# Research on Intelligent Refrigerator Control based on Artificial Intelligence Algorithm

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**Abstract.** Artificial intelligence (AI) brings the Internet of Things (IoT) into the construction and development system, which catalyzes the improvement of the construction quality and level of IoT, and efficiently promotes its development in the application process. Now, based on IoT, objects can be connected with the Internet for communication, so as to realize intelligent remote control and management of objects. Therefore, IoT has become an important part of the new generation of information technology. Traditional refrigerator enterprises urgently need to upgrade their products to break through the bottleneck of market development, in which intelligent refrigerators are an important direction. With the advent of the Internet era, the overall level of equipment application and the level of efficient and high-quality information processing have gradually become the new standard of work in the IoT era. In this paper, the control strategy of intelligent refrigerator based on AI is proposed. The intelligent refrigerator can be remotely controlled by computer or mobile phone through the network and the information can be sent to users in real time, which can realize the IoT control of intelligent refrigerator.

**Keywords:** Artificial Intelligence; Smart Refrigerator; Internet of Things; Remote Control.

## 1. Introduction

In today's civilized society with the rapid development of technology and the rapid improvement of people's living standards, household appliances are paid more and more attention. At present, manufacturers and scientific research institutions of household appliances in many countries in the world have invested a lot of manpower, material resources and funds to research and develop household appliances based on AI by using modern high technology [1]. Traditional refrigerator enterprises urgently need to upgrade their products to break through the bottleneck of market development, in which intelligent refrigerators are an important direction. With the advent of the Internet era, the overall level of equipment application and the level of efficient and high-quality information processing have gradually become the new standards for work in the IoT era [2]. The technical research on the practical application of AI in IoT can fundamentally solve the defects of poor operation and maintenance effect and lack of flexibility of traditional network technology. Now based on IoT, objects can be connected with the Internet for communication, so as to realize intelligent remote control and management of objects. Therefore, IoT has become an important part of the new generation of information technology [3]. In essence, AI research and development is actually a process of optimizing and improving IoT and other forms of network drivers on the basis of traditional communication technologies [4]. The development of intelligent control technology is changing people's lifestyle, and more comfortable and reliable household appliances can improve people's living standards day by day.

At present, through continuous research and innovation, the defects of IoT in information storage, computer processing and network application have been basically optimized, and its flexibility and operation and maintenance have also been greatly improved [5]. AI has incorporated IoT into the construction and development system, which has catalyzed the improvement of the construction quality and level of IoT, and efficiently promoted its development in the application process [6]. As one of the essential household appliances in China, the traditional refrigeration and fresh-keeping function has been difficult to meet the diversified needs of consumers. With the rapid development of IoT, smart household appliances in China have developed rapidly, and AI has also been widely used in refrigerators [7]. Fuzzy control technology, multi-stage temperature change technology, automatic ice making technology, aiming cooling technology, automatic door opening technology,

frequency conversion technology and information networking technology of household refrigerators all reflect the wide application prospect of intelligent control technology in household appliances to varying degrees [8]. In this paper, the control strategy of intelligent refrigerator based on AI is proposed. The intelligent refrigerator can be remotely controlled by computer or mobile phone through the network and the information can be sent to users in real time, which can realize the IoT control of intelligent refrigerator.

## 2. Fuzzy Control Technology

Fuzzy control technology can be used to judge the change of external environment temperature and food storage, adjust the start-stop point of refrigerator in time, and ensure that the start-stop period of refrigerator fluctuates in the best range under different environment temperatures. This technology not only reduces the energy consumption of frequent starting of the compressor, but also controls the temperature fluctuation in the refrigerator. Fuzzy control is a new computer control method based on fuzzy set theory, fuzzy language variables and fuzzy logic reasoning. From the angle of linear control and nonlinear control, fuzzy control is a nonlinear control. From the intelligence of the controller, fuzzy control belongs to the category of intelligent control, and it has become an important and effective form to realize intelligent control at present [9]. Classical control theory is not effective for nonlinear time-varying systems. With the development and application of computers, especially microcomputers, the theory and technology of automatic control have made great progress. Modern control theory based on state variable description has been widely used to solve linear or nonlinear, steady or time-varying MIMO system problems. The IoT security hierarchy model of intelligent refrigerator control system is shown in Figure 1.

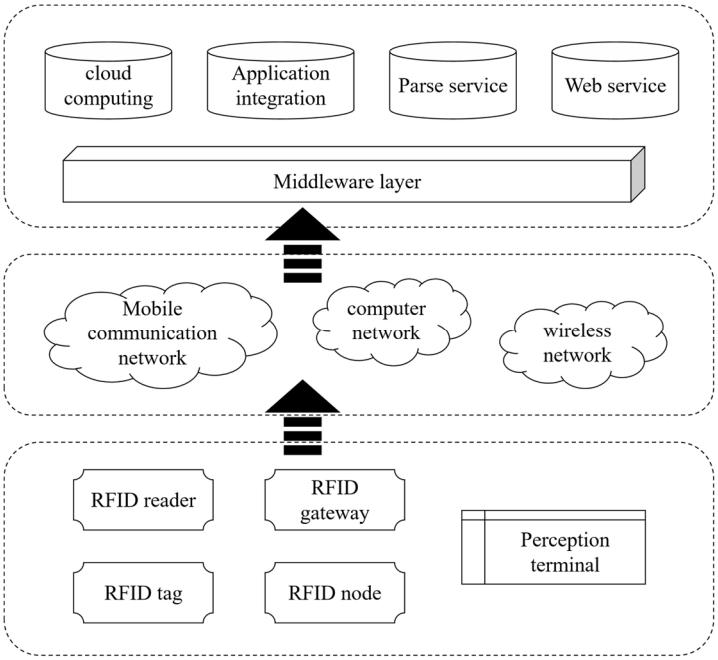



**Figure 1.** IoT security hierarchy model of intelligent refrigerator control system

IoT smart refrigerator, using the prototype of the existing refrigerator, adds IoT control function. Its refrigerator control system is still completed by the previous control system, namely the refrigerator main control module. The new IoT function is completed by the display and control module, which aims to increase the stability of the refrigerator, not interfere with each other and reduce the difficulty of development. If the knowledge of domain experts and the practical experience of skilled technicians are summarized and formally described, a set of qualitative conditional statements and imprecise decision-making rules are formed by language, and then fuzzy sets are used as tools to quantify them, a controller is designed, and the formal rules of human experience are used

to imitate human control strategies, and then the equipment is driven to control complex industrial processes. The frequency of users using refrigerators is mainly obtained by counting the times and times of opening doors every day and week, as well as the temperature rise after each opening of refrigerators, and using fuzzy control algorithm. In the refrigerator of single-cycle refrigeration system, adaptive temperature compensation technology is used to control the temperature compensation heater to make up for the lack of start-up time of compressor in low temperature environment. Based on the principle of long shutdown time in winter and long startup time in summer, the factors such as compressor shutdown time, startup time, temperature change rate of refrigerator during startup and shutdown, state change after compensation heating is turned on, etc., are used to calculate and decide whether the temperature compensation heater should be turned on or off, so as to achieve the best refrigeration matching between rooms in the refrigerator.

## 3. Combined Application of AI and IoT in Intelligent Refrigerator Control

### 3.1 Artificial Intelligence

AI is a typical representative of the advanced stage of computer development, which mainly focuses on understanding the essence of intelligence and AI. Since the beginning of AI theory, it has been carrying out technology research and development with the ideas of simulating human thinking and imitating human consciousness, so it is widely called a high-tech technology simulating human beings. Connecting with cloud data quickly through the network can play a significant role in sensing the changes of the environment, and automatically and dynamically adjust the application parameters on this basis to maintain adaptability. The wider the application scenarios in the application process of AI, the more its embodied value will be. With the continuous improvement of the collected data sources, the learning efficiency of the system will also be significantly improved. If you want to promote the further development of AI in IoT, you should constantly expand the application scenarios of AI to lay a good foundation for IoT data collection.

### 3.2 Internet of Things

IoT is an important product of the current development of information technology, which specifically refers to the interactive relationship between goods built on the Internet. The organic integration of IoT and AI is the core element to realize the AI of the Internet. Therefore, the development of IoT needs to start from the innovation of Internet application, and make new breakthroughs in many aspects of IoT development through AI research, so as to further realize the original purpose of improving users' Internet experience. Relying on information sensors, radio frequency identification, positioning systems, infrared sensors and other facilities and technologies, real-time, efficient collection of monitored, connected and interactive objects and processes is realized. Through its diversified information bases such as light, heat, electricity, mechanics, chemistry, biology and location, multi-dimensional network access is used to connect objects and people, and intelligent management, identification and perception of objects and processes are realized.

### 3.3 Combined Application of AI and IoT

The converged network formed by various Internet and communication networks is the network layer in IoT. In addition, the network layer also includes information intelligent processing parts such as home appliance networking management center, cloud computing platform, information center and expert system. In the network layer of smart home appliance management model, it is necessary not only to have sufficient network operation ability, but also to strengthen the ability of operating information such as application database. In the intelligent household appliance management model based on IoT, multiple computers with strong processing ability are used as the cloud platform, and the collected data information is transmitted to the cloud platform, and then the cloud platform performs tasks, and the data processing results are transmitted to the smart refrigerator to display the

results with a user-friendly interface [10]. The AI cloud service platform of smart refrigerator is shown in Figure 2.

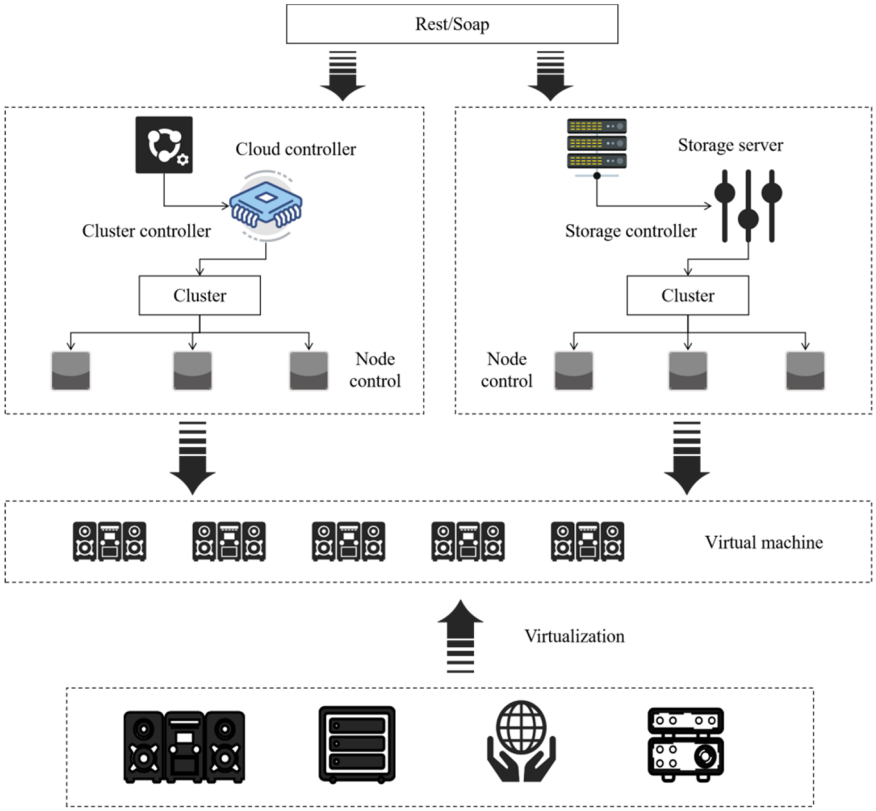



**Figure 2.** AI cloud service platform of smart refrigerator

The interconnection between smart refrigerator and smart home network, and the interconnection between smart refrigerator and Internet. The interconnection between devices and smart home network is the most important part of the platform, which mainly includes: the interconnection interface between mobile phone and TV, the interconnection interface between tablet computer and TV, the interconnection between mobile phone and home gateway, the interconnection between smart TV and gateway, and the interconnection between smart refrigerator and gateway. IoT deeply integrates traditional refrigerators with modern information technology through the role of application layer, and realizes the application of intelligent automation. At the same time, family service providers provide various quality services for people's lives through the application layer.

## 4. Conclusion

IoT under the background of AI has broad development prospects and great development potential. In addition, under the development trend of modernization, informationization and intelligent society, the combination of various new information technologies has brought great changes to people's daily life. At present, the smart refrigerator is still in the research and experiment stage, and the cost is the biggest problem, but another more important condition is how to put human factors into the research of the smart refrigerator system, so that people can't change themselves to adapt to this system, but must make the system conform to the user's psychology. In this paper, the control strategy of intelligent refrigerator based on AI is proposed. The intelligent refrigerator can be remotely controlled by computer or mobile phone through the network and the information can be sent to users in real time, which can realize the IoT control of intelligent refrigerator. With the emergence of AI and IoT, under the joint action of information technology and network technology, a brand-new application technology has emerged, which has promoted the development of society towards intelligence, automation and informationization. The development of IoT also needs to start from the innovation

of Internet application, and make new breakthroughs in many aspects of IoT development through AI research. The application of AI in refrigerator control system has improved the quality of household refrigerators, increased their functions, and carried out the process of simulating human intelligence in household refrigerators.

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