If the simulation pause, continue and end information released by the evaluation control module is received, RTI will control the pause, continue and end of the simulation system.

9) If the federate joining and exiting information released by the evaluation and control module is received, the federate joins or exits the simulation.

10) If the meteorological environment information released by the evaluation and control module is received, the information is stored in the array.

11) If the computer shutdown information is received, issue the response information and shut down the computer.

12) If the equipment entity status information is received, replace the original information with the new information.

13) If you receive laser ranging information for yourself, judge whether the combat unit has laser warning and smoke screen function (query the comprehensive protection performance data of the combat unit according to the combat unit model). If so, call the basic smoke simulation model. If the smoke is successful, release the entity status information.

14) If the direct hit target information is received, judge whether the target is the combat unit. If so, query whether the combat unit has active protection capability (soft kill active protection capability or hard kill active protection capability) from the comprehensive protection performance data file of the combat unit. If not, call the basic simulation model of damaging armored target during direct hit. If the combat unit has active protection capability, call the basic simulation model of active protection. If the active protection fails, call the basic simulation model of armor target damage in direct hit.

15) If the information of missed target is received, judge whether the target is the combat unit. If yes, call the basic simulation model of armor target damage in case of missed target.

16) If the combat unit is damaged, issue entity status information and damage information. If there are no casualties or slightly injured personnel, it is considered that the combat situation of the combat unit can be reported, and the damage information is stored in a damage data file.

17) If the camouflage information is received, judge whether the support object is the combat unit. If so, release the entity status information.

18) Issue entity status information if it receives the decontamination information of this combat unit.

19) If receiving the equipment repair information and equipment rescue information of this combat unit, issue the entity status information.

3 LOGISTICS SUPPORT EQUIPMENT SIMULATION MODULE

This module is a time cycle of federal members. Set the current simulation time as t, and complete the following operations for K combat units in the combat unit deployment data file within each simulation cycle $\triangle T$:

Query the fault data file of the combat unit, if any, when the simulation time t meets:

$t <$ the failure time of the combat unit $< t + \triangle T$

Publish entity status information when.

Query the fault data file of the combat unit, if any, when the simulation time t meets:

$t <$ the failure time of the combat unit + the time required to check the failure of the combat unit $< t + \triangle T$

According to the fault information, fill in the battle information and publish it to the communication network evaluation module.

Query the damage data file of the combat unit, if any, when the simulation time t meets:

$t <$ the damage time of the combat unit + the time required to check the damage of the combat unit $< t + \triangle T$

According to the damage information, fill in the war situation information and publish it to the communication network evaluation module.

If the combat unit has positioning function (query the performance data file according to the combat unit model) and the combat unit is not damaged or faulty, set the distribution cycle of positioning information as △T1 (query the combat unit network deployment data file), △T1 takes the integer multiple of △T, and make n = △ T1 / △T. within n simulation cycles, call the basic model of equipment positioning simulation to calculate the combat unit position output by the positioning system, Fill in the data structure of positioning information and publish it to the communication network evaluation module [5].

Call the basic model of maneuver simulation, calculate the grid number I and j occupied by the time position of combat unit T, compare it with I and j in the last entity state, and release the entity state information if there is any change.

Use the deployment data and maneuver data of the combat unit to calculate the entity state information at time t, and update the entity state information together with the information of the previous entity state modification.

If the type is logistics support command equipment, call the logistics support command simulation module.

If the entity type is medical support equipment, call the medical support simulation module.

If the entity type is transportation support equipment, call the transportation simulation module.

If the entity type is oil and material support equipment, call the oil and material support simulation module.

Query the intelligence and command and control information data file. If the simulated equipment releases unformatted intelligence and command and control information in this simulation cycle, release the information to the communication network evaluation module.

4 LOGISTICS SUPPORT COMMAND SIMULATION MODULE

The logistics support command simulation module is composed of logistics support command and control model.

The logistics support command and control model mainly completes three functions: command receiving, command analysis and command distribution. The logistics support commands include tactical maneuver commands, field operation commands, health and epidemic prevention commands, rescue commands, casualty transportation commands, material supply commands, transportation plan commands and oil supply commands [6].

It can realize the command function simulation of the commander of the combat unit, including receiving the combat command and support information issued by the superior command entity, decomposing and processing them, forming the determination of the current level, issuing them to the corresponding equipment, and reporting the combat situation to the superior.

Command receiving, read the commands distributed to yourself from the global linked list of the engine, and save the commands locally.

Command analysis: analyze the received command to obtain the sender, sending time, task type, task start time, task parameters and other information.

Command distribution: send commands to each task execution model according to the parsed information.

The logistics support command and control model is composed of several functional modules, such as command receiving, command parsing and command distribution.

Description of typical logistics support command and control model simulation process:

Step 1: initialize data.

Step 2: read the damage information from the damage model. If it has been destroyed, end.

Step 3: receive the support information and analyze the support information.

Step 4: generate a support command, and then issue it to the corresponding support equipment.

5 HEALTH SUPPORT SIMULATION MODULE

The health service support simulation module can realize the simulation of various health service equipment functions, which is composed of health and epidemic prevention vehicle simulation model, field emergency vehicle simulation model, field surgical vehicle simulation model and casualty transport vehicle simulation model [7].

1) Simulation model of sanitation and epidemic prevention vehicle

The simulation model of health and epidemic prevention vehicle mainly completes three functions: data receiving, data analysis and processing and health and epidemic prevention.

Data receiving, receiving the command data distributed by the command and control module.

Command analysis and processing, analyze the received command data, so as to obtain the support location, support unit and other information.

Sanitation and epidemic prevention: carry out sanitation and epidemic prevention in designated areas.

The simulation model of health and epidemic prevention vehicle is mainly composed of three functional modules: data receiving, data analysis and processing and health and epidemic prevention.

2) Simulation model of field ambulance

The simulation model of field ambulance mainly completes three functions: data receiving, data analysis and processing and field first aid.

Data receiving, receiving the command data distributed by the command and control module.

Command analysis and processing, analyze the received command data, so as to obtain the support location, support unit and other information.

Field first aid: conduct field first aid at the designated place.

The simulation model of field ambulance is mainly composed of three functional modules: data receiving, data analysis and processing and field ambulance.

3) Simulation model of field operation vehicle

The simulation model of field operation vehicle mainly completes three functions: data receiving, data analysis and processing and field operation.

Data receiving: receive the command data distributed by the command and control module.

The command analysis process parses the received command data to obtain the support location, support unit and other information.

Field operation, field operation.

The simulation model of field operation vehicle is mainly composed of three functional modules: data receiving, data analysis and processing and field operation.

4) Simulation model of casualty transport vehicle

The simulation model of the wounded transport vehicle mainly completes three functions: data receiving, data analysis and processing and transporting the wounded.

Data receiving, receiving the command data distributed by the command and control module.

Command analysis and processing, analyze the received command data, so as to obtain the support location, support unit and other information.

Transport the wounded and carry out the operation of transporting the wounded.

The simulation model of casualty transport vehicle is mainly composed of three functional modules: data receiving, data analysis and processing and casualty transport.

6 TRANSPORTATION SIMULATION MODULE

The transportation simulation module can realize the simulation of various transportation equipment functions, which is composed of transportation vehicle simulation model.

The transport vehicle simulation model mainly completes three functions: data receiving, data analysis and processing and transportation [8].

Data receiving, receiving the command data distributed by the command and control module.

Command analysis and processing, analyze the received command data, so as to obtain the support location, support unit and other information.

Transport the wounded to the designated area.

The simulation model of transport vehicle is mainly composed of three functional modules: data receiving, data analysis and processing and transportation.

7 OIL AND MATERIAL SUPPORT SIMULATION MODULE

The oil and material simulation module can realize the simulation of the functions of various oil and material supply equipment, which is composed of the oil supply vehicle simulation model.

The simulation model of oil supply vehicle mainly completes three functions: data receiving, data analysis and processing and oil supply.

Data receiving, receiving the command data distributed by the command and control module.

Command analysis and processing, analyze the received command data, so as to obtain the support location, support unit and other information.

Oil supply: supply oil to the designated area.

The simulation model of fuel supply vehicle is mainly composed of three functional modules: data receiving, data analysis and processing and fuel supply.

8 LOGISTICS SUPPORT SIMULATION DATA OUTPUT AND RECORDING MODULE

The logistics support simulation data output and recording module completes the recording of release and order data.

Combined with the actual project, several simulations were carried out. The simulation time and task completion data of each simulation module are shown in the following table.

TABLE I. TABLE TYPE STYLES

Module name	Simulation time	Task completion
Logistics support equipment simulation module	43	82%
Logistics support command simulation module	29	74%
Health support simulation module	13	90%
Transportation simulation module	18	77%
Oil and material support simulation module	26	85%

9 CONCLUSION

According to the needs of logistics support simulation field, this paper proposes a design method of logistics support simulation support software, and realizes the corresponding software based on this method. The method includes logistics support simulation initialization and data receiving module, logistics support equipment simulation module, logistics support command simulation module, health support simulation module, transportation simulation module, oil and material support simulation module Logistics support simulation is composed of data output and recording module. Based on this method, the problem of logistics support simulation can be solved.

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