Research on the Automation Control Information System Model based on the Chaos and Nonlinear Transformation

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Abstract

In this paper, we conduct research on the automation control information system model based on the Chaos and nonlinear transformation. Electronic control automation system in the process of social and economic development plays the key role is obvious, it can effectively encourage industry automation level is improved greatly, at the same time, electronic automation system control to the larger extent on saving the cost of enterprise. Electronic systems control automation industrial enterprises should also improve their in technical innovation ability, to have independent intellectual property rights of electronic automation engineering control system. This paper combines the chaos and nonlinear transformation principles to optimize the traditional system that is meaningful.

Keywords: Automation Control, Information System, Chaos and Nonlinear, Transformation.

Introduction

Electronic control automation system is the core of the modern advanced science and technology, guiding the future development direction of modern industry, therefore, the society for the future and the development of enterprises play an irreplaceable role. In the present era of electronic information, various industries of information technology has become more widely used, and the electronic control automation system to a great extent, the facilitator informatization in our country, the development of intelligent, for the progress and development of China's modern industry has laid a solid foundation.

According to the basic control object of intelligent control of information openness, complexity, multi-level and multiple time-scale and pattern diversity, the characteristics of fuzziness, uncertainty, intelligent control of the main research content from the following several aspects. (1) Under the condition of a certain structure, the structure of the system properties analysis and stability analysis method. (2) Intelligent control in the industrial process, the robot control and traffic system and the application research in the field of management and so on. (3) According to the experimental data and mechanism model of dynamic system, the identification, modeling and control of the uncertainty. (4) The study of intelligent control of basic epistemology and methodology, to explore human activity mechanism of perception, judgment, reasoning and decision making [1-4].

Electronic control automation system in the process of social and economic development plays the key role is obvious, it can effectively encourage industry automation level is improved greatly, at the same time, electronic automation system control to the larger extent on saving the cost of enterprise, lifting equipment, production lines, the possible performance. Essentially belongs to the category of nonlinear systems, chaotic systems is developed in view of the nonlinear system of research and application of mature method, its basic idea can be summarized as by using the method of linearizing the original nonlinear system into a linear system in the framework of study again. When the existence of chaos is harmful to the system, the methods to eliminate chaos, in contrast to the control problem of chaos, chaotic inverse control is refers to when the existence of chaos is beneficial to system, someone for to produce or enhance the chaos. From the control point of view, people want to be able to adopt a unified method, in need of chaos as do not need to eliminate chaos, give a designer with maximum

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flexibility, direct against chaos control delay feedback control method has the same structure, in this paper, the result shows that it will direct delay feedback control method can not only realize chaos control, and can realize the control of chaos. In other words, the linearization method is not designed for control system. The purpose of this new concept based on the pseudo partial derivative, the paper introduces a new kind of chaos system linearization method.

In this paper, we conduct research on the automation control information system model based on the chaos and the nonlinear transformation. In the above figure one, we show the general chaos and nonlinear system. Chaos optimization algorithm is a new kind of search algorithm, the basic idea is to put the variables from chaotic space transform to the solution space, then using chaos variable has the characteristics of ergodicity, randomicity, and regularity. Later sections will discuss this in detail.

The Proposed Methodology and Perspective

The Control Automation Review. Electrical automation as a product of the development of a new era, this subject is the main object of study: electronic automation system, information processing, power electronics technology, experimental analysis, and computer applications, and so on. Electrical automation let the machine operation and therefore does not need to control their production, in the process of industrial production in many cases to be able to make electrical automation and artificial intelligence technology blends. Although not yet set up a relatively complete theoretical system of intelligent control, on the basis of the basic concept of intelligent control, combined with specific engineering background, in various professional technology applications has gratifying achievement.

At present, the electronic control automation system gradually from a single device to integrated, diversified, systematic direction. Electronic systems control automation industrial enterprises should also improve their in the technical innovation ability, to have independent intellectual property rights of electronic automation engineering control system, increase the investment in the area of scientific research in order to be able to electronic control automation system supplies the broad space. The multilevel computer control system, the control system is based on computer processing speed greatly improved in recent years and widely used in the development of the microcomputer as making the
application of computer technology is more accurate and reliable and can say that the emergence and development of control technology and the development of the computer technology are inseparable. With this basis, we could summarize the control automation features as follows [5-6].

- Compared with the heat engine equipment, electric control system of controlled objects, small volume, less operating frequency is low, but with the advantages of rapid and accurate.
- The development of electronic automation influenced by information technology, the physical sciences, including information technology plays a decisive influence. Modern information technology refers to the various methods of core development and utilization of information, computer and the network technology, communication technology and related technology of synthesis, such as computer, photoelectric, communication technology as the main body.
- Intelligent equipment installation is simple as can save the control cable and the corresponding installation work and the maintenance workload and cost is lower. Due to the connected through the network of each device, independent, flexible network configuration, improve the system reliability, device failure will not affect other devices, is not to make the system paralysis as is a major development direction of electrical automation control system.

We can believe that, with the development of academic disciplines results of strong support has a very broad field of practical application of intelligent control will be achieved rapid development, providing theoretical basis for intelligent automation.

The Automation Control Information System. According to system theory, in particular, the general framework of internal control by three related elements: IS, IS the management and control mode of process technology and IS support that under the influence of the external environment, the elements around the appraisal model of internal control and influence each other, interact with each other. Governance mode IS the main consideration IS the risk policy, the application IS the essence of the behavior, competitors and regulators as well as the strategic resource allocation problems, belongs to the management level. The organization management and technology IS understandable execution oriented activities, its main concern IS the function of management and value chain management and the corresponding information exchange and communication, etc.

The so-called control system is mainly aimed at the weak link in the information system life cycle, that system analysis and system design, covers and the program design, operation maintenance, data processing, hardware equipment control system. For the current control information system, the basic security is the primary challenge that could be reflected from listed aspects. (1) From the perspective of
physical information fusion system to study the theoretical basis of the industrial control system and the direction, is an industrial control system of information security theory to study another big challenge. (2) From the perspective of complex system to study the extension of industry control system, the information security within the industrial control systems and the extension of the fusion, is of great importance in industrial control system of information security theory research challenges. (3) Further deepen industrial control system of risk assessment technology, industry control system research platform. Construction, deployment and management toughness technology of the industrial control system, information security for integrating theory and practice has brought challenges.

**The Chaotic Systems.** At present, in the chaotic circuit in the engineering field, there have been many technologies using non-smooth nonlinear function to produce the chaotic attractor of many volumes. However, how to produce more wings with the smooth nonlinear term of chaotic attractor technical challenges still exist. In the sliding mode variable structure control, the system movement from initial state to the fixed point of the process can be divided into two stages, namely two kinds of mode, the first stage is approaching the movement, the second stage is sliding mode. So according to the ideas of the sliding mode variable structure control, in order to make better sliding mode of the system, first of all, to design a strong robustness of fractional order sliding mode surface to make the system has good dynamic characteristics; Secondly according to the adaptive sliding mode controller was designed by the condition of sliding mode can be reached, the controller can make the system from any point in space trajectory can converge to the sliding surface in finite time [7].

For the systematic implementation, we define the four-dimensional system as follows.

\[
\begin{align*}
\dot{x} &= ax - \alpha y \\
\dot{y} &= x - \beta yz^2 \\
\dot{z} &= -y - \alpha z - \chi w \\
\dot{w} &= z + \phi w
\end{align*}
\]

(1)

Multi-volume wave phase trajectory of chaotic attractor jump between different attractor, volume wave number, the more jump the randomness of the stronger the information hiding is hidden as the information encryption is of great significance. Fractional multi-volume wave chaotic system reach a state of chaos, the order is a range, rather than a fixed value. Its key space is an integer order is bigger, has important application value in the chaotic encryption. Some similarity was damaged in the systems, controlled system can generate through the attraction domain boundaries of up and down the main diagonal and the diagonal chaotic attractor, further, with the evolution of the parameters, and chaos attractor and diagonal chaotic attractor fused into true four-winged chaotic attractor. Therefore, we could define the systematic controller as the follows.

\[
U_{\text{system}} = U_0 - BCx - g(y) + CAx + Cf(x)
\]

(2)

With fractional order chaotic systems is the deepening of the research in the field of encryption and randomness of the chaotic sequence test is becoming more and more attention. Unable to establish a comprehensive mathematical model of the random events, therefore, to test the randomness of chaotic sequence is particularly important. Under this basis, \( U \) can be expressed as follows.

\[
u_t = -\mu k_i \sum_{j=1}^{n} |e_j| \text{sgn}(s_j)
\]

(3)

The purpose of the theory is the linearization of the control system design method that has simple structure as convenient adjustable parameter is moderate, controller design, convenient to use the data input and the corresponding output directly [8].

**The Piecewise Linear System.** Actual control systems are usually general complex multivariable nonlinear dynamic process, the predictive control is essentially based on the predictions of the linear model. The fuzzy model of nonlinear function approximation ability adequately, nature is nonlinear, but the rules after the part adopts linear equation, according to facilitate the application of traditional control strategy, which provides a new way to solve the problem of nonlinear system control.
Nonlinear system control theory research and general research of the control system, and also is to solve two basic problem as namely the system of comprehensive and analysis problems. However, a large number of actual systems not only stay in such simple processing requirements. In general, for the former, we want to be able to further provide the high quality control performance, in the latter case, we want to further know in what circumstance can continue to maintain a stable controller. The nonlinear approximation of nonlinear system dynamic increment minimization model, the predictive control law is to solve long time optimization calculation while the controller parameter recursive prediction and noise estimation problem of the system. The system has strong robust stability and steady-state unbiasedness, generalized predictive control of nonlinear system is realized.

To the actual output and the model of system output deviation minimum weighted sum of squares as the performance index, the criterion function can be expressed as equation 4.

\[ \text{Measurement}(\theta) = \sum_{i=1}^{t} (y_i - y(\theta, \phi))^2 D(\phi_0, \phi) \] 

Data driven learning algorithms require system existing database covering all operating mode, which makes learning algorithm is limited by great. To make the system adapted to new conditions, instant add new data information, at the same time to avoid overlapping of system data and therefore, we should take the propose modification of equation 4 into the consideration.

**Conclusion**

In this paper, we conduct research on the automation control information system model based on the Chaos and nonlinear transformation. Electric control automation system is combined with computer technology, electronic communication technology to protect the electrical control and monitoring, it implements the fault of the electrical control automatic alarm. In the FCS system, the signal when the transmission is in the form of one to many as uses a two-way transmission and the numbers of high precision, its use is very strong reliability. This paper integrates the Chaos and basic nonlinear transformation to propose the novel perspective on the automation control information system that will optimize and enhance the systematic performance of the current system.

**References**


