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Research on Automatic Inspection System Based on Computer Artificial Intelligence RPA Technology

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Abstract: *With the support of artificial intelligence, robotic process automation (RPA) technology imitates human beings to operate computers. It has strong advantages in the digital transformation of enterprises, process automation, and system inspection and maintenance. RPA achieves intelligent, end-to-end inspection and maintenance of non-invasive systems through a method similar to how humans see, understand, and operate software, and through a clear information system inspection and maintenance rule. Among them, task prompt, data verification, abnormal monitoring, statistical query, automated report, etc. are the focus of this article. The system has the characteristics of high efficiency, high precision and intelligence.*

Keywords: *Artificial Intelligence; RPA; Automatic Inspection; Intelligent Inspection*

1. Introduction

Many capital-intensive companies have dozens or even hundreds of information systems. Due to the following reasons, some systems can only rely on manual operation and maintenance: (1) When the information system was established, it was not stipulated that the information system should have operation records or operation monitoring points required for operation monitoring. (2) The system itself is relatively closed and outdated, so it cannot be modified, nor can it provide monitoring points. (3) For a company with a group nature, since the systems adopted by its various departments are different, the same data must be established and maintained in each system. There are both commercial data and system operation data in the system, such as operating work records, etc. If you use manual methods for inspection and monitoring, or develop a tool similar to a crawler to achieve data handling, operation and maintenance, or monitoring, it will bring the following problems: (1) There are more and more operating personnel, and so are they. Maintenance costs are also increasing. (2) Manual operation cannot achieve near-real-time operation, nor can it achieve 7*24 hours operation; (3) Technologies such as crawling are more difficult to apply. (4) Due to the continuous construction of the information system, the frequency and scope of human maintenance are limited, resulting in some abnormal phenomena in the system or information terminals, which have a certain impact on the company's production and operation.

2. RPA technology and advantages

2.1 RPA technology

RPA software is a technology that automates manual operations by performing repetitive, rules-based tasks. Many companies are conducting research on RPA and applying it to the business domain of information systems [1]. At the same time, RPA is also researched in the field of operation and maintenance of information systems, thus completing the transformation of digital and intelligent working models. Now, there are many mature system operation and maintenance software on the market, which can meet about 80% of the operation needs of enterprises, and the remaining 20% of the operation needs are usually through customized secondary development, offline files, online electronic files or manual operations. The problems existing in the current information system operation are sorted out, and compared with the product-level operation management tools. According to the analysis of RPA, the

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following requirements are obtained:

(1) The workflow machine supports screen recording, one-click recording process, and supports drag-and-drop method to create and modify processes and process visualization. (2) A form customization engine. The maintenance form of the maintenance manager is required, such as problem feedback, change application, etc. (3) The report system can customize the report in web page format or Excel format according to the report template, and can also output the report in table format. The above-mentioned problems and requirements are difficult problems that the current operating software cannot solve.

2.2 Advantages of RPA

(1) Monitoring can be completed without the development interface, configuration or embedding of the monitored system. (2) The RPA mold is designed as traction type, which is easy to put into use quickly. (3) Compared with manual computer operation, the work efficiency of RPA is about 3 times that of manual computer operation. (4) RPA is simulated through the interface without any commercial errors. (5) Every step of the RPA operation can be monitored to ensure compliance. Compliance is significantly better than manual work. (6) The previous manual work can be completed 7*24 hours without interruption. (7) Exclude errors caused by people. (9) RPA robots can be quickly configured according to business and technical requirements.

3. Introduction to functional modules of the R&D platform

3.1 Function Introduction

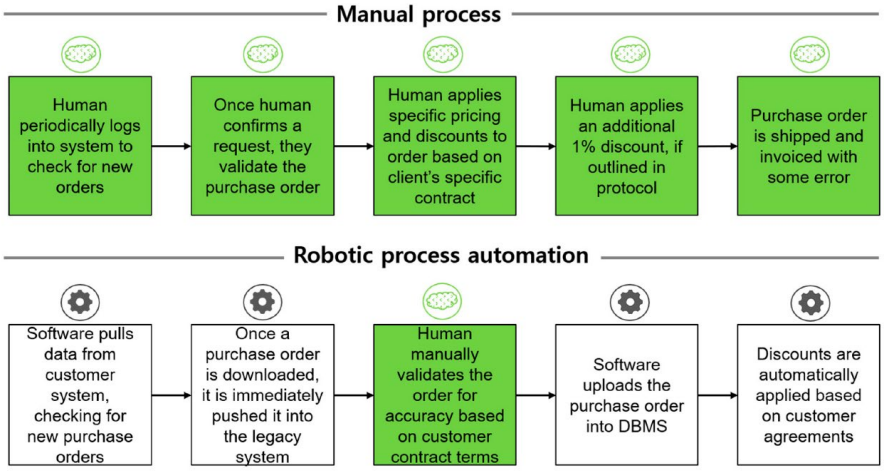

Figure 1: Intelligent process robot design and management platform

The intelligent process robot research and development platform based on RPA technology consists of a designer, an operator, an AI integration platform, and an intelligent process robot. The process robot equipment and management platform are shown in Figure 1 (the picture is quoted in Development of Evaluation Criteria for Robotic Process Automation (RPA) Solution Selection). The upper computer of the inspection robot is developed and the hardware integration of the sensor is carried out, and the sensor data is collected and organized [2]. Before the inspection robot arrives at the designated equipment, it can use photos, videos, thermal infrared, temperature and humidity and other information to conduct a comprehensive inspection of the equipment from top to bottom. At the same time, it is also necessary to record the relevant information of the equipment.

Its purpose is to develop "dexterous flow robots", and it can also operate and test RPA robots. It is mainly to provide users with various scenario development and design, and it can assist users in the design of machine process automation more easily. After the RPA system is established, the user uses the operating platform to operate the completed robot. When it is necessary to run "intelligent process robots" on multiple computers, these "software robots" can be centrally controlled, for example, unified distribution, unified setting of start-up conditions, etc. The development of the inspection robot's lower computer and its environment deployment. The specific content includes: the development of functions

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such as robot indoor positioning and mapping, autonomous navigation, and fixed-point travel. After completing this part of the research and development, the inspection robot can conduct autonomous inspections in the computer room, automatically recharge, and go to designated places at fixed points [3]. And intelligently avoid pedestrians or objects in the process of travel. The AI integration platform provides intelligent process robots with various AI capabilities required for process automation. Using artificial intelligence technologies such as OCR character recognition, natural language processing, and image recognition, the process processing capability and efficiency have been further improved.

3.2 Key technologies

3.2.1 Visual programming technology

The original visual programming and source code programming of the R&D platform can be freely switched under any circumstances, which is very simple and convenient to use. Designers don't need to master any advanced programming technology, they only need to use the visual process view and rich source code command library view to complete the presentation of the process. These two methods can effectively improve the efficiency of RPA process development. The specific details are shown in Figure 2 below (the picture is quoted from andreamannari).

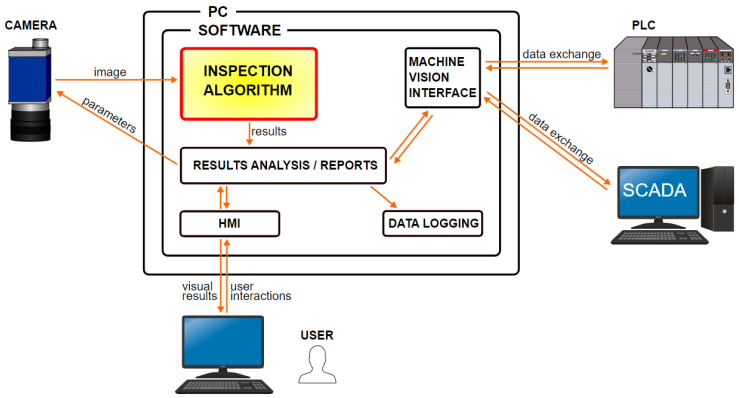

Figure 2: Visual programming interface

3.2.2 Business and software process intelligence

In RPA intelligent process design and in our daily office work, we often need to automate common software such as Excel, Word, and browsers [4]. It can be intelligently operated by using RPA technology. RPA can perform repetitive mechanical operations according to pre-written scripts, and replace manual tasks with automatic processes, thereby improving work efficiency.

3.2.3 Human-computer interaction simulation

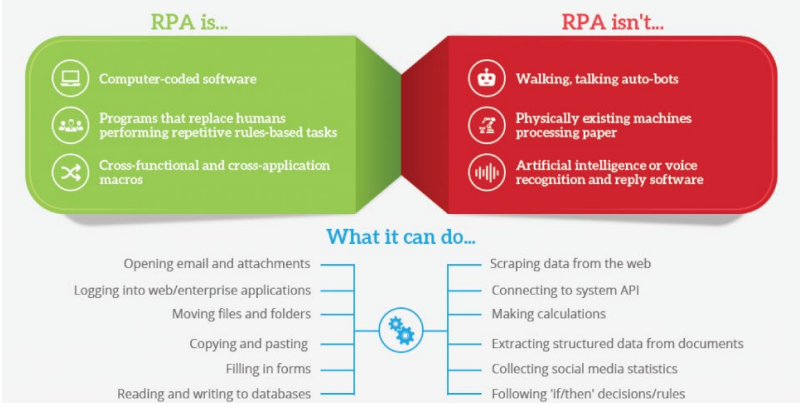

Figure 3: Comparison of RPA and conventional operation mode

The RPA intelligent process machine mainly simulates the user's manual operation. For example: data entry, character copying, pasting, mouse click, keyboard input, etc., automatic processing of data conversion between tables, automatic adjustment of document format and article layout, automatic

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sending and receiving of emails, automatic opening of inspection web links, literature retrieval, data collection, etc. operate [5]. The comparison between its traditional work and RPA robot is shown in Figure 3 (the picture is quoted in Robotic Process Automation: what is it and what is it not?).

3.2.4 Good scalability and compatibility

Provides a series of custom plug-ins, such as Python, C/C++, C#, JAVA, and some other commonly used programming methods. Support for multi-level development. In addition, it also has the advantages of multiple platforms, for example, it can run on multiple platforms such as Windows, Mac and Android. Compatible with PCs and mobile devices, it supports various UI automations such as browsers, desktops, and SAP.

4. System Application Prospect Analysis

4.1 Terminal online status monitoring

As more devices have entered the online monitoring platform, staff have to log in to the monitoring system every day to check the operating status and alarm information of all devices, including login operations, telephone communication, alarm notifications, task assignments, etc. In this process, the work intensity of the staff is very high, it takes a lot of time and energy, and there are still uncertainties such as personnel handover and manual errors, which will affect the quality of the work [6]. Using RPA technology, robots can independently complete the reading, judgment, analysis, uninterrupted monitoring and work order assignment of equipment operating status data in daily life, thereby saving labor costs and greatly improving work efficiency.

4.2 Comparison of daily inspection data

According to the requirements of equipment operation and maintenance work, regular inspections should be carried out on the equipment, and detailed data including temperature, location and other measurement information should be carried out. After each inspection, the inspection records must be completed manually. After the inspection is completed, it must be compared with the data of the previous inspection, and an inspection report will be compiled [7]. After several comparisons, it is found that only a small part of the data will change in a large amount of data, so the cost performance of this process is relatively low. Using the integration of RPA, AI recognition, and mobile terminal technology, automatic reading and comparative analysis of robot data can be realized, and the changed data can be screened to improve the efficiency of inspections.

4.3 Closed-loop maintenance data flow

According to the instructions of the superior, the defect data should be introduced into the transportation inspection management system to carry out the closed-loop management of the entire process, which specifically includes defect input, statistics, analysis, processing, acceptance and reporting. Currently, there are many power transmission and transformation devices, some of which have been used for a long time, so there are many problems among them [8]. If there are a large number of defects that need to be dealt with, it will take up a lot of working time for professional technicians, and when there are other objective factors such as auditors' business trips that cannot be handled in person, there will inevitably be situations of neglecting one another and delaying processing, which will affect the overall work progress of maintenance.

4.4 Summary of electricity production data

Now, with the increasingly serious safety production, the demand for lean operation management is also increasing, so there are more and more types of data to be filled in the worksheet. However, due to the relatively large size of the electrical equipment, a large number of people will perform repetitive work, so often a form can only be completed through the cooperation of multiple people. In this way, the work efficiency is relatively low, and it often happens that the report data cannot be fed back in time.

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5. Conclusion

RPA technology is a method to effectively support existing platforms, and it has obvious advantages in specific application occasions and requirements. It has the advantages of low cost, customizable, independent operation, etc., and can maximize the advantages of its independent development. In the process of gradually deepening the application, this technology can also play an increasingly important role in more fields such as system integration applications, data crawling processing, hierarchical protection construction, and information security management and control. It can form an effective complement to the traditional development technology, and has a good application prospect.

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