



Abstract

5G, as the hottest topic at present, has opened a new digital era of everything and Internet. Industrial Internet is the main application place of 5G, and the combination of pumping station group and 5G Technology is a great leap in water conservancy industry. Large pump station is the only artificial power source of water, but usually the regulation of pump station group mainly depends on the experience of engineers, it is difficult to ensure the effective operation of pump in a reasonable period of time, and it is easy to cause waste. Therefore, the reasonable management of large pump station is particularly important. The integration and development of 5G Technology and pump station has become an important direction for the industry to explore. In this paper, the BP neural network and 5G Technology are combined to predict the operation curve of the pump station and the edge cloud technology is applied to the pump station. The two kinds of exploration are conducive to the operation and control of the pump station, and will also have a significant impact on the economic and social development of our country.

Exploration and Innovation

1. Multilayer BP neural network plus 5G control

BP neural network is a kind of multilayer feedforward network trained according to error back propagation algorithm. It is one of the most widely used neural network models at present. It can collect independent and intelligent variables from each unit, and build mathematical model for each operating point of large pump station in BP neural network system, and establish corresponding constraint function and objective function. Under the given reasonable initial conditions, in the long-term operation process, the BP neural system will modify the distribution of independent variables of each working condition point according to the collected data, so as to obtain the operation state more suitable for the real-time working condition. Under the condition of multiple equipment and working condition points, the multi-layer BP neural network can train more reasonable operation time and operation cycle through big data.

However, BP neural network has some disadvantages and shortcomings, because its learning rate is fixed, so the convergence speed of the network is slow, and it needs a long training time. In addition, network learning and memory are unstable, so there are higher requirements for computing communication and other environments. When 5G Technology is added to the BP neural network, the application of 5G Technology has the characteristics of fast response speed, to overcome the disadvantages and shortcomings of BP neural network optimization itself, through 5G Technology faster real-time response to the operation of the unit.

Through BP neural network control to overcome the disadvantages of traditional pump operation, it can continuously predict the operation performance of pump station unit, and then through 5G high efficiency operation and corresponding speed, it makes the pump station more energy-saving and water-saving. Figure 1 shows a typical pump station.



Figure 1. pump station

2. Application of edge cloud technology

Figure 2 shows the control room of the pump station, the current pumping station group has basically realized the automation control, but the automation function has not been fully utilized. In the practical application process, because of the influence of the external environment of the application site, including environmental temperature and humidity, mechanical vibration and other factors, the automation system is often only used as an auxiliary means, more or less rely on experienced operators to complete the daily work, the automation system is difficult to play, the automation system can not be fully utilized will increase human resources and material consumption. Using the characteristics of 5G Technology, edge cloud technology is introduced into the pump station under construction or already built. Edge cloud is a new network architecture and open platform, which integrates network, computing and storage. It is deployed near the edge of human network, and can meet many key requirements, such as agile connection, real-time business, data optimization, application intelligence, security and privacy protection. Edge cloud is a concept of nearby computing, which can bring computing power to the edge of network. With the edge cloud, the data does not need to be uploaded to the centralized cloud, which reduces the waiting delay and the cost of back and forth to the cloud. Edge cloud migrates intensive computing tasks to the edge of the network, reduces the burden of the core network and the transmission network, and realizes low delay, large bandwidth and fast response to user requests. Then establish a wireless network transmission management system, real-time monitoring of the changes of various parameters in the pump station, and upload a large number of data to the background quickly, which greatly facilitates the background personnel to control the parameters. A reliable man-machine exchange is produced, which saves manpower and material resources, and strengthens the control of pump station. It can be

seen that the combination of edge cloud technology and traditional pump station will greatly improve the control and monitoring of pump station, and save traditional hardware, wires and cables and other equipment. Cost saving, convenient operation, it is worth exploring.



Figure 2. pump station control room

Conclusion

1) BP neural network can continuously predict the operation performance of pumping station units, but its own shortcomings seriously affect the response speed. When 5G Technology is added to BP neural network, the use of 5G Technology has the characteristics of fast response speed and high transfer rate, to overcome the disadvantages and shortcomings of BP neural network optimization itself, through 5G Technology, the real-time response is faster to the operation of the unit.

The combination of the two, through BP neural network control to overcome the disadvantages of traditional pump operation, and then through 5G high efficiency operation and response speed, make the operation of the pump station more reasonable, and make the operation of the pump station more energy-saving.

2) The combination of edge cloud technology and traditional pump station can monitor the changes of parameters in the pump station in real time, and upload a large number of data to the background quickly, which greatly facilitates the background personnel to adjust and control the parameters. A reliable man-machine exchange is produced, which saves manpower and material resources, and strengthens the control of pump station. At the same time, traditional hardware, wires, cables and other equipment are saved. Cost saving, convenient operation, it is worth exploring.

Reference

- [1]Wang Yizhi. Study on the optimal operation of the second pumping station [D]. Chongqing University, 2015
- [2]Gao Zhanyi, dou Yisong, Huang Linquan. Study on optimal operation of Dayudu cascade pumping station [J]. Journal of water conservancy, 1990 (05): 1-11
- [3]Wu Jianhua, Shang wangze, Liu Chunhui. Discussion on energy saving of optimal variable angle operation of pump device [J]. Energy saving, 1994 (01): 8-9
- [4]Lu Mou, Dong Shen, Han Wei, Ren Li. On line optimal control technology of multi water source pumping station based on intelligent algorithm [J]. System engineering theory and practice, 2010,30 (01): 140-144
- [5]Cheng Ying. Research on pump station operation optimization system based on multi intelligent algorithm [D]. Hebei University of engineering, 2013
- [6]Zhao Haiming. Optimal control of urban pumping station based on ANFIS network model [D]. Zhejiang University, 2018
- [7]Chen Guoxing. 5g + water conservancy exploration and innovation [J]. Information technology and informatization, 2019 (07): 206-207
- [8]Xi Honglei. Research and design of industrial Internet of things in 5g era [J]. Communication world, 2020,27 (04): 69-70
- [9]Wei Liangliang, Ding Xiang, Cai Tian, Ouyang Erming. Optimal operation of pumping station based on BP neural network and improved genetic algorithm [J]. Hydropower and energy science, 2019,37 (05): 168-171
- [10]Wukan. Research and application of automatic system of unattended water supply pump station group [J]. Water supply and drainage, 2016,52 (06): 132-137
- [11]Tian Hui, fan Shaoshuai, LV Xinchun, Zhao Pengtao, he Shuo. Mobile edge computing for 5g demand [J]. Journal of Beijing University of Posts and telecommunications, 2017,40 (02): 1-10
- [12]Kong Ling, Zhang Yanjie, fan Dian. Research on the development and application of mobile edge computing [J]. Information and communication technology and policy, 2020 (03): 81-85
- [13]Wang Haimei. 5g enhancement technology for edge computing [J]. Mobile communication, 2020,44 (04): 72-7

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