The study of Simulation Intelligent Analysis System of UAV Control On the basis of Computer Big Data Technology

Haoming Qu, Hongkui Yan*, Bo Sun,Weijia Niu

Shenyang Institute of Engineering, School of Automation, China

* Corresponding Author Email: 1073379102@qq.com

Abstract. With the advent of the era of computer big data, the application of big data is increasing. Computer big data technology is suitable for the analysis of UAV simulation intelligent system, which can clarify its practicability. After the intelligent analysis system is put into use, the accuracy of UAV control is improved. The UAV flight control system is the core part of UAV, and the performance of UAV depends on the design of its flight control system to a great degree. In this paper, the intelligent analysis system of UAV control simulation is studied. The accuracy of massive data set algorithm with adaptive selection and adjustment strategy and the complex causal relationship between data in the intelligent analysis system of UAV control simulation under computer big data technology are studied. The research results show that the global optimization of the whole process can be ensured by combining the structural characteristics and algorithms of data-to-data association algorithm, and the data is more than 58.96%. Therefore, the intelligent analysis system of airborne software simulation, which provides guarantee for the research and development of UAV control through testing, has a certain market application space and prospect.

Keywords: Computer big data, UAV control, Intelligent simulation analysis system

1. Introduction

Information technology is bringing profound changes to people's daily work and life, promoting the continuous improvement of work efficiency and bringing many conveniences to people's lives [1]. As a very advanced processing technology at present, big data can improve the level of safety and IT to a certain degree by effectively applying it to computer safety and IT, thus providing reliable guarantee for computer safety and IT [2]. Improving quality, reducing cost and improving efficiency are the eternal topics of manufacturing enterprises [3]. The manufacturing of complex products not only involves industrial technology itself, but also the factors such as manufacturing organization and production management scheduling usually restrict the quality and cost of products [4]. Sensing the real-time state of human, machine, material, method, environment, measurement and other factors in the manufacturing process can not only quickly deal with the quality problems in the manufacturing process of products, but also provide effective data and decision-making basis for management and production organization [5].

Unmanned aerial vehicle (UAV) is a kind of powered, controllable, capable of carrying a variety of tasks, performing a variety of tasks, and being reusable [6]. UAV is increasingly used in remote operations, such as reconnaissance, survey, logistics and plant protection [7]. Due to the limitation of site resources and management system, UAVs have become more and more popular in vertical take-off and landing in recent years [8]. Vertical take-off and landing UAV is an important development direction of fixed-wing UAV in the future because of its vertical take-off and landing function and high cruising speed [9]. The simulation intelligent analysis system of UAV control on the basis of computer big data technology is studied. on the basis of the research results, a set of simulation intelligent system for UAV control is built, which is convenient for testing. It is used for configuration items and system testing of UAV airborne software, and a series of processes from model in the loop to software in the loop to hardware in the loop are realized by existing technical means. The research and development of a set of general UAV control simulation intelligent system test can not only provide environmental support to meet the demands of domestic UAV model airborne software test and evaluation, but also provide important quality assurance for the research and development of key

UAV models, which greatly shortens the research cycle and saves the research cost. Besides, the development of embedded general simulation test technology can promote the level of test automation and intelligence.

2. Methods

2.1. Computer Big Data Technology

Big data involves the massive data set that can't be analyzed and advanced by ordinary algorithm tools in normal time [10]. It is an information asset with high value, high growth and diversification after the algorithm model needs to be improved or innovated. The accuracy of data itself and complicated causal relationship between data are no longer pursued. The process of simulation intelligent analysis system controlled by UAV on the basis of computer big data technology is shown in Figure 1:

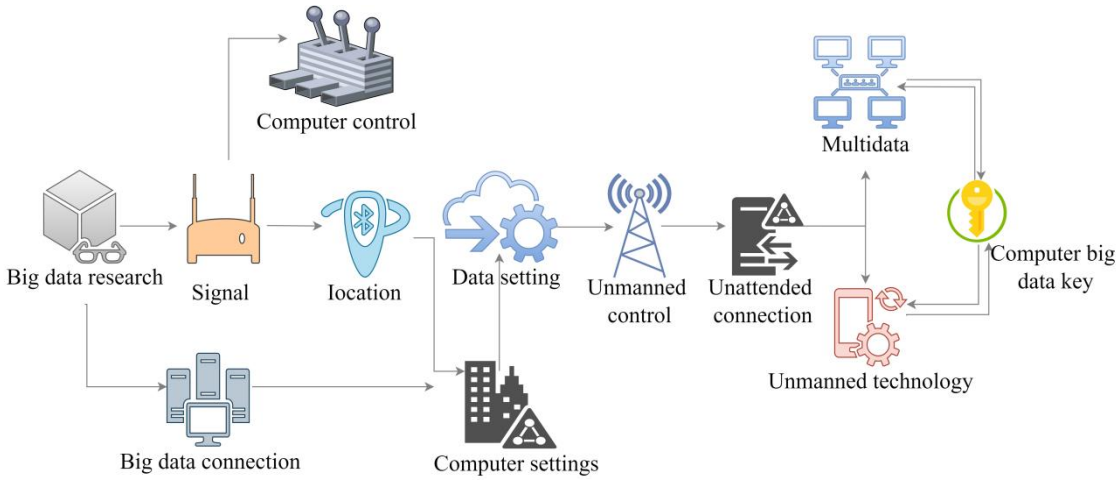


Figure 1. Simulation intelligent analysis system

The full implementation of computer big data pursues accuracy data itself, which promotes the development of UAV control simulation intelligence. At present, the types of data are gradually increasing, showing diversified development. For some computer big data with special depository demands, the traditional depository methods are no longer applicable, which will bring potential hidden dangers to the safety and IT of computer big data. The simulation intelligent analysis system of UAV control can meet the diversified demands of computer big data depository, and it is also the future development direction of big data. It can gradually form a set of computer big data information analysis platform application system with rich functions and perfect functions.

Aiming at an intelligent analysis and research system of UAV control simulation on the basis of computer big data technology to be tested, the dimension is reduced reasonably on the basis of the feature words, and then a mixed test vector set is formed to test the set of training big data. According to the professional knowledge in the field, the similarity degree of each sample in the set of computer big data to be tested and information data before the aggregation degree reaches the critical value is calculated, where the similarity expression is:

$$Sim_1\left(d_i, d_{1j}\right) = \frac{\sum_{k=1}^{m} W_{ik} + W_{1jk}}{\sqrt{\sum_{k=1}^{m} W^2 + 2}} \tag{1}$$

$$\left(d_i + d_{1j}\right) = \sum_{k=1}^{m} W_{ik} + W_{1jk} \tag{2}$$

Among them, Sim_1 represents the similarity expression, d_i represents the big data feature vector of the computer to be tested, d_{1j} represents the center vector, and W_{ik} represents the $k=1$ dimension of the vector.

$$W_{ik}+W_{1jk}=\sqrt{\sum_{k=1}^{m}W^2}+2 \tag{3}$$

According to the obtained sample similarity, $k=1$ samples that are most similar to the computer big data to be tested are obtained, and the samples to be tested are judged to belong to a certain category among the k samples. Among them, the aggregation degree is much similar to that of computer data sets.

2.2. UAV control simulation intelligent system

Unmanned aerial vehicle control simulation intelligent system can be regarded as a rigid body moving system in free space, with many degrees of freedom and the coupling of rotation and translation degrees of freedom [11]. It is a typical nonlinear system. Multi-inertial navigation system, magnetic flux sensor, barometer, satellite navigation, optical flow, camera and other equipment are configured to estimate the pose of UAV control. Inertial navigation system has high real-time performance and little influence from the outside world, so it can realize autonomous navigation, but its accumulated error is large, so it is often used in combination with other navigation systems. Satellite navigation system can realize the global positioning of the airframe in an unobstructed environment, but its data rate and accuracy are low. In foreign countries, optical flow and image navigation technology started earlier, and the pose estimation technology on the basis of aerodynamic model and optical flow navigation algorithm has been applied to commercial unmanned aerial vehicles.

For the design of UAV control simulation, the common methods are as follows: in the hovering stage of UAV, the nonlinear system is linearized by perturbation method, equivalent linearization and other methods, and solved by mature LQR control and other linear control technologies; Or directly apply backstepping, adaptive control, sliding mode control, fuzzy control, neural network and other nonlinear control strategies. As shown in Table 1:

Table 1. UAV control simulation intelligence table

Apply method	Adaptive control	Sliding mode control	Fuzzy control	Neural network
Freedom	0.45	222.39	4.763	4.311
Rotate	0.2	189.62	1.788	2.277
Parallel	0.16	156.37	2.569	1.122
Coupling	2.3	165.28	1.456	2.366

For example, in Table 1, for the intelligent state feedback system of UAV control simulation, by establishing an energy function, weighing the convergence speed of the system and the control quantity of the actuator, the optimal method is used to find the control mode with the least energy for pole assignment. When unmanned aerial vehicle (UAV) is controlled to fly at a very high speed in the atmosphere, the aerodynamic force and moment generated by the interaction with air are very large, and these forces and moments, together with the gravity and thrust of UAV itself, will cause the UAV to undergo elastic deformation to a great degree, and the aerodynamic characteristics will

also change accordingly, and the influence of elastic deformation will also have an impact on the space movement of the aircraft, which will bring great difficulties to UAV flight control technology. Through the research of simulation intelligent analysis system, it is concluded that the UAV control system is a space motion and is studied as a rigid body system.

3. Analysis of experimental results

Rational application of public big data can not only increase employment opportunities, but also increase people's choice opportunities to solve problems. There is a strong interest in computer big data technology, and the development of computer big data technology era has already exceeded the scope that human beings can imagine. The The study of transforming the original independent devices into intelligent analysis system of UAV control simulation under computer big data technology makes the original cold big data time colorful. The data of UAV control simulation intelligence increases by 56.33% every year. Fully deploy big data preparations, take big data as a basic strategic resource, fully implement actions to promote the development of big data, accelerate the sharing, opening, development and application of big data resources, and help industrial transformation and upgrading and social governance innovation. As well as information asset innovation that integrates massive data with high value, high growth and diversification. As shown in Figure 2:

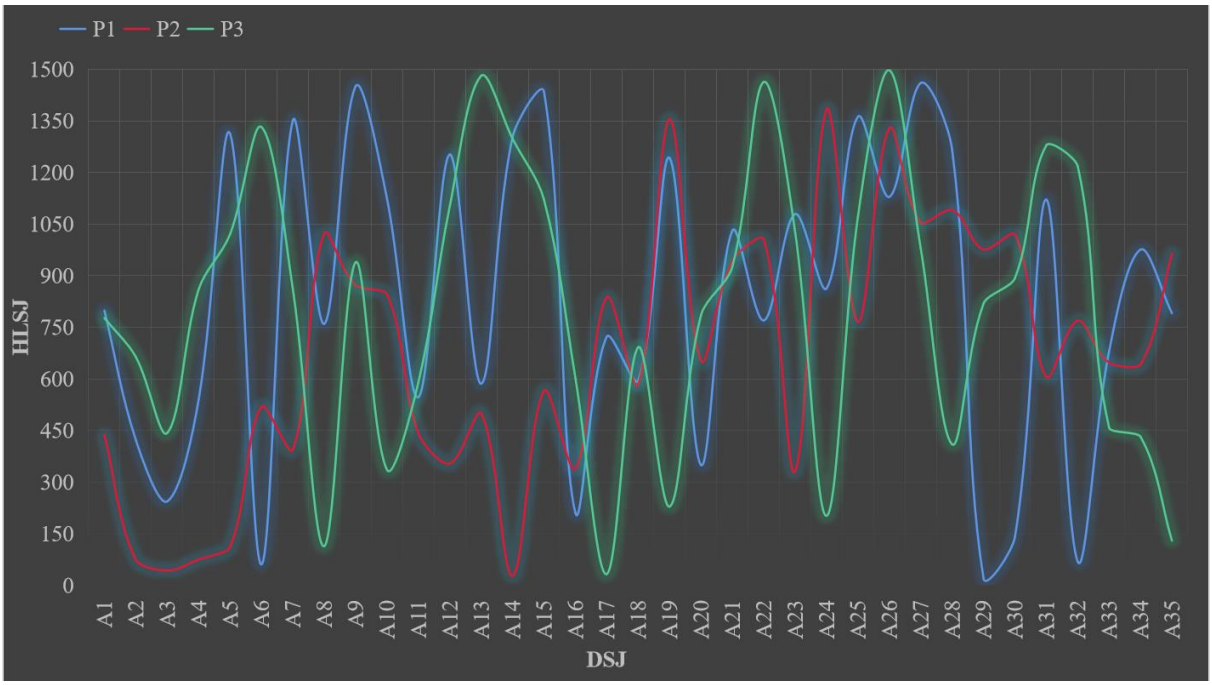


Figure 2. Data collection

On the basis of the in-depth research of UAV control simulation intelligent analysis system on the basis of computer big data technology, this paper expounds its big data algorithm principle, development trend and application scenarios in detail, and puts forward a massive data set algorithm with adaptive selection and adjustment strategy, which has the accuracy and complex causal relationship between data. By combining the structural characteristics and algorithm of data-to-data association algorithm, it can ensure the global optimization of the whole process and the data is more than 58.96%. The purpose of intelligent analysis of UAV control data is realized, and the basic demands of intelligent optimization algorithm for data processing in the background of big data can be met.

The extensiveness and diversity of demands in various fields provide more opportunities for the development of simulation intelligent analysis system technology. Along with the continuous strengthening of computer big data computing ability and the deepening of algorithm research, simulation verification has been proverbially used in all walks of life. The research and development

of intelligent analysis system for UAV control simulation is on the basis of the specific investigation of UAV control research enterprises, weighing the convergence speed of the system and the amount of actuator control, and carrying out feasibility analysis in combination with the present situation, market application and technology, so as to ensure that the system can break through various key technologies, be successfully developed, be effectively applied in the market, and generate social value. For the sake of meeting the testing needs of UAV control simulation intelligent analysis system products from the early stage of development to the completion of development, it is necessary to realize the full simulation intelligence and hardware-in-the-loop simulation intelligence of airborne software at the same time, and the seamless transition from hardware-in-the-loop simulation intelligence to hardware-in-the-loop simulation intelligence can be well realized. The big data process is shown in Figure 3:

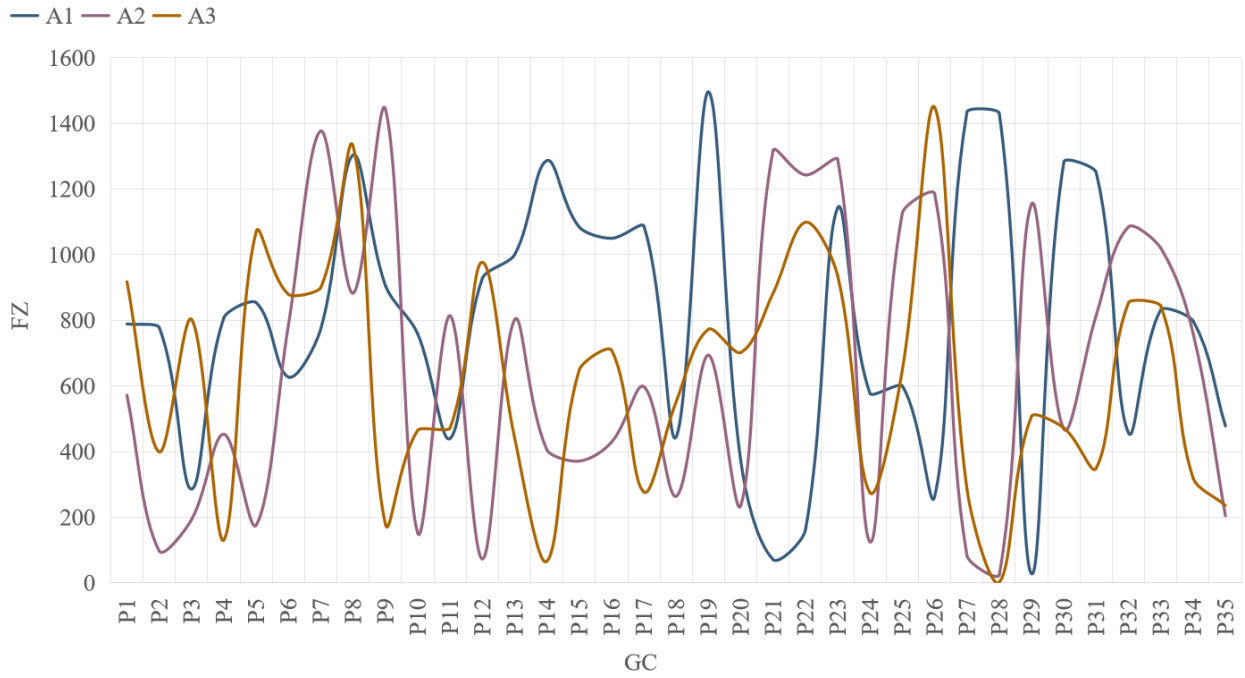


Figure 3. Simulation intelligent data

At present, only the intelligent feedback of UAV simulation is commonly used for development, and the environment is not mainly established for the simulation flight of UAV control, so there are many inconveniences in the use of safety officers. Among them, there is a big conflict between the use time and the scene and the developers, and the input means of test data are also few, and the process of verifying the safety and reliability of the system basically depends on the experience of the testers. However, China's UAV model verification has a lot of tasks, so a general UAV airborne software simulation intelligent analysis system is urgently needed to solve the problems of few means and low efficiency, and effectively improve the test quality. UAV control technology is developing rapidly, and nearly one hundred UAV models are newly added and modified every year. The intelligent analysis system of airborne software simulation, which provides guarantee for UAV control research and development, has certain market application space and prospect, and is feasible.

4. Conclusions

UAV control simulation intelligent analysis system simulation analysis system needs advanced big data analysis technology to match it to fully play its role. This paper puts forward an intelligent analysis system of UAV control simulation data with big data cognition as the core, analyzes its characteristics and key technologies, and sorts out the system architecture and related technical foundation. The flight control system is the core of the UAV. To complete autonomous flight, the

UAV needs the control system to have good control characteristics for the inner loop attitude loop and the outer loop horizontal position and altitude loop. The development from manned flight to unmanned aerial vehicle autonomous flight is actually the development from flight automation to flight autonomy, and the flight control system should play the dual roles of decision-making and control. Obviously, advanced flight control technology is one of the most important supporting technologies to realize autonomous control. The successful research and development of UAV software simulation intelligent analysis system can not only provide an effective support tool for the simulation intelligent analysis and evaluation of large UAV software, but also greatly shorten the research and development cycle, save the research and development cost, guarantee the quality improvement of UAV products, and promote the technological progress and innovation of the whole embedded simulation intelligent industry. With the analysis of computer energy system, as well as the progress of massive data set algorithm and aggregation fusion technology of computer big data.

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