Research on Robot Dynamic Path Planning Based on Multiple Linear Reinforcement Learning

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Abstract. Under the background of digital and intelligent transformation, all walks of life are facing the conflict between internal stability and rapidly changing external needs, and the conflict between stable background and dynamic foreground. To solve these conflicts and problems, it needs to take new means to adjust from multiple dimensions. Draw support from the new info and communication operation support system, it could form a digital Internet info support system with the cloud platform, which can effectively establish fast and flexible front-end utilizations and support the rapid development, agile iteration and on-demand adjustment of related businesses. The Internet backbone network needs to make the info open. The new info communication operation support system based on the Internet can enable the info resources to be transmitted as needed. The research and utilization of cloud resource visualization and controllability has gradually become the key to the development of new Internet communication operation system. On the premise of systematically combing the Internet info and communication operation support system, this paper comprehensively studies the utilization of cloud resources, and analyses the utilization scenarios of cloud resources of the new education communication operation system, in order to better ameliorate the more efficient and secure utilization of cloud resources and communication operation system inside and outside the enterprise.

Keywords: Cloud Resources, Info and Communication, Operation Support System

1. Introduction

With the continuous advancement of global digitization process and the rapid development of mobile Internet tech, mobile utilization, as the mainstream form of system utilization, has become an indispensable part of people's work and life, deeply affecting and changing social production and lifestyle [1]. All industries are accelerating the promotion of mobile development strategy. The large energy system represented by power grid has gradually become the development strategy of global energy Internet. On the other hand, the number of multi-source, polymorphic and heterogeneous data is increasing exponentially, which needs to be supported by corresponding data technologies of wide area collection, efficient storage and rapid processing [2]. Quickly mine deep knowledge and utilization value from these large, multi-source, polymorphic and heterogeneous data, so as to assist
the multi-source system operation decision of energy Internet, support the safe, stable and economic operation of energy Internet, and ameliorate the visual controllability of cloud resources.

The establishment of a new info and communication operation support system based on energy Internet takes big data cloud resources as the utilization scenario and platform, so as to better enhance the utilization value of cloud resources within the enterprise, outside the enterprise and all links of the value chain. New info and communication tech plays an important role in promoting the interaction and intelligence of the industry, and promoting the collection and processing of existing info data, including the transmission of info data [3]. Through info access, alternation and special communication, info analysis and sharing can better meet the needs of industry development. The new info and communication operation support system based on the Internet is to reconstruct the energy thinking mode and realize the in-depth integration of info tech and energy tech, so as to establish a new cloud resource utilization system.

In addition, the new info and communication operation support system based on energy Internet supports access to super large-scale distributed systems, relying on Internet tech to realize and resource sharing in a wide range of fields. Draw support from Internet tech, it realizes the coordination among a wide range of energy, load and energy storage equipment, and is closely coupled with other systems to form a complex multi network flow system. The new info and communication operation utilization can provide strong data support for business processing, support online collection of job data, report generation, work assistance and other functions, and ameliorate the efficiency of workflow [4].

In short, draw support from the Internet info and communication operation system, it can collect data in real time, accelerate the business process, enlarge the enterprise value, support the company's digital transformation, and realize the in-depth reform of operation management mode and multi service mode. The communication operation support system can provide strong data support for relevant business processing, and realize the functions of online operation data collection, report generation, work assistance and so on. Cloud resources are visible and controllable, which can provide customers with a more convenient, intelligent and intimate energy use experience, efficiently handle all kinds of business processes, and greatly ameliorate the efficiency of business flow and processing. Therefore, the research on the visualization and controllability of cloud resources, a new info and communication operation support system based on energy Internet has important practical value.

2. Utilization status of info and communication operation support system

2.1. Utilization status of info and communication operation support system

With the iterative progress and development of new info and communication technologies represented by the Internet, the construction of communication operation support system and platform has also increased significantly. At present, the related utilizations represented by Internet communication operation show a blowout growth trend [5]. The new info and communication operation support system integrating the Internet covers all fields and business segments, including production operations, operation management, customer value-added services and many other aspects. Figure 1 below shows the growth of info and communication utilizations in various business segments. The construction and utilization of the system effectively supported the production and operation activities of various industries and achieved remarkable utilization results.
2.2. Problems in the utilization of info and communication operation support system
Firstly, the construction and utilization of the new info and communication operation support system based on the Internet need to further strengthen the overall planning at the enterprise level, and accelerate and standardize the utilization of visual controllable tech represented by cloud resources. Secondly, due to the lack of overall and forward-looking planning from the perspective of enterprise level, multiple info communication procedures and data are repeatedly entered. Insufficient demand for grass-roots operations and insufficient support for on-site operations have caused many obstacles for grass-roots employees in using the new info and communication operation support system and the visual and controllable utilization of cloud resources. In addition, due to the insufficient coverage of various business process approval and auxiliary decision-making, some business info cannot be easily mastered, which is not enough to support info decision-making. Due to the lack of a unified info and communication access portal and the lack of unified security protection, the risk points of info and communication security protection are increased and there are great potential security risks [6].

3. Construction of info and communication operation support system based on Internet and visualization and controllability of cloud resources

3.1. Construction goal of new info and communication operation support system
The construction of a new info and communication operation support system based on the Internet must first be able to ameliorate the flexibility of industry operation and create an intelligent, interactive, efficient and collaborative operation mode. Secondly, the construction of the system needs to be able to ameliorate the ability of intelligent operation and the intelligence, convenience and safety of on-site action. In addition, the new info and communication operation support system needs to further ameliorate the enterprise's agile service ability and achieve the goal of customer-oriented active service and timely service [7-8]. At the level of improving security, it is necessary to achieve full coverage of terminals and realize the security protection of the whole link of network, utilization and data. Build a new mode of intelligent operation and agile service by building a new info and communication operation system with unified entrance, traffic aggregation, light utilization, agile intelligence and resource sharing; and realize the all-round mobile connection of personnel, business and data, and help the digital transformation and high-quality development of the industry.

3.2. Construction principles of new info and communication operation support system

![Figure 1. Growth of info and communication utilizations in the business segment](image)
The construction of the new info and communication operation support system based on the Internet should take the industry-level planning idea, take the user as the center, fit the user's on-site practical utilization, break the professional management planning thinking, and strive to integrate mobile utilizations among disciplines to ensure the overall situation and applicability of utilization planning. At the level of overall planning and collaborative promotion, strengthen cross departmental and unit cooperation and linkage, accelerate data fusion and sharing, and avoid isolated utilization islands and repeated construction [9-10].

In terms of demand guidance and service orientation, we should start from the actual business scenarios and utilization needs, pay attention to user experience, carry out planning and construction in combination with user needs and usage habits, and meet the diversified and personalized scenario usage needs of users. At the level of unified entrance and enhanced security, info communication is taken as the unified entrance of utilizations, centralized shelf management is carried out draw support from the portal, and common functions are precipitated to the info portal. In addition, we have established a unified technical route, standards and specifications, comprehensively ameliorated the adaptability of the new info and communication operation system to personalized needs, and formed a combination of overall planning and self-construction. The visual calculation of scattered data is shown in equation 1 below.

$$g^u_i = \left( \sum_n \Delta X_{i_j}^{u-a} \cdot \Delta X_{j}^{a-n} \right)^{-1} \sum_n \Delta X_{i_j}^{u-a} \cdot \Delta F^{a-n}$$

(1)

3.3. Cloud resource visualization and controllability architecture based on communication operation support system

Based on the Internet communication operation support system, the cloud resource visualization and controllability architecture mainly includes two parts: info communication utilization and cloud resource visualization portal, which are connected with relevant business systems and basic components. Its overall architecture is shown in Figure 2 below. It includes info and communication operation utilizations such as production operation, office management and public services, as well as unified portals such as MIP, security center, connection center, communication center and development center. Among them, in terms of auxiliary decision-making, by building six professional core data mobile Kanban, we can display the operation status info, apply data processing and quantify the management indicators, so as to ameliorate the lean management level of students.

Figure 2. Cloud resource visualization and controllability architecture

3.4. Visualization and controllability of cloud resources under communication operation system

Based on the Internet communication operation support system, the functions of the cloud resource visualization and controllability system include enterprise level authentication, platform level protection, all-round search, internal and external connection, convenient communication and open framework, as shown in Figure 3 below. Among them, the authentication function provides basic services such as messages and equipment, realizes strong security control over intranet operation.
equipment, and provides support for extranet communication operation utilizations. Build a unified and platform level certification and protection around the construction of a new cloud resource visual and controllable utilization system with unified entrance, traffic aggregation, lightweight utilization, agile intelligence and resource sharing.

**Figure 3.** Controllability function of cloud resources under communication operation system

### 4. Conclusion

In summary, the Internet backbone network needs to make the info open. The new info communication operation support system based on the Internet can enable the info resources to be transmitted as needed. By analyzing the utilization status of info and communication operation support system, this paper studies the problems existing in the utilization of info and communication operation support system. Through the research on the construction of cloud resource visualization and controllability of info and communication operation support system based on Internet, the architecture and functions of cloud resource visualization and controllability based on communication operation support system are analyzed.

### References

[1] Celenlioglu M R, Goger S B, Mantar H A. An SDN-based energy-aware routing model for intra-domain networks software [C]. 22nd International Conference on Telecommunications and Computer Networks (SoftCOM), 2014: 61-66.

[2] Dong Chaoyang, Zhao Junhua, Wen Fushuan, et al. From smart grid to energy Internet: basic concepts and research framework [J]. Power system automation, 2014, 38 (15): 1-11.

[3] Liu Shiceng, Zhang Dongxia, Zhu Chaoyang, et al. Thoughts on big data tech in energy Internet [J]. Power system automation, 2016 (08): 80-81.

[4] Su Lan, Wang Yudong, Xin peizhe, et al. Research on the architecture of global energy Internet world collaborative communication tech [J]. Telecommunications Science, 2017, 9 (1): 45-50.

[5] Wang Jiye, Guo Jinghong, Cao Junwei, et al. Overview of key technologies of energy Internet Info Communication [J]. Smart grid, 2015 (6): 473-485.

[6] Wang Yi. Research on info and communication architecture of energy Internet [J]. Power info and communication tech, 2015, 13 (07): 15-21.

[7] Xie Guohui, Li Qionghui. Key areas and key technologies of global energy Internet tech innovation [J]. China power, 2016, 49 (3): 18-23.

[8] Zeng Pengfei, Liang Yun, Wang Yao, Zhu Liang. Research on global energy Internet info and communication standard architecture [J]. Smart grid, 2016, 4 (09): 851-856.

[9] Zhang Chaokun, Cui Yong, Tang Yi, et al. Research progress of software definition network (SDN) [J]. Journal of software, 2015, 26 (1): 62-81.

[10] Zhang Junyan, Dong Na, Feng Wei, et al. Utilization of big data platform in power enterprises [J]. Hebei electric power tech, 2016 (01): 61.