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Research and Development of Key Technologies of Chip Post-processing Multifunctional All-in-one Machine

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Abstract

Chips are currently used in most regions, many of which are combined. The consistency of the chips will determine the performance of the combination. Therefore, the performance of the chips system should be strictly checked to ensure its permanent classification. Small batches of manual detection and removal of chips are very effective. Low, high error rates are not suitable for testing large numbers of chips, which will result in them not being sold as titanium alloys. This article focuses on the design and completion of automated detection and screening systems for chips. The structure, working principle and performance of the system are described in detail. It mainly introduces the installation process of the system and analyzes the performance of the system. Each part of the system uses an internal resistance detection device and an anti-interference method.

Keywords

Chips; Testing; Classification; Machine Vision.

1. Research background

With the wide application of portable electronic products such as computers and video recorders, and the increasing demand for chips in traditional applications such as automobiles, the speed of these machines has increased by more than 20% in the past decade. According to IDC statistics, the number of people using mobile phones and laptops worldwide in 1999 was 426.8 million, reaching 1.48 billion yuan by 2004, with an annual growth rate of more than 26%.Frost Sullian predicts that the annual sales of the global mobile computer market will increase from 248.1 billion yuan in 1998 to 437.3 billion yuan in 2005.

9Monthly statistics show that China & apos; s mobile computer users have exceeded 25 million, and the growth rate is very fast (expected to grow to 100 million users in 2005), and now there are more than 2 million portable computers. High-end cameras and PDAs require high-performance chips.

The domestic production of chips is far from meeting the market demand. Taking a large lithium battery manufacturer in Tianjin as an example, the total output of chips produced by Tianjin is about 10,000 units per day, and the annual output is between 3 million and 4 million units. Compared with the current domestic production capacity of chips, the huge market has formed a contradiction between supply and demand. At the same time, imported chips from abroad have also been pushed into the market of our country. Therefore, lithium battery manufacturers urgently need to solve the capacity problem of chips. At present, one of the key factors affecting the production capacity of chips is the detection and classification of finished chips. Especially when chips are used in groups, in order to ensure the longest life and the best performance of chips, the characteristics of chips need to be consistent. For example, chips in laptop computers need two groups, whose internal resistance, voltage, charging and discharge current, capacity

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and other parameters are the same. Qualified chips need to be divided into more than 30 categories in detection and classification. At present, manual classification is prone to errors. It is time-consuming and urgent to develop an automatic detection and classification system for chips. Y-chip improves automation, reduces manual intervention, reduces labor intensity and improves production efficiency in the process of product sorting.

The main content of this project is to use computer network and database technology to collect data, record and analyze the characteristic parameters of lithium battery produced by lithium battery production and testing equipment, and use industrial sensor technology and electronic display technology to convert current. NT manual sorting, and the classification data applied to sorting display equipment, using sensor monitoring, to ensure that there are no errors in the sorting process, to achieve the purpose of automatic sorting. At present, the preliminary experimental work of the project has been basically completed, and has been approved by chips. Enterprises have entered the stage of actual development.

At present, chips have been widely used. In practical applications, most of the combined chips are in the form of combined chips. The performance of the combined chips depends on the consistency of the electrochemical characteristics of individual chips in the combined chips, which requires the performance testing and classification of chips before manufacture.

2. Progress at home and abroad

The long-term safe operation of chips is mainly supplied by China, Japan and Korea. The Japanese lithium battery industry appeared earlier, and the equipment and technology are also relatively perfect. At present, almost all high-end chips are provided by Japan, followed by Korea, which is now shifting from low-end market to high-end market. For China, the lithium battery industry has only begun to develop in recent years, limited to low-end chips. With the expansion of the scale, the proportion of chips in the market will increase accordingly. Because of the high technology content of high-end chips, and the excellent characteristics of green environmental protection and high economic value-added, China should focus on strengthening technological innovation. Promoting the supply of chips from large quantities to high quality, even if the number of chips produced by a certain scale of lithium battery manufacturers in China is less than 100 million pieces per year, it can not meet the market demand at all, which makes more foreign chips pour into China. Therefore, lithium battery manufacturers urgently need to increase the production of lithium battery wafers.

3. Systematic objectives and research contents

3.1. System goals

This system is called "lithium battery automatic detection and sorting system”. The system can realize the following functions: after the production of a batch of chips, there are four infrared/photovoltaic measurements in the process of pallet discharge, and one conversion and subsequent processing. According to the different requirements of users for chips, the system can automatically complete the selection of finished products, additional processing, structural adjustment and post-processing of chips systematically. At the same time, the system should complete each of them systematically. A measurement data is recorded in the program, selected according to the standard, and eventually the level type is obtained. Because different work faces different modules, the operators are different. Exercise of other rights. Considering that the current user is connected through the LAN, the system is connected through the LAN. The system is developed by using C/S mode and Microsoft SQL Server 2000 database resources. At the same time, PowerBuilder 8.0 as a client development tool ensures the safe and stable transmission of data.

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The development of the system is mainly based on computer network and database technology, from manual and manual operation to automatic detection and classification. Combining electronic sensing technology with electronic display technology, the automatic separation of chips can be realized to reduce errors and labor, reduce expenditure and improve production efficiency.

In order to adapt the automatic detection and classification system to the overall needs of actual production, a notebook brain lithium battery with the highest requirements for detection and classification is developed. The following functions are realized:

The characteristic parameters of lithium battery produced by test equipment are collected in real time and recorded in database. The characteristic parameters of lithium battery were analyzed, compared and classified. The classification results are output to the pallet sorting equipment of the sorting station. The tray sorting equipment of the sorting station shows the type of chips to be sorted and checks whether the sorting is correct. The interface between the manipulator and the transmission equipment is reserved to facilitate the full automation of sorting and packaging in the future.

3.2. Research contents

This paper mainly discusses the design and implementation of the detection and sorting system for chips, describes its structure, working principle and performance, focuses on the installation of various parts of the system & apos; s internal resistance detection device and anti-interference methods, and gives specific implementation methods. By using Bayesian estimation parameters and lithium battery screening method, the one-sidedness of the original single feature lithium battery screening is solved. The realization of the system can save manpower and time, improve efficiency and reduce the labor intensity of workers.

This paper consists of two parts: the design of detection system and classification method. The first part outlines the principle and development criteria of detection system, and completes the design according to the actual needs. The emphasis is on the design of internal resistance detection device. The second part includes, but is not limited to, the first part, elaborates the basic concepts and methods of data fusion. The second part, under the premise of practical application, uses Beibei. In the third part, the fusion results are well applied in the selection of chips. In the selection of chips, the layout of the selection equipment will dominate the design of the chip. The capital and practice required to complete the product, as well as the profit of the product.

At present, most factories are clustered layout, working in machine tools and facilities centralized, increasing processing time and time, rational layout, well-equipped manufacturing system will promote new product listing, reduce development funds. Reducing risk, reducing preproduction preparation and interruption time, improving product quality directly affect the operation of the whole system. Now all researchers are concerned about the layout of the design and manufacturing system. Many researchers in our country e some specific algorithms to improve equipment. Among them, simulation algorithm and genetic algorithm are the most widely used ones. This method can reduce equipment requirements. Space and logistics costs seriously affect the initial cost and quality of the system, the type of products and the time of transformation, and the scalability of the system. It has reliable performance and high production efficiency. Most of the ideal products are used in the electronics, food and pharmaceutical industries, and little research has been done on system configuration. According to the layout of pallets, manipulators and unloading equipment, we can find that different equipment layout may lead to different equipment costs. SCR has less research on layout and no experience to guide, so it should focus on the most perfect layout design of manipulator equipment.

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4. System design

4.1. System Overall Function Design

The assembly of chips mainly realizes the detection, grouping and information recording functions of single chips. In order to realize the grouping of chips, it is necessary to group chips in series and in parallel according to the grouping process of chips. The control contents include the monitoring of robot movements, the transportation control of single crystal silicon wafers, the grasping control of special cylinders and so on. Robots need to implement chain control according to the working status of the transmission line, the quality of single crystal silicon wafers and whether the information matches, and intelligently replace the system adopts decentralized control mode and intelligent interlocking to realize the overall function design. The overall functions of the system are as follows: 1) chips are connected in series and parallel by manipulator according to feeding mode and grouping process. 2) Measure the voltage and internal resistance of a single lithium battery, detect the voltage and internal resistance of a single lithium battery, and screen out unqualified single lithium battery. 3) Intelligent replacement of natural gas chips. According to the comparative results of single voltage, resistance and bar code information collected by PLC, the manipulator of lithium battery puts the unqualified single lithium battery into the waste tank and takes out the single lithium battery in the spare area for replacement. 4) Conditions monitoring, real-time monitoring and fault alarm of transistor refrigerators, robots, special cylinders, scanners, spare parts and waste tanks in transport lines; 5) Data management, storage of bar code information, voltage, internal resistance of single lithium battery, and reporting monitoring information to MES system to trace product quality; 6) Recording and prompting fault alarm information, recording equipment operation process. Fault information, and according to the fault code prompt fault treatment measures.

4.2. System Hardware Design

This system constructs a set of intelligent lithium battery integrated detection system, which takes the robot hand as the main body and carries scanner, contact probe, special cylinder card and conveyor line. After the lithium battery material reaches the No. 1 station, it is conveyed to the No. 3 station through the conveyor line The integrated testing system of semiconductor refrigerating wafer mainly consists of two parts: monitoring software and control software. The monitoring software is mainly composed of equipment condition monitoring, parameter setting, equipment operation, alarm history record and prompt, data management, voltage internal resistance trend interface of semiconductor refrigeration chips, etc. The system startup equipment first enters the equipment condition monitoring interface. According to the number, location and operation status of the semiconductor refrigeration chip on the transport line, the marshalling mode and the number of robot grabbing blocks are set. The system is switched to automation, and the equipment enters the operation status by clicking on the operation button. When the equipment fails, sound and light alarm and interlocking shutdown will be issued. In the monitoring interface, alarm will be given in the form of warning lights and the fault will be inquired in the historical alarm interface. The lithium battery wafer material is blown clean by ionic wind as it passes through the second station. After the material was detected, the robot began to organize, inspect and replace chips as required. Action. Special clamps are installed on the fourth axis of the robot. The lithium battery and its internal resistance were tested by AC four-terminal test method. Four terminals are mounted on the clamp of the special cylinder through a contact probe. The clamp of cylinder is driven by the motion of the robot, and the contact measurement of a single lithium battery is realized by the movement of the fourth axial downward pressure of the robot. At present, the detection of voltage and internal resistance of a single lithium battery has the advantages of simple design and high measurement accuracy.

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Very fast. The scanner is installed on both sides of the special drum grabbing device. In order to improve the production efficiency, this design uses double-barrel clamp design, which can clamp two chips at the same time for marshalling. The system uses voltage internal resistance tester to test the internal resistance and voltage of single crystal silicon wafer. According to the test results, it can be judged whether a single lithium battery meets the production process requirements, whether the lithium battery is inverted in the marshalling process, whether the bar code information matches, in order to achieve interlocking control between devices, interlocking control between devices must be realized. The interactive communication between 1 and N controllers is carried out in the form of 1 + n control. This system uses PLC to process all information and control and distribute the whole system.

Industrial Ethernet, fieldbus and industrial wireless are three main technologies in the field of industrial communication. Integrating Ethernet, fieldbus and wireless technologies into the control network can ensure the stability of the system, enhance the openness and interoperability of the system, and improve the level of information service. Because the equipment of the system is in a fixed state, the communication mode of industrial Ethernet and field bus can improve the accuracy and stability of the system and reduce the maintenance cost.

This system uses Siemens PLC to integrate the system and realize the distribution control of the whole system. PLC supports various communication modes, including field bus communication between cylinder and four-axis robot, RS-485 serial port of voltage internal resistance tester, Industrial Ethernet of scanner and touch screen, start-stop digital switch of various equipment receiving and controlling through Digital input-output module of PLC itself. The equipment and the communication between the system management station and the control station are realized by industrial Ethernet and the communication network.

In order to improve the production rhythm and efficiency in actual production, it takes a very short time to complete a group of chips. The main process of forming chips includes: measuring individual chips by voltage internal resistance tester of chips, and feeding back the measured results. NT results are returned to the control layer. The control layer compares and judges the measurement results according to the technological requirements, and feeds back the judgement results to the four-axis robot. Robots make corresponding actions according to the judgment results. It takes a certain time to complete these actions, and information exchange between devices takes a very short time. Most of the time is spent on the measurement of the voltage internal resistance of chips. In the process of measuring the voltage internal resistance of single crystal silicon wafers, the voltage of single crystal silicon wafers is small. If the commonly used testing methods are used, not only time-consuming, but also lead to great errors in the measurement results.AC four-terminal test method can not only measure voltage and resistance at the same time, but also carry out high-precision and high-speed measurement. It is most suitable for the production and testing of chips.

Because the test terminal is to test the lithium battery through a probe installed in a special electric cylinder, a self-made test line is needed. In order to reduce external interference, shielded twisted pair is used, and the test terminal should be far away from the metal plate. Therefore, the support of the contact probe is made of plastic material. In order to reduce noise interference and signal attenuation wiring length within 5 meters, the probe and the voltage internal resistance tester are joined by welding, so as to avoid abnormal test caused by excessive contact resistance and prevent normal current from flowing into the test. Lithium battery.

4.3. System Software Design

The integrated test system for lithium battery wafer is mainly composed of two parts: monitoring software and control software. The monitoring software is mainly composed of equipment condition monitoring, parameter setting, equipment operation, alarm history

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recording and prompting, data management, voltage internal resistance trend interface and so on. The system startup equipment such as chips first enters the equipment condition monitoring interface. According to the number, position and working status of chips on transmission lines, the grouping mode and the number of robotic grabbing blocks are set. System switch to automation, click on the operation button, equipment into operation state, when equipment failure, sound and light alarm and interlocking parking. The monitoring interface alarms in the form of warning lights, and inquires for faults in the historical alarm interface.

When chips are grouped, unqualified single chips will appear in the test of single chips. Therefore, the equipment can not continue to produce. If the equipment manually participates in the replacement of unqualified single chips in the production process, it can not guarantee the production efficiency and safety of employees. The system has set up spare parts grooves and waste troughs. When the robot detects unqualified chips in the marshalling process, the unqualified chips are first put into the waste trough, and then the spare chips are removed from the spare parts trough for testing. After qualified, it is directly grouped and put into the third place of the blanking line. If it is not qualified, it will be put into the waste trough, continue to remove from the standby conductive cooler, grab it from the trough and replace it until the replacement is successful. After successful replacement of chips, incomplete chips continue to be grouped and counted. The chips in the spare tank and waste tank are counted by a photoelectric sensor mounted at the bottom. When the waste water tank is full and the backup water tank is short of material, the equipment stops running and sends out prompt information. The flow chart of intelligent replacement control for lithium battery wafer formation and NG lithium battery wafer is shown in Fig. 1.

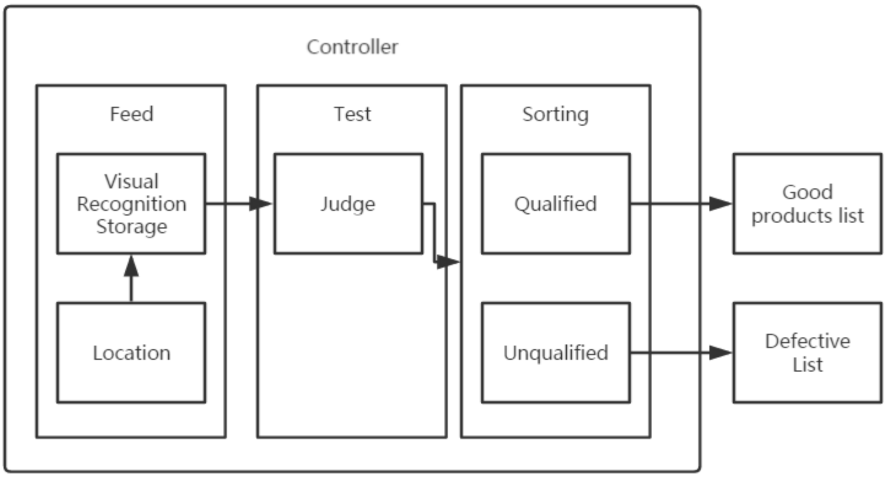

Figure 1. Flow chart of intelligent replacement control

After the material of lithium battery arrives at the main workstation of the feeding line, the material number of lithium battery is counted by photoelectric sensor. When the photoelectric sensor receives the induction signal to express the material here, the PLC collects the number of chips through the photoelectric sensor and interacts with the robot. The robot communicates with the robot according to the PLC. The data information acquired determines the location of a single lithium battery. Because the number of materials in a given lithium battery is fixed, for example, when the lithium battery is dispersed and the material of the lithium battery is not in the proper position, if the number of remaining chips is calculated by the number of times the robot grabs, t can not monitor the number of chips in real time, which is likely to happen. Collision accidents of robots cause great damage to the life of robots. Therefore, it is necessary

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to monitor the number of individual chips by sensors. When the lithium battery material is displaced due to the deformation of the battery, a fault alarm is issued to prevent the interlocking shutdown robot. When the robot moves, it stops the equipment failure. The sensor can monitor the number of chips in real time and determine the grasping position and placement position of the robot, such as the scattering of chips on the conductor body, the manual movement of chips or materials, etc. The lithium battery L did not reach its position. In case of emergency, sound and light alarm will be issued for the first time, and the robot will be shut down in cascade according to the failure situation. In order to prevent the material position of chips from changing due to the expansion and deformation of chips, a laser displacement sensor is installed on one side of the material of chips. When the lithium battery material is displaced due to the deformation of the battery, a fault alarm is issued to prevent the interlocking shutdown robot. When the robot moves, stop the device failure. The unqualified single semiconductor refrigeration chips will appear in the test of the single semiconductor refrigeration chips when the semiconductor refrigeration chips are grouped. As a result, the equipment can not continue to produce. If the equipment manually participates in replacing the unqualified single semiconductor refrigeration chips in the production, the production efficiency and safety of the staff can not be guaranteed. The system has set up spare parts trough and waste products trough. When the robot detects the unqualified monomer semiconductor refrigerating sheet in the process of marshalling, it first puts the unqualified monomer into the waste products trough, then grabs the spare parts semiconductor refrigerating sheet from the spare parts trough and detects it.

5. Concluding remarks

According to the development and demand of lithium battery wafer pack at present, the integrated test system of lithium battery wafer introduced in this paper adopts automatic control technology, uses robot technology instead of manual grouping, and strictly controls the quality of battery pack by detecting the internal voltage of battery pack. The NAL resistance of single lithium battery wafer ensures the consistency between single lithium battery wafer batteries. Because the system adopts the mainstream communication mode in the industry, the real-time monitoring of equipment status is realized. At the same time, combined with fault diagnosis technology, the interlocking shutdown of equipment is realized, the stability of the system is improved, and the sustainable operation of the system is guaranteed. By storing lithium battery information, the traceability of product quality information and real data is realized. With less material consumption and available production data, large-scale data analysis can be carried out to help establish a digital workshop and realize lean production.

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