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RESEARCH ON INTELLIGENT CONTROL CONSERVATION SYSTEM OF FREEZE STATIONS

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ABSTRACT

The intelligent control technology with the traditional control theory formats intelligent compound controller in order to learn from each other and improve the overall advantage of complementary features. Fuzzy PID control neuron PID control, fuzzy sliding mode control, and optimal control of the neural network. This paper discusses the current situation and development of smart composite control system, and describes the smart composite controller structure based on theory and research results in recent years.

Keywords: *Intelligent Control; Traditional Control; Composite Control*

1. INTRODUCTION

Intelligent control technology has 20 years of history, but it is still in its development phase as an emerging theory of technology. Control experts in the field pointed out that in recent years, the direction focus of development for intelligent control technology and research should shift to the integration of intelligent control technology. Smart technology integration, including two aspects: one is the promotion and application of integrated intelligent control technology, integration of several intelligent control method or mechanism, constitute the advanced hybrid intelligent control system with a high degree of autonomy, such as fuzzy neural (FNN) control system, fuzzy control system based on genetic algorithms, fuzzy expert system. On the other hand intelligent control technology with the traditional control theory formats a smart composite controller, in order to learn from each other, access to complementary features to improve the overall advantage. Fuzzy PID control neuron PID control, fuzzy sliding mode control, and optimal control of the neural network. This paper discusses the current situation and development of smart composite control system, and describes the smart composite controller structure of theory and research results in recent years. Summarize the development of two smart composite controls.

Complex systems with nonlinear, strong coupling, uncertainty, the traditional control method is difficult to achieve the desired control effect. Therefore , it cannot applied the traditional control methods to design such systems directly. The development of intelligent control technology for the control of complex systems provides a new idea. Intelligent control strategies usually do not need accurate mathematical model but only requires understanding of the system information section, especially the intelligent controller with powerful self-learning and self-tuning ability, can effectively control the object of the uncertainties or unknown disturbances caused by the system fluctuations, but because the intelligent control system is nonlinear in nature, making it difficult to design system performance and analysis theory. In view of this situation, some researchers have proposed the intelligent control technology and control theory, thus the intelligent compound controller came into being. This controller not only has intelligent control, self-learning and self-tuning ability, but the effective use of traditional control theory, the theoretical analysis of the performance of the system design a nonlinear multivariable control systems to meet performance indicators. The application of smart composite control of nonlinear multivariable systems has become a hot research topic of the current control area, and has made a lot of research.

2. SMART COMPOSITE CONTROLLER

Fuzzy control, neural networks, expert systems, intelligent control of the three pillars of the PID control, optimal control, robust control, and decoupling control method in the traditional control theory are perfect. So experts and scholars for nonlinear time-varying uncertainties, and other complex characteristics of the object, they were combined to broaden the areas of integration of intelligent control technology research and traditional control technology, design a more widely used, good control effect of the composite

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Controller. The following highlights several common composite controllers.

2.1Fuzzy PID Controller

The fuzzy controller has control research focus, and stability analysis of fuzzy control system is needed to study and solve the basic problem of fuzzy control. Characteristics of fuzzy controller such as PI or PD controller can achieve good system dynamic characteristics. But it cannot eliminate the static error of the system; the traditional PID controller is a controller for process control in the application of the basic, with simple, stable, and reliable feature. In order to improve the static performance of the fuzzy controller, the idea of the fuzzy PID controller is proposed [1]. The study of fuzzy PID controller has been the concern of many scholars. Abdenour [2] proposed FI-PI, FI-PD, FI-PID fuzzy controller of the three forms in terms of PID control. Ying [3], Li [3] derived a variety of fuzzy controller quantitative factors, the relationship between the scale factors with the PID controller factor KP, KI, KD. Ying simple linear rule TS model-based fuzzy controller is analyzed; pointing out that this type of fuzzy controller is a nonlinear gain PID controller. Zhang Siqin [5] proposed a class of fuzzy composite controller based on TS model. There are many other research results on the fuzzy PID controller, no longer listed.

2.2Adaptive Fuzzy Controller

Adaptive fuzzy controller draw on some ideas of adaptive control theory to design the fuzzy controller, also known as the language of self-organizing fuzzy controller (SOC), the idea is that online or offline to regulate the structure or parameters of the fuzzy control rules tends to be the optimal state. [6] With a correction factor for the control algorithm, he changes the characteristics of the control rules by adjusting the correction factor. SOC directly propose amendment of fuzzy control rules as a rule organized fuzzy controller. Raju hierarchical management control rules proposed adaptive hierarchical fuzzy controller. Linkens [7] proposed rule self-organizing learning algorithm, the parameters and the number of rules for automatic correction. The use of neural network fuzzy control rules and adjusted parameters is also a good way for fuzzy adaptive control (although is strictly not really a composite controller).

2.3Fuzzy Sliding Mode Controller

Sliding mode control, because of its simple design and it is not sensitive to system changes, has been widely used in industrial processes, but there is a prominent shortcomings - buffeting the traditional sliding mode control, fuzzy sliding mode control solves this problem device. Tian-Ping Zhang [8], Sim, [9], a fuzzy sliding mode controller that can weaken the jitter, but because it is difficult to guarantee the boundary layer sliding mode reach ability, and lose the advantage of sliding mode control for the inconvenience . Zhenghuai Lin [10] for this problem, propose a new fuzzy sliding mode controller design method to fully guarantee the sliding mode reach ability, enabling the controller to optimize the design. This is also a composite controller design process of continuous improvement.

2.4Fuzzy Decoupling Controller

Xu Chengwei [11] first proposed a series of decoupling of the fuzzy system, introduced a decoupling compensator. Then put forward the feedback decoupling of the fuzzy system, the introduction of a feedback decoupling controller. Yang Hui [12] studies multi-variable fuzzy control algorithm, the introduction of fuzzy subset of the cross-coefficient, with the design principles of multivariable system decoupling, with more than a single variable fuzzy controller to indicate a decoupling of the multi-variable fuzzy controller to obtain good control, but the study of fuzzy decoupling control system is still in the stage of development, there are many issues yet to be resolved.

2.5 Other Research On Fuzzy Composite Controller

Zhang light [13] proposed a multivariable robust adaptive controller based on fuzzy basis function, fuzzy control and robust control, can fully guarantee the robustness and tracking error of the closed-loop nonlinear control system of progressive convergence. There are similar studies, such as the fuzzy variable structure control, model reference adaptive control, optimal fuzzy controller, and fuzzy predictive control.

2.6 Neural Network PID Controller

The neural network has the ability to learn approximate arbitrary nonlinear mapping, thus resolving the uncertainty of complex systems control which is a very large application prospect. Domestic and foreign scholars in recent years in the neural networks and traditional techniques are combined to study nonlinear system and control aspects of a number of useful attempts and achieved some encouraging results. Yubin [18] starting from the classical PID control idea and proposed PID weights in the form of network structure, constitute

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the neural network PID Composite Controller and author in order to avoid the neural network may fall into local minimum, the establishment of a mixed nerve directly from adaptive control structure and the corresponding learning algorithm to obtain a good control effect.

2.7 Neural Network Robust Adaptive Controller

Yubin [16,17] model the unknown system, a complex control structures - neural network parallel self-learning of robust adaptive tracking control structure, it can take advantage of the neural network learning ability and nonlinear mapping ability to adapt the control model of online identification and controller design issues, in order to achieve precision output tracking control of uncertain nonlinear systems; through the introduction of the running monitor, to overcome the neural network control method is usually solid ; use a robust feedback controller to ensure that the neural network model studies the stability of the initial closed-loop system. The two methods are 3.6, 3.7 proposed by a conventional feedback controller to guarantee the stability of the system. The design of neural network controller larger degree of freedom, such intelligent compound controller has better control performance than pure intelligent control.

2.8 Optimal Neural Network Controller

WANG Yao-nan [19] linear optimal control techniques and nonlinear neural network learning methods are combined to propose a new nonlinear optimal composite controller. This control method of artificial neural network with parallel, adaptive, self-learning ability in optimal control, link control system compensation to complete a more accurate modeling and control, the control system has more advanced intelligence, which is a very effective method.

2.9 Other Types Of Neural Network Composite Control

Wang Zhen Lei [21] combined H composite construct intelligent controller, successful completion of the fuzzy neural network intelligent control strategies and H optimal control strategy for nonlinear multivariable systems with uncertain models and unknown bounded disturbances. Control fuzzy neural network and sliding mode variable structure control combined with the design of fuzzy variable structure. The composite controller can improve the performance of the sliding mode variable structure controller, and control a class of uncertain systems effectively .

Prospects for the development of smart composite control system

Smart composite controller in nonlinear multivariable systems has become a hot research topic in the current control area, having made a lot of research. The design and application of the composite controller still exist some problems: intelligent control technology and control theory combined with the relatively simple form, you cannot make full use of intelligent control technology and traditional control theory research; intelligent controller has no theoretical basis for the determination of the modular structure, selected by virtue of the designer's experience. Selected structure is usually more complex, long learning curve is not conducive to real-time operation; controller intelligent approximation module approximation accuracy is difficult to determine, cannot obtain accurate control effect. These problems require further study.

3. CONCLUSIONS

In short, the intelligent control strategy and the traditional control method combining construct intelligent compound controller, taken in the control advantages and characteristics, have become a hot research topic in today's control area, but also need tools to solve all kinds of complex system control problems, which have great significance in theory and practical application.

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