Evaluation of Space Measurement Radar Maintenance Support Capability Based on System Dynamics

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Abstract: Based on the analysis of the causal relationship between the space measuring radar maintenance support ability of the system, the system dynamic simulation flow graph is established by the system dynamics method, and the simulation experiment is carried out by the maintenance cycle as the boundary.

1 INTRODUCTION

The space measurement radar is widely used in the outer ballistic measurement of the aircraft. The measurement radar maintenance capability assessment is carried out through the small sensor device to realize the various kinds of data information collection, and use the various reasoning algorithms and intelligent models to monitor, predict and manage the state of the system, evaluate the system's own health status, and combine the various available resources and the beam conditions to create the best maintenance strategy. This paper studies the operation of the space measuring radar maintenance, establishes the quantitative model by means of the system dynamics method, and reveals the feedback mechanism between the factors between the factors in the system, and then evaluates the maintenance and maintenance ability, and provides the Suggestions for the decision department.

2 CONCEPT INTRODUCTION

The method of studying dynamic systems is based on structural function simulation method, which is modeled by the microstructure of the system, and the dynamic behavior of the system is simulated and analyzed by the basic operation structure of the tectonic system, which is suitable for the closed-system system that the research behavior has defined, the feedback cycle, balance and consolidation of the main research system, and the determination of the stock and flow of the system. The space measurement radar maintenance guarantee can be regarded as a complex system that has a structural order, counterguard object and maintenance change, and has a complex system that has certain self-organizing ability in the maintenance task, and the system dynamics method provides the possibility for solving the problem of maintenance and maintenance (Craigw, 1998). The system dynamics method is as follows:

1) system analysis. The main contents include: understand the law of the maintenance and safety of the space measurement radar; To analyze the composition of the maintenance and the composition of the maintenance and the environment, parameters and effects of the maintenance and safety tasks; This paper analyzes the basic contradictions and main contradictions, variables and main variables of the maintenance and operation of the space measurement radar maintenance, and can describe the state of the system.

2) structural analysis. The main contents include: the system level and the substructure, the gradual decomposition system, the key analysis system is generally with the local feedback mechanism, the feedback loop and the coupling, the causal analysis, the causal mechanism, the drawing of the causal diagram; Analysis of the relationship between system variables and variables, the dominant circuit of the definition system and its properties, the possibility of dynamic transfer of the main circuit.

3) establish a model. The main content includes: state variables, flow rate variables, and other auxiliary variables on the basis of the causal diagram. The mathematical equations of state variables, rate variables, auxiliary variables and constants are established, and the relationship between qualitative and semi-qualitative variables is described, and the

equation parameters are determined. Assign the initial value equation, the constant equation and the table function. In the process of construction, we should pay attention to the problem of nonlinear and delay.

4) simulation and analysis. The main contents include the simulation experiment of the simulation software platform, and the graph table of the result diagram is plotted. To find out the decision of solving problems, obtain more abundant information, and find new contradictions and problems. Modify the model structure or parameter and simulate the experiment repeatedly.

5) model test. The main contents include: the rationality of the system feedback loop; To test the equation of the description function variable; Verify the simulation results.

3 DOMINANCE ANALYSIS

System dynamics is a specific problem to solve, not the whole system. The purpose of modeling is to help determine the system boundary and variable relationship, strengthen the understanding and study of the internal feedback structure and dynamic behavior relationship of the system. The use of system dynamics to study the ability of radar maintenance and maintenance of the space measurement radar is characterized by the following advantages:

1) the evaluation of radar maintenance and maintenance is a kind of complex time-varying system problem of nonlinear, high order, variable quantity and multiple feedback, and its system itself has not only clear, determined relationship, but also a fuzzy and random factor (Rehak, 2006).The simple qualitative analysis is floating on the surface, the complete mathematical description and the accuracy and the overall failure of the whole side is not guaranteed and the defect, the combination of qualitative analysis and quantitative research of the system dynamics, and the simulation realizes the interaction between the human-computer can be convenient and effective.

2) the measurement radar maintenance and maintenance ability assessment is difficult to quantify, but the system dynamics model is a kind of structural dependent model, which focuses on the dynamic and behavior of the system's internal structure, and the analysis of the data is not high, which is suitable for the research of the maintenance and maintenance ability of the space measurement radar.

3) the system dynamics can be tested and tested repeatedly by the space measurement radar maintenance and maintenance ability assessment. In this paper, the model is consistent with the actual situation, and the parameters of the system are controlled, the simulation experiment is carried out, the dynamic behavior and the changing trend of the system are observed, and the optimal system structure and parameters can be designed, and the optimal system function is obtained, and the scientific development of the evaluation of the space measurement radar maintenance and maintenance ability is promoted.

4 MODEL BUILDING

The main variables of important relationship between the selection and the space measurement radar maintenance ability are evaluated as the typical representative of the description system. The relationship diagram of 7 flow levels is obtained by qualitative analysis, as shown in figure 1. The main variables are described as follows:

1) the growth of funds invested is influenced by the original foundation, and the more emphasis is attached to the construction of radar maintenance and maintenance, the more money is invested (Benigno, 2005). At the same time, the higher the overall level of the space measurement radar maintenance and safety capability, the lower the urgency of construction, the smaller the investment.

2) the growth of talent is influenced by the original foundation. Through personnel training input, also can cultivate some information-based talents. At the same time, a good talent policy environment can also attract and retain a large number of informationized talents.

3) information resources are related to the original basis, while a large amount of information resources development investment, good talent support, higher technical means, and improved information resource development environment have important influence on the change of information resources.

4) the improvement of technical means is related to the original basis, and the higher the cost of technology development and technology procurement, the higher the technology, the higher the talent index, the higher the degree of application of information technology, the better the technical environment, the better the policy environment, the better the development and application of the technology.
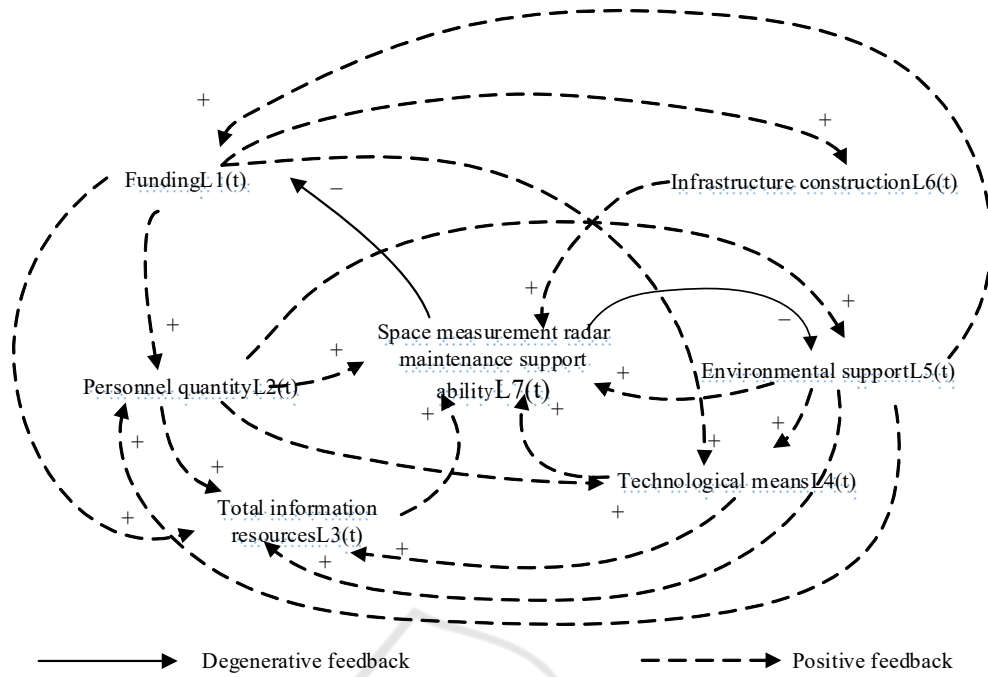
Figure 1: The space measurement radar maintenance and safeguard ability causality diagram.
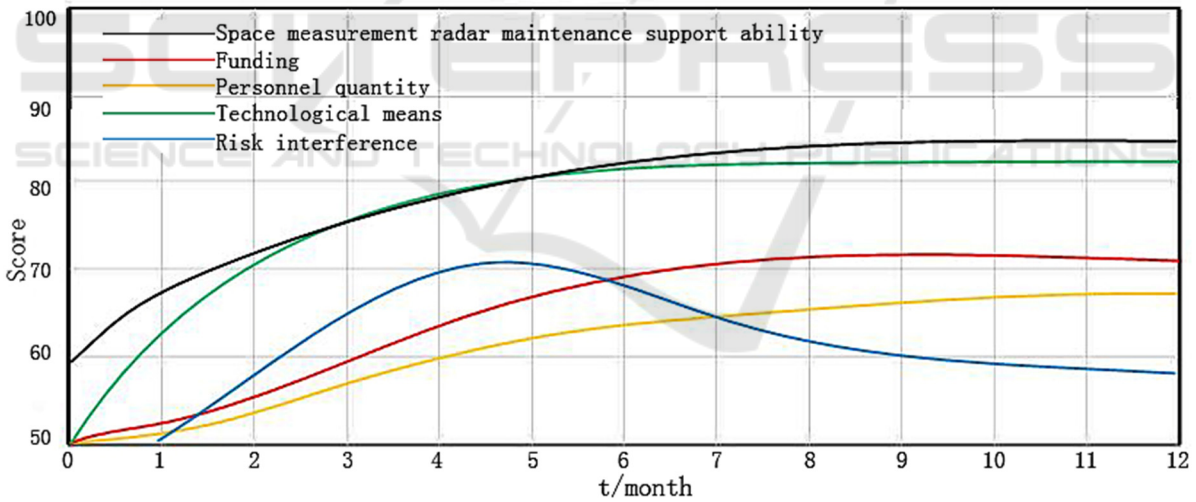

Figure 2: The environment supports full situation simulation results.

5) the growth of environmental support is affected by the original level, and the higher the maintenance and maintenance of personnel, the higher the capacity and efficiency of the environment. At the same time, the higher the overall level of the space measurement radar maintenance and maintenance capability, the demand for environmental support will decline.

6) the infrastructure construction level of the equipment management information system of the infrastructure construction team, which has increased with the investment of the equipment management information construction fund, and has its own depreciation (Nyhuis, 2005).

7) the overall level of the space measuring radar maintenance and maintenance ability is the result of the common role of information technology, information technology application, information resource development and utilization, construction environment and infrastructure level.
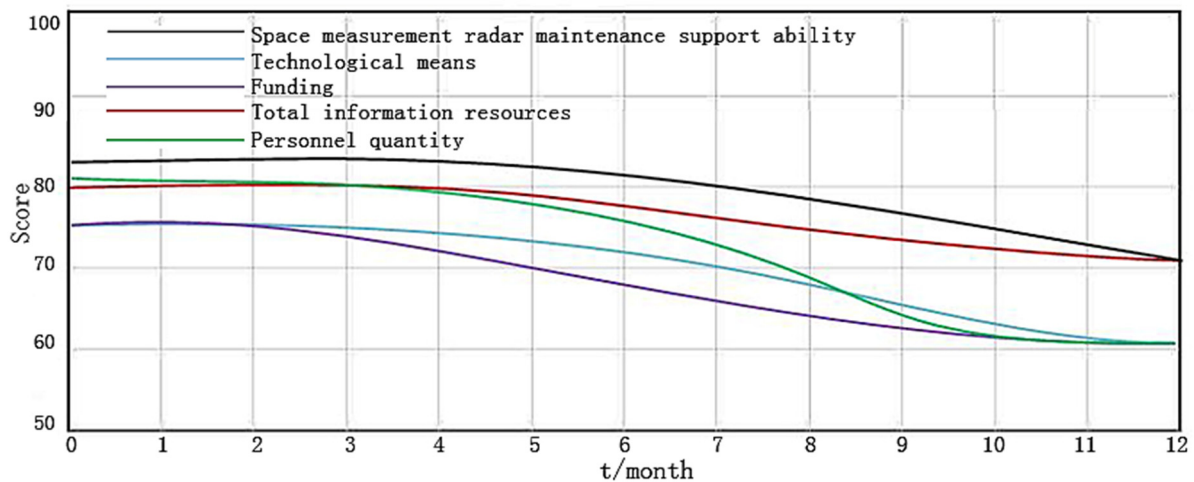
Figure 3: Simulation results of environmental undersupport.

5 INSTANCE VALIDATION

In order to verify the validity of the test model, this paper analyzes the dynamic model of the system dynamics model by using the vensim simulation software, and the simulation platform is shown in figure 2. Vensim is a visual modeling tool based on the window interface, which provides the graphical editing environment, which is the advantage of the software to realize the concept of the research target system and the visualization of the text, and the simulation results show that the intuitive and function equation programming is convenient. Simulation simulation time is 12 months, the simulation step is 1, the unit is the month. The simulation experiment sets two situations: case 1, the environmental support is sufficient, the simulation results are shown in figure 2; The simulation results are shown in figure 3.

From figure 2, the increase of environmental support will lead to the increase of capital input, the quantity of talents and the means of technology, which will improve the overall level of the maintenance and maintenance of the infrastructure and the space measurement radar maintenance. After introducing the impact of risk interference, the overall horizontal growth rate of the space measurement radar maintenance and maintenance ability slows, and gradually becomes stable.

From figure 3, Reducing environmental support will lead to a decline in the overall level of the space measurement radar maintenance and maintenance capability. The amount of money, talent, technical means and information resources are decreased. In terms of degree, the number of talents is the most influential, and the next is the investment, the smallest effect is the total information resource.

6 CONCLUSION

The system dynamics dilemma provides some reference for the operation of quantitative maintenance system. Through the analysis of the simulation results of the space measurement radar maintenance and maintenance ability, the system dynamics is a feasible and effective method for evaluating the ability of radar maintenance and maintenance. The next step will be to analyze the influence factors of the maintenance and maintenance of space equipment more comprehensively, and to further verify the rationality and scientific nature of the method in practice.

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