Analysis Model of Situational Awareness in Flight

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\textbf{Abstract.} Situational awareness refers to a person in the process of information processing, through understanding and judgment, the accurate perception of environmental changes and for the future development to make a correct predict ability, is the flight crew non technical competence of an important aspect. Are summarized in this paper situational awareness and flight in situational awareness's basic concept, the influence factors, proposed situational awareness influencing factor analysis model, and by the model obtained main factors influence of situational awareness. The flight personnel to more efficiently on the risks and mistakes effectively detect, rapid, accurate access to information, timely adopt coping behavior and decision making of evaluation.

\textbf{Aircraft Flight Collaborative Simulation Model}

With the automation of aircraft control, according to the principle of optimal man-machine function allocation, pilots have by the manipulator variable in order to monitor managers, performing a task in the procedure becomes more and more simple that pilots to establish and maintain situational awareness of the lack of enough information to stimulate, there is no sufficient situational awareness to deal with all kinds of accidents. Situational awareness assessment system is a comprehensive subject, involving a large number of activities. In order to scientific and rational assessment of the situational awareness of influence factors, 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 order to cope with the complexity of the cooperative system, this paper studies the establishment of an executable model system, mainly for system construction, system debugging, test system design, implementation and deployment[1].

In Matlab / Simulink environment, the application of CPN software for situational awareness factors function model package generation CPN information analysis sub module, in the flow field analysis of process simulation, simulation, link control link and the output link independent module system.

As shown in Fig.1, in the analysis process, the introduction of feedback data to form a closed loop analysis system[2]. 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. After introducing the influence factor strength feedback information, the condition of the termination calculation feedback information needs to be judged. In order to realize this function, a separate judgment sub module is set in the structure of the closed loop system StopSim. The factors affecting the strength of the mean value of the response is used as a feedback signal, substituting the system model loop calculation, when the response strength and determine the strength of the absolute value of the difference less than stop judgment value, end of operation, system output speed response values.

![Figure 1. Closed loop control based on MATLAB.](image)

**Data Communication**

In this paper, we use the SOA framework of the simulation system, according to the analysis of demand, set up the MATLAB control process and package ANSYS function software, set each function module to make them meet the HLA standard, build the SHLAM module. Loose coupling between the modules, the module has input and output data, these data are in compliance with the HLA standard, with reusability. That could be dynamically generated by the RTI to complete the RTI, the use of as a soft bus, to achieve interoperability between the input and output data of the SHLAM model, reuse. The data exchange between the SHLAM modules cannot be carried out, so it will not affect the simulation task in the SHLAM module. The effect can be used in collaborative simulation. The research of the SHLAM module, can be called MATLAB and SHLAM HLA/RTI module collaborative simulation, the platform can be based on the analysis of the mission to further expand the platform, with good general. Through the loose coupling technique with the close coupling technique, application of HLA as soft bus, the simulation model input and output data unified, and the modules are coupled together, the process simulation of information interoperability and reuse the information. For different areas of analysis, as shown in Fig.2, software function structure a model PA stored in the local memory. B software can pa output text information obtained by remote calling, on the basis of analyzing the situational awareness, all memory connected together to form a processor cache[3].
Realizing the influence of situational awareness in the process of simulation analysis, the influence factors simulation software complete the simulation analysis of each subject. The research and application of MATLAB engineering calculation and numerical analysis software, complete the analysis and control design. Using powerful toolbox SHLAM complete the SIMULINK module package. MATLAB can be seamlessly integrated with C++ Visual, Basic Visual and other high-level programming language program.

**MATLAB and Database Connection**

Server SQL 2000 is a medium sized database based on the server side. Application of Visual C++ programming unified information acquisition, information monitoring, information judgment and decision function analysis output file format, and complete the result file and SQL Server 2000 database connection program design. This process not configures the data source. Then through the MATLAB and C++ Visual mixed programming to achieve the data transmission between the database and MATLAB, can achieve the close integration of the software[4].

**Logic Analysis Model**

The influence of mental, physical, environmental and knowledge accumulation on situational awareness is shown in the process of manipulation, which is information acquisition, information monitoring, information judgment and decision making. The construction of collaborative analysis structure model using CPN is shown as Fig.3 to Fig.5.
Figure 3. Information acquisition and monitoring logic influence relationship CPN analysis structure.

Figure 4. Information judgment logic influence relationship CPN analysis structure.
Conclusions

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.

References


