

A Study of Application and Development of Sensors in the New Period

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Abstract

Sensor technology is one of the three foundations of information technology. In the information age, people's social activities will mainly rely on the development, acquisition, transmission and processing of information resources. Sensor is the main way and means to obtain information in the natural field. It refers to those components or devices that have the function of response and detection to certain information of the object under test and convert it into corresponding output signals according to certain rules. The development and application prospects of modern sensor technology in the new era were analyzed, and the development direction of sensor technology was summarized.

Keywords: *Sensor Technology; Sensor Development Direction; Sensor Network*

1. INTRODUCTION

Nowadays, the world is facing a new technological revolution, which is mainly based on the information technology, and sensor technology is considered as one of the three pillars of information technology. Some developed countries have classified sensor technology as the same position as communication technology and computer technology. With the development of modern science, sensor technology, as a new subject closely related to modern science, has also been rapidly developed. It has been widely used in industrial automation, measurement and detection technology, aerospace technology, military engineering, medical diagnosis and other disciplines. At the same time, it also promotes the development of various disciplines. At present, more than 6,000 companies around the world produce sensors of up to 10,000 varieties. Sensors are listed as one of the key scientific and technological research and development projects in China. In recent years, with the emergence of various new photoelectric devices, especially the rapid development of laser technology and image technology, photoelectric sensors have become the key components to achieve photoelectric conversion in various photoelectric detection systems, and play an important role in the field of sensors. At present, photoelectric sensors have been widely used in various fields of national economy and science and technology, and play an increasingly important role. Photoelectric sensors are widely used in the field of current scientific research and have great influence. Especially, the new photoelectric sensor based on the principle of photoelectric sensor technology has become the mainstream of sensor market.

2. MAIN DEVELOPMENT DIRECTIONS OF SENSOR TECHNOLOGY

2.1 Developing towards high precision

With the continuous development of automatic production technology, the requirement for sensors is also increasing. New sensors with high sensitivity, high accuracy, fast response speed and good interchangeability are required to ensure the reliability of production automation [1]. In recent years, the world's major sensor research institutes have made outstanding achievements in improving sensor accuracy by adopting new theories, new methods and new technologies. American scholars have found a new method to improve the sensitivity of sensors. Systematic methods are adopted to integrate various design principles and improve the design of sensors with a consistent framework. They compared traditional planar sensor components with cylindrical single-nanotube sensor components [2]. The results show that the sensitivity of smaller cylindrical sensors is at least 100 times higher, which is enough to prove that the smaller is better.

2.2 Developing towards miniaturization

The functions of various control instruments and equipment are getting more and more varied. The smaller the size of each component is, the better the volume of the sensor itself can be. This requires the development of micro-sensors based on new materials and processing technology. The "giant magnetoresistance" effect discovered by French scientist Albert Fair and German scientist Peter Greenberger, Nobel Prize winner in Physics, enables weaker and weaker magnetic signals to still be clearly read and converted into clear current changes [3]. The breakthrough of this technology provides an extremely important technical support for the miniaturization of sensors.

2.3 Developing towards micro-power consumption and passivity

Sensors can not work without power supply. In the field or far away from the power grid, batteries or solar energy are often used to supply power. The development of micro-power sensors and passive sensors is the inevitable direction of development, which can save energy and improve system life. German scientists have developed a sensor that converts the energy of the passing fluid (liquid or gas) into electricity by itself. That is to say, the sensor can generate electricity by itself, which greatly facilitates the design and maintenance of the system. The process of converting electricity takes place in a fixed chamber, where media fluids (liquids or gases) flow like blood through the heart [4]. Because of the wall effect, the fluid flows along the pipe wall; the continuous flow generates periodic pressure fluctuations, which are transmitted from the feedback components to the piezoelectric ceramics and ultimately convert the energy of the fluid into electricity. The generated power is at the microwatt or milliwatt level, which can meet the energy requirements of the circulating sensor and ensure that the sensor reads and transmits relevant data.

2.4 Developing towards intelligence

With the development of science and technology, the functions of sensors are becoming more and more complex. Its output is no longer a single analog signal, but a digital signal processed by a microprocessor, and some even have control functions. Technology development shows that digital signal processor (DSP) will promote the development of many new next generation products [5].

3. FUSION APPLICATION OF SENSORS WITH NETWORKS

3.1 Sensor network

Wireless sensor network (WSN) is a wireless network composed of a large number of static or mobile sensors in a self-organizing and multi-hop way. It covers the information of the perceived objects in the geographic area by cooperative perception, collection, processing and transmission network, and eventually sends these information to the owner of the network. Wireless sensor network (WSN) is a self-organizing distributed network system composed of a large number of micro sensor nodes with wireless communication and computing capabilities [6]. With the comprehensive technology of micro-sensor, micro-machine, communication, automatic control, artificial intelligence and other disciplines, wireless sensor network can be realized, which can accomplish the assigned tasks independently according to the environment. Wireless sensor networks have many types of sensors, which can detect various phenomena in the surrounding environment such as earthquake, electromagnetic, temperature, humidity, noise, light intensity, pressure, soil composition, size, speed and direction of moving objects. Potential applications can be summarized as military, aviation, explosion-proof, disaster relief, environment, medical, health care, home, industrial, commercial and other fields.

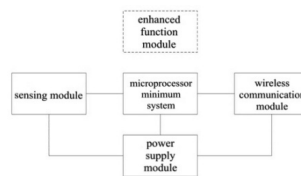


FIG. 1 ARCHITECTURE OF SENSOR NETWORKS

3.2 Significance of sensor networks

Sensor network is a new frontier research hotspot, which has attracted much attention in the world and is highly interdisciplinary. Sensor network integrates sensor technology, embedded computing technology, modern network and wireless communication technology, distributed information processing technology and so on. It can monitor, perceive and collect information of various environments or monitoring objects in real time through various integrated micro-sensors. It can process information through embedded system and transmit perceptual information to user terminals by multi-hop relay through random self-organizing wireless communication network, thus realizing the concept of "ubiquitous computing". The research of sensor networks adopts the system development mode, so it is necessary to integrate modern advanced micro-electronics technology, micro-fabrication technology, SOC (system-on-chip) chip design technology, nano-materials and technology, modern information and communication technology, computer network technology and so on, so as to realize its miniaturization, integration, multi-function, systematization and networking [7]. In particular, this measure can realize the design of ultra-low power system unique to sensor networks. Sensor network has a very broad application prospects, and it has important scientific research value and great practical value in many fields such as military defense, industry and agriculture, urban management, biomedical, environmental monitoring, disaster relief, terrorism prevention and counter-terrorism, remote control of dangerous areas, and so on. Sensor networks have attracted great attention from military, academic and industrial circles in many countries in the world, and are considered as one of the technologies that have great influence on the 21st century.

4. DEVELOPMENT MEASURES OF SENSOR INDUSTRY IN THE NEW PERIOD

4.1 Investment in science and technology

At present, the sensor industry in our country is in the key stage of developing from traditional type to new type of sensor. It reflects the general trend of the development of new type sensor to miniaturization, multi-function, digitalization, intelligence, systematization and networking [8]. In introducing foreign advanced technology, China can improve our own technology and meet the needs of the domestic market, thus forming the scale of sensor production industry. In the future, the following measures should be taken for the development of sensor industry in China. First of all, investment in science and technology should be increased to ensure the sustainable development of sensor technology and its industry. Considering the strategic development, the state should increase its investment in science and technology at the same time. When implementing the policy of investment inclination, the state should pay attention to supporting the backbone enterprises and characteristic enterprises in sensor industry. It is advisable to upgrade and expand the scale through technological transformation. The state should also focus on supporting regions with potential for development to form production bases and cultivate new economic growth points for sensor industry.

4.2 Independent innovation

It is very important to increase independent innovation and increase the proportion of independent intellectual property rights. In the 21st century, the general trend of sensor development is miniaturization, integration, multi-function, intelligence and networking. The main technologies in sensor field will be extended and improved on the basis of existing technologies, especially micromachining and micron/nano technology. On the basis of existing technology, while widely absorbing, digesting and tracking foreign advanced technology, China should increase technological innovation and strive to develop special technology, characteristic technology and independent intellectual property technology. In order to improve the innovation and development ability of enterprises themselves, China should adopt the mechanism of joint production, learning and research, in which enterprises are the main part, universities and scientific research institutes participate extensively, and benefits and risks are shared, so as to occupy the technological commanding heights and enhance the core competitiveness of enterprises [9]. It is necessary to gradually realize the virtuous circle of self-development and self-development and create brand-name products with independent intellectual property rights.

4.3 Efficient operation mechanism

It is feasible to establish an efficient operation mechanism for the rapid transformation of sensor technology. With reform, innovation, quality, market and management as the main tasks, and with the development of sensor industry as the main objectives of scale, grade, competition and profit-making, an efficient operation mechanism should be established, which is conducive to the close integration of sensor technology and economy and the rapid transformation of its scientific and technological achievements, so as to basically form the development model of integration of science, technology and economy in sensor industry [10]. The transformation of sensor industry from speed and quantity to quality and benefit should be realized as soon as possible in order to achieve the win-win results of both technological and economic upgrading and innovation and entrepreneurship.

5. CONCLUSION

Modern sensor technology has tremendous application potential and wide development space. Faced with the current situation of imperfect technology, the development of sensor technology is full of opportunities. In the near future, sensor technology will get faster development and be applied to a wider range of fields, becoming an indispensable scientific and technological product in human production and life. Sensor technology, as one of the three foundations of information technology, is a high technology developed by developed countries and one of the top ten priority technologies in the 21st century. Modern sensor technology has tremendous application potential and wide development space. However, it can be clearly seen that China's research and application strength in sensor technology is still inferior to some other countries in the world. Therefore, the research and development of sensors in China should attach importance to basic research in order to promote the industrialization of sensor industry in China. We have reason to believe that although the development of sensor technology is full of opportunities, in the near future, this technology will gain more rapid development in China.

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