Application of sensor and detection technology in Mechatronics System

Wei Gui*
Wuhan Business University, Hubei, China, 430056

*Corresponding author e-mail: taobisuikechi111@163.com

Abstract. With the development of science and technology, mechatronics production technology has been widely used. However, for many people who are not exposed to the technical system, or will think that Mechatronics is only a technical mode. Mechatronics is an integrated technology, which needs many links. It means that with the development of microelectronics, sensors and other technologies, mechatronics can also make great progress. Before analyzing the key technology of mechatronics, we should first make clear its composition structure to eliminate some people's misunderstanding. Mechatronics refers to the integration of different important mechanical and electrical work links, with microprocessors and mainframe as the control center, and orderly coordination of work in each link.

Keywords: Mechatronics, sensor, detection technology

1. Application of sensor in measurement module

Sensor is a kind of name of detection device. It is also the most commonly used transmission, storage, processing and recording equipment in current digital management (figure 1). In the mechatronics system, the sensor is the bridge between the control center and each link. It mainly realizes two aspects of work: first, executing the command requested by the control center. After receiving the instruction, the sensor transforms it into non transmission data language, carries out analysis and content deployment, and then transforms the result into data transmission mode, and transmits it to the link to be controlled; secondly, it is responsible for dynamically transmitting the link to the control center, so as to ensure the orderly progress of each link. Before transmission, the sensor needs to receive information, process and transform according to SNMP protocol[1]. It can be found that the sensor itself is an electronic device composed of complex structure. It mainly includes three levels: detection, transmission and processing. Each level will be configured with different components according to work requirements. It can also be understood from another aspect, comparing the sensor to the head of a person, "brain" is responsible for data processing, "eyes", "nose", "ears" are responsible for data collection, "mouth" is responsible for data transmission, and then the "brain" of a person can control or report to other people[2].

1860-2059/19 $40.00 © IOP Publishing Ltd

Content from this work may be used under the terms of the Creative Commons Attribution 3.0 licence. Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.
Published under licence by IOP Publishing Ltd
2. Application of sensor and detection technology in Mechatronics

In the mechatronics system, the sensor is the first part of the system, and its function is equivalent to the sensory organ of the system can obtain information quickly and accurately and withstand severe environmental tests mechanical and electrical integration system to achieve a high level of assurance[3]. In case of lack of these sensor pairs state and accurate and reliable automatic detection of information, information processing and control decision of the system, etc function cannot be talked about and realized.

![Figure 1. Application and development of sensors in Mechatronics](image)

2.1 Application of sensor and detection technology in robot industry

In modern society, the development and application of robots have become a new development trend. Although all-round intelligent robots are still under development, robots with specific functions have been widely used in many industries [4]. Especially in precision instrument manufacturing and complex equipment manufacturing, the application of robot is essential, which can fully improve the working efficiency, such as the application of fully automatic manipulator. In addition to electronic chips and programming, robot control is also inseparable from the application of sensors and detection technology. The built-in sensor in the robot can form the cooperation between the external components and the internal control program of the robot [5]. For example, the robot needs to sense the temperature, humidity, distance, size and other objects and environmental conditions in its work. After measuring the external conditions, the sensor transmits the information to the control system, and the control system will make the corresponding instructions according to the information data. The processing speed is very fast, and the faster the processing speed is, the more efficient the robot will be. The higher. The sensor detection technology can ensure that the robot does not work in the case of problems and avoid the damage of the robot components. In fact, the more complex robots need more sensor components, the more advanced sensor technology they need.

2.2 Application of sensor and detection technology in machining

In the industrial production, the mechanical processing technology has gradually realized the mechanical and electrical integration [6]. In order to ensure the accuracy of mechanical processing, the application of sensor and detection technology is also essential. Shape processing, combined processing and installation processing are often used in machining. In the middle, corresponding mechanical equipment is needed to complete the necessary cutting, grinding, forming, matching, detection and other processes. With the application of machining automation technology, sensor and detection technology has become the key. For example, in the aspect of machining and cutting work, metal materials are generally fixed on the operating platform, CNC mechanical equipment is programmed, cutting requirements are determined, and then all cutting work is automatically
completed by mechanical equipment. In the working process, the role of the sensor is to sense and monitor the cutting force, angle and shape, so as to ensure the final forming of metal materials. Generally speaking, the mechanical cutting programming is fixed, which can achieve many common shapes of cutting. In the process of grinding, the sensor also needs to perceive the smoothness and curvature of the material through the grinding wheel. For some more complex machining, it needs more complex and advanced sensor technology. In addition, in modern industrial production, the application of sensor detection technology can reduce the failure rate of mechanical equipment. In general, automatic mechanical equipment can carry out self inspection and self-protection, such as displaying the failure situation before the problem occurs, avoiding the failure work of mechanical equipment, extending the service life of mechanical equipment, and ensuring the safety of operators.

![Figure 2. Sensor detection technology](image)

### 2.3 Application of sensor and detection technology in automobile industry

In modern society, the number and utilization rate of cars are higher and higher. At the same time, people's requirements for car performance are also higher and higher. The application of mechatronics technology in the automobile industry improves the level of automatic control, which can not be separated from the application of sensors. For example, from the aspect of automobile performance, the emergency braking system, anti sideslip system, safety belt locking system, air bag ejection control system, automatic transmission system, adaptive cruise system and self inspection system of automobile are indispensable. The functions of sensors are indispensable. It can be said that the application of sensor technology makes the car more intelligent, the performance of all aspects of the car has been improved, and the safety of the car has been greatly improved. Sensor detection technology also realizes the detection of all aspects of automobile performance in the application of automobile. When the internal mechanical parts and control system of automobile work, it can realize the automatic detection through sensor detection technology. According to the general situation, the progress of sensor and detection technology can also promote the progress of automobile technology. In the future, the driverless automobile needs higher precision and sensitivity sensor.

### 3. Conclusions

All in all, the application of sensor and detection technology is the general trend, and sensor and detection technology is also progressing with the development of the times. At present, there are some deficiencies in the precision, reliability, intelligence and energy-saving of sensor and detection technology in China, which need to be improved, so as to ensure the improvement of production technology in all walks of life in the process of industrial development in China, and improve the use effect of products. In order to improve the level of sensor and detection technology in China, we should learn more from abroad to master more advanced technology.

### Acknowledgment

Research on the construction of practical teaching system of robot engineering under the collaborative
education of school and enterprise -- Based on the perspective of CDIO-KSQA. ;2017 project of Education Science Planning of Hubei Province No;2017GA044.

References
[1] Li Weijun, application of sensor technology in mechanical and electrical automation control [J]. Science and technology wealth guide, 2017 (08).
[2] Li Yajuan, research on digital strain detection and online calibration of six dimensional force sensor [D], Harbin University of technology, 2017.
[3] Liu Zheng, research on sensor and detection technology in mechatronics system [J], information system engineering, 2017 (02).
[4] Xu Jiandong, Tong Jianzhong. Research on Application of sensor and detection technology in mechatronics system [J]. New technology and new products in China, 2015 (24).
[5] Yi Tingmao. Brief introduction to the application of sensor and detection technology in mechatronics system [J]. Engineering Technology: citation, 2016 (11).
[6] Yin Feng. Application of sensor and detection technology in mechatronics system [J]. Nanfang agricultural machinery, 2016 (5).