Design of Automatic Packing System for Workshop Based on PLC

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Keywords: PLC; Automation; Packing

Abstract: Automatic packing and palletizing manipulator plays an important role in the current code palletizing and packaging line. There are many drawbacks such as high labor intensity, low efficiency and so on in the manual work. Programmable Logic Controller (PLC) is a real-time industrial control device designed for application in industrial environment. With the rapid development of microelectronics technology, automatic control technology and computer communication technology, PLC has made great progress in hardware configuration, software programming, communication networking function and analog control. The packing process is one of the most important processes in the process of achieving complete production. The quality of the product and the speed of the product are the key factors affecting the high and low productivity. In this paper, when using PLC technology to transform it, on the basis of changing some hardware structures, PLC is used to control the program for control, design a PLC-based automatic packaging production line, greatly improving production efficiency, and reduce the pressure on logistics costs and tight warehouse capacity, saving inventory costs and logistics costs.

1. Introduction

Automatic packing and palletizing manipulator plays an important role in the current code palletizing and packaging line. There are many drawbacks in manual work, such as high labor intensity, low efficiency and so on, which can not meet the needs of packaging line development [1]. Therefore, the use of automated means of operation has become an ineviTable trend. Programmable Logic Controller (PLC) is a real-time industrial control device designed for application in industrial environment [2]. With the rapid development of microelectronics technology, automatic control technology and computer communication technology, PLC has made great progress in hardware configuration, software programming, communication networking function and analog control [3]. It has become one of the standard configurations of factory automation. Automation applications are also indispensable in the production of recorders. Especially in today's rapid growth of labor costs, the realization of automated production is even more urgent [4]. At present, there are mainly supply processes, inspection processes, assembly processes, etc. that can achieve automatic control in the production of domestic recorders. However, there are few in the packing process [5]. It can be seen that the bursting and research work of the punching product packaging automation system is particularly important.

The packing process is one of the most important processes in the process of achieving complete production. The quality of the product and the speed of the product are the key factors affecting the high and low productivity [6]. The cylinder is mainly used for the rotary motion or linear reciprocating motion of the load, and the solenoid valve is mostly used in the control circuit of the pneumatic system. As a link between gas and electricity, the circuit signal controls the operation and stop of the pneumatic components [7]. The traditional packing method only uses manual processing, and the product is packed mechanically and singly. This not only aggravates the worker's labor intensity, but also the introduction of human factors, which greatly increases the risk of product quality stability [8]. In the process of modern industrial production, the application field of packing automation is very wide, and all walks of life are inextricably linked with the packing system [9]. According to the product objects in different fields, the packing system adopted is also

  DOI: 10.25236/csam.2019.043

different. If the automation is applied to the packing link, the manual work intensity can be greatly alleviated. It can reduce the input of labor cost, ensure the stability of product quality and improve the working rhythm of finished product processing.

2. Materials and Methods

In order to reduce the expensive price of industrial control and improve the stability of relay group control, programmable controller came into being in digital equipment company. Its application ranges from the initial "on" and "off" control of switch logic to analog control, digital control, robot technology and so on. Slowly dominate the wave of new technology. Empty box supply is mainly responsible for the vertical code operation of the turnover box, decomposed into a single state, and placed horizontally to the transmission line. Full box discharge is mainly responsible for the turnover box filled with products, moving out of the transmission line to the finished product area for temporary storage, waiting for manual centralized transportation. In the actual production, because the control system of the equipment uses the computer control system and other reasons, the stability of the integrated packing machine is insufficient. It has a certain impact on production, but also caused the problem of excessive system cost [10]. The automatic transmission system is the key unit of the recorder bottom plate packing project, and completes the work between the upper station punching group and the lower station robot packing.

Before the production line begins to operate, the robot may be in any position, requiring the robot to be sent to the upper left corner during the initialization phase of the production line.

Since all types of PLCs produced by different manufacturers have basic logic instructions for coils and contacts. Therefore, the user program designed by the empirical design method has wide versatility. When the robot capture signal is valid, the robot is programmed and controlled according to the program. Perform actions and trajectories such as gripping, transplanting, boxing and release to complete the robot unit function. At the same time, the full floor transfer box is transferred to the palletizing unit through the roller machine. In order to meet the development needs of industrial enterprises' automated production, improve production efficiency, and ensure the health of operators, it is an ineviTable development trend to use automated control technology to realize the manufacturing process. With the continuous development of science and technology, industrial control technologies have also been developed, such as relay group control technology, computer control technology, PLC control technology and embedded controller control technology. The connection with the controlled object and the connection between components can be wired. Such as analog signals or digital signals through cables. It can also be wireless, such as infrared, microwave, radio wave, light wave, etc.

3. Result Analysis and Discussion

For the manufacturing industry of large-scale one-stop production lines, the stamping and forming department is indispensable. Among them, the stamping process is the most important. The bottom plate stamping of the recorder is to use the uncoiler to punch the sheet into a material. Then, through large-scale equipment such as leveling machine and punching machine, the die, die, bend, and shape are formed. Finally, the bottom of the recorder is manually packed. After starting the robot, the system starts a self-test. After the self-test is completed, check if the package is in place. After the carton is in place, the type of the carton is recorded. After the carton is in place, the type of the carton is recorded, and the system check Table determines the packing plan. The relay control system realizes logic control and sequence control through the wiring circuit. Embedded controller has poor anti-jamming performance and is prone to error information due to external interference. In the field of industrial control, with the continuous development of production, the control system becomes more and more complex. A system often contains multiple controllers or actuators. This is a fatal weakness for industrial control aimed at mass production. PLC is a batch product with sTable performance, strict screening of product production, and perfect production management and standards.

Analytic Hierarchy Process (AHP) was used to evaluate the perceived risk of PCL. Comparing the relative importance of each factor in the same level with the same factor in the previous level, a pair comparison matrix is constructed. The statistical results are shown in Table 1.

Table 1 PCL sensing layer risk comparison data results

	Residence time	Arrival rate	Views
Residence time	1	0.47	0.68
Arrival rate	0.69	1	0.62
Views	0.68	0.59	1

The development of PLC is inseparable from the research of science and technology. It is closely related to computer technology, microelectronics technology, cybernetics, communication network technology and so on. The hardware aspect of the embedded controller is limited by the processor, memory capacity and interface type. The software aspect is mainly limited by the relevant programming language of the corresponding processor type. In most cases, the application of embedded control belongs to a class of dedicated control devices that serve a particular product. PLC has a wide range of applications, and it has better versatility, compatibility and scalability than embedded controllers. Since the microprocessor is embedded in the underlying control instrument, it has digital computing and digital communication capabilities. Therefore, multiple devices can be directly attached to the bus and communicate with the host computer according to the standard protocol. The common embedded control system has strong data processing ability. However, its programming language is not easy to master, often using assembly language or high-level language for programming. And the use of embedded control system needs to do a lot of interface work, the corresponding platform or device.

The realization of data communication between PLC and computer can make up for the network topology and application function of PLC more effectively, realize the design idea that small devices play a great role, give full play to their own advantages suiTable for industrial control, and expand their application scope. As the amplitude of the signal increases, the estimated signal can reach and exceed the true value. It also has a certain enhancement effect on the relatively large radial component, which can effectively preserve the edge and contour information of the image. The comparison of this function with other contraction functions is shown in Figure 1.

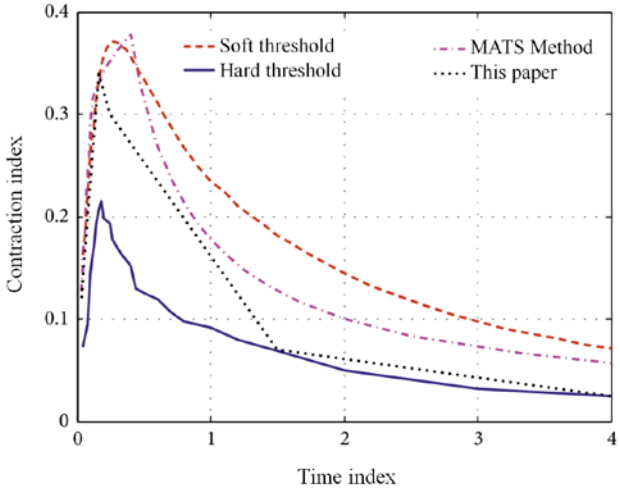

Fig.1. Comparisons with other contraction functions

For complex industrial control designs, it can't be done by a single unit. In this way, the complex control system needs to be decomposed into different branch systems, and then the controllers of the respective systems cooperate and work together. From the birth of PLC to the multi-domain application of PLC control system, PLC control system has completed the technical requirements of manufacturing industry automation with its extended control module and convenient programming software support. After initialization, it performs self-diagnosis for each scan cycle, and determines whether there is a problem with the syntax of its internal power supply, connection circuit, and user

program. At the same time, the special function module is periodically reset according to the content of the curing chip to ensure the stability of the entire system. At present, with the development of communication technology and the enhancement of network communication function, many PLCs are interconnected to form a large-scale control system, which makes it more suiTable for industrial control applications. The connection of memory is detected, and communication is processed and interruption requests are detected accordingly. At this stage, PLC can be programmed online or offline. Compared with fieldbus, Ethernet has the advantages of low cost, high bandwidth and abundant hardware and software resources. With the development of Ethernet switching technology, full duplex communication technology is adopted. The problem of uncertainties in transmission delay of Ethernet communication is fundamentally solved.

4. Conclusion

When designing the automatic control system with PLC as the core device, many factors such as the complexity of the system, the control requirements, the response speed of the PLC and the design efficiency should be fully considered. In this paper, the PLC technology is used to modify part of the hardware structure, based on the selection of PLC programming control program. The automatic packing production line based on PLC is designed, which greatly improves the production efficiency. The hardware unit and programming method are selected to make the designed control system meet the requirements of production automation to the greatest extent. It truly reflects the basic principle that PLC is designed for industrial applications, easy to program, and easy to integrate with other control devices. The use of soft relays reduces the number of external connections and simplifies the entire control system. The modification of the local program and the input and output wiring can complete the control function change, which is convenient for system development and debugging. Automated packing system to standardize, standardize packing and turnover. Reduced the pressure on logistics costs and tight warehouse capacity, and indirectly saved inventory costs and logistics costs.

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