

The Structure Model of Situational Awareness System

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Abstract. According to automation of aircraft control, with the principle of optimal allocation of human and machine functions, the pilot has been changed to monitor the manager. When performing a task, its operating procedures become more and more simple. Usually it will lack of sufficient information to stimulate, when Pilots establish and maintain a situational awareness. It also has not enough situational awareness to cope with all kinds of unexpected. How to establish and maintain situational awareness and how to restore the lack of situational awareness, that should start from the analysis of the influence factors of affective consciousness, to find out the influence of the weight and characteristics. And according to the weight and characteristics, that take the targeted training methods and content to promote the overall quality of the pilot. At present, the analysis of the influencing factors of the situational awareness in flight still stays on the level of qualitative analysis. That is because the influence of situational awareness is independent of each other, and is affected by the people and the environment, and the quantitative analysis and evaluation is more difficult.

Situational awareness assessment system is a comprehensive subject, involving a large number of activities. In order to influence factors of scientific and rational assessment of the situational awareness, this paper mainly uses method to construct the optimization genetic algorithm for collaborative model, analysis the influence weight of situational awareness, influencing factors and mutual influence between them. In this study, the virtual prototype is built with RTI bus combined with SOA technology in the HLA architecture.

Advanced Structural System of HLA and Its Application

In 1995, the United States Department of defense DOD proposed in the outline of its planning modeling and Simulation for the first time, and proposed HLA high level architecture. It is not a function of the simulation software, but the planning simulation platform in the function of the simulation module structure and collaborative simulation of the common technical framework. By using the RTI soft bus, a large collaborative simulation platform system is synthesized by the function simulation module. September 2000 HLA officially became the international standard IEEE 1516.

HLA is different from the function simulation software, it does not realize the single function simulation analysis, it is one kind of rule is used to define the simulation system structure the technical frame. Its structure is composed of the Federation, and the system structure is divided into hierarchical structure, and which could be changed according to the functional requirements of certain levels of model. The structure of the simulation system is very flexible and can support the data reuse. HLA architecture achieves simulation collaboration through RTI. In the architecture, each function module is defined as the unified standard of the Federation, each of which is connected by RTI bus. The whole simulation system and the federal, federal and federal through the RTI bus unifies data structure standard. The coordination management of simulation system which be realized by controlling the information ordering. Data exchange between the Federation and the Federation cannot be realized directly, which must be done via the bus.

As shown in Fig 1, we give the basic parts of a HLA architecture. HLA/RTI structure includes the interface specification, the federal rules, and object model template. The interface specification is a program run support environment, through which The simulation system operate.

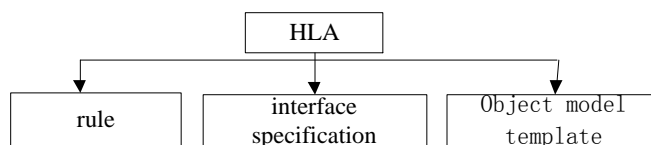


Figure 1. Finite The basic parts of a HLA architecture

After many years of development and improvement, numerical simulation technology has been developed in various fields to improve the maturity of the commercial simulation software. It uses HLA-RTI as a software bus, which integrates various simulation commercial software. That completes different areas, different disciplines of simulation software collaborative analysis, complex system design process, the same or similar process steps to support information sharing. The study of the situational awareness is a complex influence relationship, which needs a variety of influencing factors to achieve collaborative simulation. So we need a kind of technology to solve the problem of analysis software and HLA connection. This research is setting up the numerical analysis to control software MATLAB and HLA/RTI universal adapter, to realize the scene consciousness simulation input and output parameter information data unification. As is shown Fig. 2.

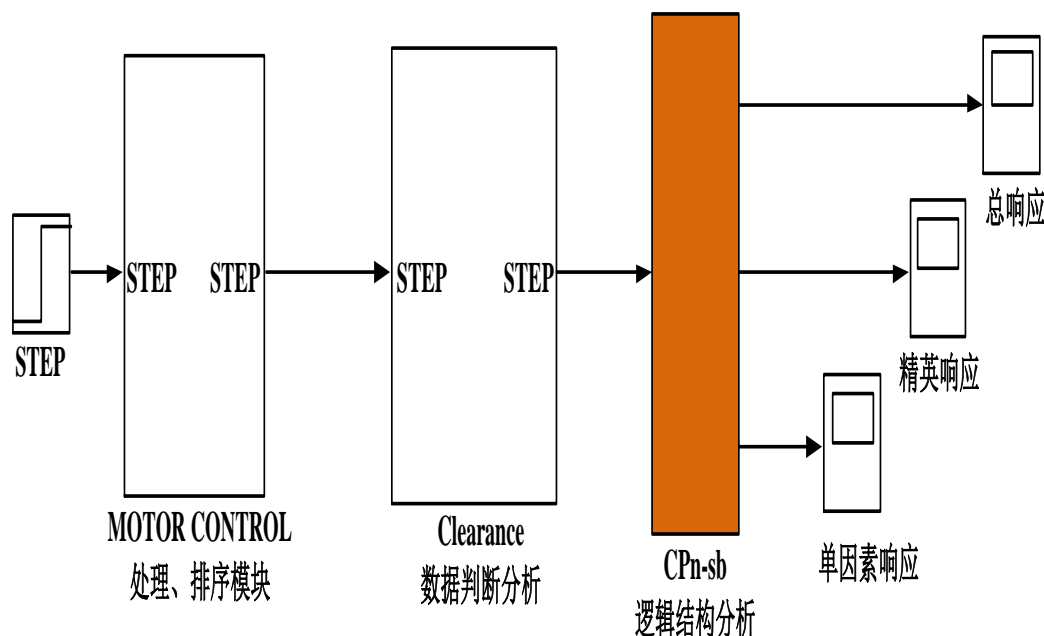


Figure 2. Finite General adapter structure

CPN Tool Profile

Colored Petri net (Cpn) is a kind of modeling and verification system language. Which could achieve the role of communication and synchronization. Petri net modeling language and Petri net modeling programming language standard ML. In order to provide the basis of graphical symbol Petri network to achieve synchronization modeling and communication. ML standard provides the definition of the data type, describes the data operation, and creates a compact, parametric model. A CPN model of a system is a representation of the system state with an executable model of the

event conversion. The CPN language makes it an organization model as a set of modules, which includes an event that represents the concept of execution time in a simulation system.

As shown in Fig. 3, The three independent links through the CONTROL MOTOR module unified control constitute the scene of the open loop simulation model. Among them, the CONTROL MOTOR sub module is the control model of processing, sorting and using CPN to analyze the influencing factors of situational awareness. Step module used for sorting sorts the input data and set the analysis step, the input for some factors influencing the feedback weights a , after the motor control module of affect the ratio of solution, output of the factors affecting the response speed. In the sub module is a data analysis and judgment module, which is used to analyze and judge the response speed, when the response speed small effect judgment value, output feedback speed value of 0, otherwise the output response velocity V to drive the CPN analysis software, complete situational awareness of the impact of numerical simulation. Finally, we get key influence factors in different stages.

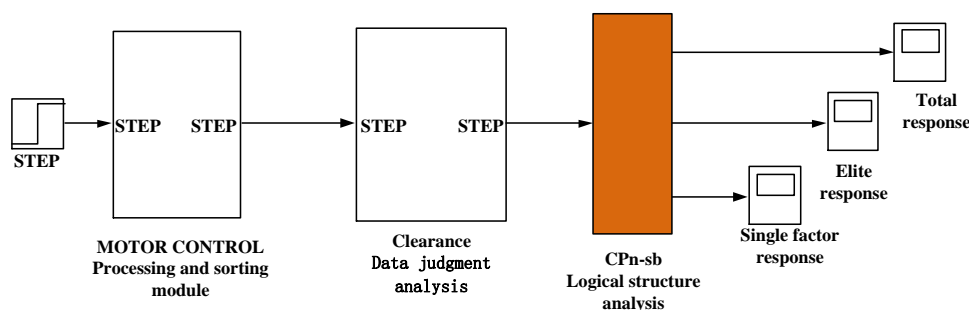


Figure 3. Finite Joint simulation open loop model

Through the analysis of CPN neural network, the relationship between information acquisition and information judgment and decision making is shown in Figure 4. It can be seen that the decision is influenced by the information judgment, and the weight of the analysis of the situational awareness is higher.

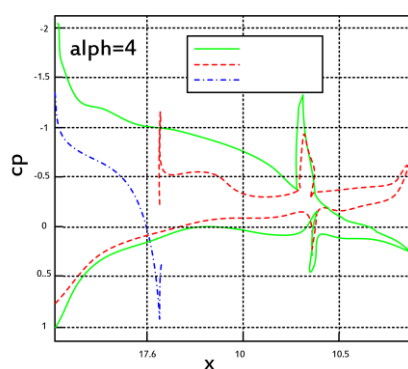


Figure 4. Finite The influence of information acquisition, information judgment and decision making

Conclusion

This research focuses on the main influence factors of the situational awareness in the flight process, and builds the numerical simulation system. Used to understand the influence factors of situational awareness: information acquisition, information monitoring, information judgment, decision-making in the control process of the impact on the flight, reveal the different stages of the control process of weight ranking. It makes conducive to improving the pilot to grasp the rules of control in different scenarios. It makes conducive to the pilot to grasp the limits of the aircraft performance. It is beneficial to provide theoretical basis for the formulation of operational norms.

Research shows that good situational awareness helps to deal with unexpected situations. However, the design of complex technical systems emphasizes the enhancement of routine operation, which may restrain the situational awareness. It is very important for the system to balance the global consciousness and local consciousness in the design.

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