Development and Program Realization of Saxophone Numerical Control System Based on Computer

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Abstract. As a common musical instrument, saxophone's voice components and its similar parts require very high machining accuracy, and a little carelessness in the process will lead to the scrapping of the whole system. Based on this, this paper studies the program implementation process of saxophone CNC system based on computer. This paper first analyzes the development characteristics and functions of modern numerical control technology, and then gives the composition and program implementation of saxophone CNC system based on computer.

Keywords: Saxophone, Numerical Control System, Computer Program

1. Introduction

With the rapid development and iteration of numerical control integration technology based on computer technology, the current manufacturing industry has brought profound changes, making the manufacturing of industrial products more accurate and convenient [1]. Numerical control technology based on computer integrates information, automation and control theory, so that the manufacturing process of CNC system has several aspects of characteristics as shown in Figure 1.

![Figure 1. Characteristics of CNC system manufacturing process](image)

With the further change of information technology, the computer-based numerical control technology is also in the continuous iterative development. The current computer-based numerical control system has gradually changed from the traditional closed control mode to the open dynamic mode, which makes the automation and intelligent degree of its manufacturing process continuously improved [2]. As a common musical instrument, saxophone's voice components and its similar parts require very high machining accuracy, and a little carelessness in the process will lead to the scrapping
of the whole system. Therefore, saxophone machining based on CNC system can meet the requirements of precision and efficiency, so it has high research value.

2. Development Characteristics and Functions of Modern Numerical Control Technology Based on Computer

2.1. Development characteristics of modern numerical control technology based on computer
Modern numerical control technology based on computer can better meet the needs of the market and the development of science and technology, as well as the requirements of modern manufacturing technology for CNC technology. In general, the development trend of today's CNC technology is mainly reflected in the open architecture of CNC system, high-speed, high-precision, high-automation, intelligent, networking, miniaturization and other aspects, as shown in Table 1 below. In addition, the modern numerical control technology based on computer is gradually developing towards the direction of digital servo interface, higher communication function and multi-function.

Table 1. Characteristics of modern numerical control technology based on computer

| Characteristics | Detail descriptions                        |
|-----------------|------------------------------------------|
| Openness        | Interoperability, portability, scalability, inter-changeability |
| Automation      | Numerical control system can interpolate at high speed |
| Intellectualization | Adaptive control function                      |
| Networking      | Realize internal resource and information sharing |
| Communication   | Controlled by digital communication interface and communication protocol |
| Multi function  | Maximize equipment utilization              |

2.2. Function of modern numerical control technology based on computer
The modern numerical control technology based on computer is used in the machining process of saxophone musical instruments. With the help of its open structure motion control system and dynamic third-party software resources, the fine processing of saxophone can be realized. Secondly, based on computer programming, it can realize the accurate analysis and capture of customer needs, so as to carry out targeted development [3]. Based on the information ability, accurate control ability and high cost performance of the system, it can greatly meet the needs of customers.

In addition, the modern numerical control technology based on computer can greatly improve the efficiency and stability of Sax CNC machining, and the flexible production through computer program can meet the processing of precision and complex parts in saxophone [4]. Thanks to its integrated multi-function and low-cost features, the computer-based Saxophone numerical control system can also reduce the number of other auxiliary equipment required in the processing process, reduce the number of operators, and bring significant economic benefits. It can be seen that the role of modern numerical control technology based on computer in saxophone processing mainly includes improving economic benefits, reducing processing costs and improving machining accuracy.

2.3. The function and architecture development direction of CNC technology based on computer
First of all, on the performance level, CNC technology based on computer is developing towards speed, accuracy and efficiency, flexibility, process complexity and multi axis, real-time intelligence and so on. Secondly, in the direction of its functional development, CNC technology based on computer has gradually realized the graphical user interface, visualization of scientific calculation, diversification of interpolation and compensation methods and popularization of multimedia technology [5]. In addition, in the development of its architecture, the CNC technology based on computer gradually changes and transits to the integrated, modular, networked and general open closed-loop control mode, so as to gradually realize the real-time intelligent control based on the computer.
3. Composition and Program Realization of saxophone Numerical Control System Based on Computer

3.1. Composition of Sax CNC system based on computer
The computer-based Sax CNC system comprehensively applies advanced technologies such as computer technology, automatic control technology, precision measurement technology and machine tool design, thus laying a solid technical foundation for the efficient processing of saxophone. The main components of saxophone CNC system based on computer include program input / output device, numerical control device and servo drive, as shown in Figure 2. Among them, the input / output device is the input of the computer program, which can output the NC machining or motion control program, processing and control data, machine parameters, coordinate axis position, and state data of detection switch.

![Diagram](image)

**Figure 2.** Composition of Sax CNC system based on computer

In addition, as another core component of computer-based Saxophone numerical control system, its components mainly include input / output interface circuit, controller, arithmetic unit and memory, etc. it can output instructions through computer programming control program through computer calculation and processing, and complete the instruction control of CNC system processing saxophone. As a key component of computer-based Saxophone numerical control system, servo drive is composed of servo amplifier and actuator [6]. Based on computer interpolation operation information, servo driver controls the displacement of coordinate axis, so as to achieve accurate positioning and trajectory of components.

3.2. Program Realization of saxophone Numerical Control System Based on Computer
There is no big difference between the computer-based Saxophone CNC system and the traditional processing system. The main reason is that the information control components are added. The specific working principle and process are shown in Figure 3 below. Among them, as the core of the whole system, after receiving the digital information, the numerical control unit decodes and processes it by the computer control software, and then outputs all kinds of instruction information to the servo system, so as to drive the executive parts for feed motion. The driving device converts the information instruction into the final mechanical movement, and realizes the precise positioning and trajectory movement based on the mechanical connecting parts, and finally processes the parts that meet the requirements of Sax processing drawings.
Figure 3. The specific working process of the saxophone numerical control system

In the process of using the computer-based Saxophone numerical control system, the complete information of the processed Saxophone part drawing should be written first, and the program can be executed by the computer control system. Then the processing program is input into the numerical control device. After the information analysis and processing of the numerical control system, each coordinate moves the corresponding position according to the program, and finally completes the processing of saxophone parts.

4. Conclusion

In summary, as a common musical instrument, the processing of its sound components and its similar parts requires high machining accuracy. The CNC technology based on computer integrates information, automation and control theory, which makes the manufacturing process of saxophone CNC system more accurate and controllable. In addition, saxophone CNC system integrates and integrates advanced concepts and technologies such as computer, automatic control and precision measurement, which not only lays a solid technical foundation for the efficient machining of saxophone, but also establishes more and more technical advantages in the processing of other complex parts, so it should be widely popularized and applied.

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