



Application and Development of Digital Signal Processing Technology in Modern Engineering

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Abstract. With the rapid development of current science and technology, digital signal processing technology has been widely used in various engineering fields, improving social productivity and providing convenience for our life to a large extent. With the development of globalization in the world, digital signal processing technology plays an important role in the field of electronic information engineering and communication engineering. With the emergence of the computer digital era, its advantages of wide range of application, strong processing capacity and high integration are reflected, providing a qualitative leap for the development of modern engineering.

Keywords: Digital signal processing · electronic information engineering · communication engineering

1 Introduction

As an advanced technology in today's society, the application range of digital signal processing technology continues to expand [1], and its diversity meets the needs of various users. The application of digital signal processing technology in electronic information engineering filters out messy and invalid information, improves signal stability, and improves data processing efficiency. The application of digital signal processing technology in the field of communication engineering can improve speech coding and use digital conversion to realize the reading of information [2]. The functionality presented in communication engineering is conducive to high-quality signal transmission.

2 Characteristics and Advantages of Digital Signal Processing Technology

2.1 Characteristics

As one of the important technologies affecting the engineering field, digital signal processing technology can convert analog signals into digital signals, i.e. analog/digital conversion, and process the converted signals through digital signal processors, which are composed of integrated chips [3], which is conducive to data acquisition and analysis,

and filter the information in the data, filtering the invalid information, thus improving the effectiveness of the signal, It further improves the accuracy of the signal. In addition, the digital signal communication equipment has the characteristics of integration and miniaturization. It can adopt the multiple-channel mode to replace the larger filter [4], which has the characteristics of small size. Most of the circuits in the equipment are digital circuits, which can be used in large-scale circuits with low power consumption.

2.2 Advantages

First, digital signal processing technology has the advantage of wide application range [5]. At present, due to the development of technology, the types of processors have increased, which can be applied to a variety of different industries and fields. For a single industry, processors can be selected according to different environments, which greatly expands the application scope of digital signal processors. Staff can not only store data into digital signal processing systems, but also realize information conversion according to their own needs [6], Data can also be stored in different forms, which fully reflects the flexibility of processing technology. For example, it can act as a network modulator in the computer to improve the convenience of programming.

Secondly, digital signal processor has strong anti-interference ability [7]. The structure of the digital signal processor is Harvard structure, and its chip has unique characteristics, which can separate the program and storage space, and avoid external interference during information processing. This makes the digital signal processor have greater advantages in processing capacity, with high processing quality and efficiency, far superior to the analog signal processor. In addition, the independent address [8] and data bus settings are adopted for data transmission, which effectively improves the transmission speed of various functions, such as addressing, independent access, data transmission, etc. This ensures the growing demand for data transmission quality and efficiency.

3 Application in Engineering Field

3.1 Intelligent Mobile Robot Field

At present, China's research in the field of electronic information engineering is still at the primary level, and there is a large gap between China and the developed countries in Europe and America. In order to further effectively accelerate the pace of the development of electronic information engineering, we should make reasonable use of the effective cost, effectively supervise the cost control, and ensure that the application benefit in the field of electronic information engineering presents a good trend. With the development of science and technology, digital signal processing technology plays an increasingly important role in the field of mobile robots. In the control system of mobile robot, a digital signal motion control card controls the stepping motor of the robot, which can effectively control the movement of the robot. The core program of the robot uses serial bus (USB). The program is input through the PC terminal. The motion control card first determines the information about the obstacles around the robot according to the instructions, and then sends the collected information to the PC terminal through

USB. Then the PC terminal converts the digital signal into pulse signal according to the information to realize the control of the stepping motor. In general, the digital signal processor converts the digital signal into the pulse signal that can be recognized by the stepping motor. The digital signal processor will more accurately judge the surrounding environment and obstacles, help the robot effectively avoid obstacles, and make the robot get more optimized control.

3.2 Software Radio System

In the development of radio communication, software radio system has played an important role, and its communication structure has become an important part of the communication system. Digital signal processing technology can be used in software to process digital signals, so that wireless signals can be fully used in software, strengthen the communication effect, and improve radio technology. In application, digital frequency conversion processing and A/D converter processing are required. The RF signal of the equipment is converted into broadband signal through software radio. The scientific processing method is adopted to enable the RF signal to be transmitted efficiently in broadband. The signal is converted into IF signal through A/D conversion. In this process, the A/D converter needs to process the radio IF signal in batches, give full play to the role of A/D converter, and make the terminal equipment receive and identify more effectively. After being converted into IF signal, digital frequency conversion technology can process a large number of complex signals through frequency conversion, filtering and other methods, and has played a good effect in application. Among them, the filtering work requires a high degree of accuracy in a large number of sampling times and data.

3.3 Short-Wave Communication Field

Applying digital signal processing technology to the field of short-wave communication can make the filtered communication digitize and intelligentize the signal. It can not only establish the relevant system, but also expand and scan the signal channel. It can also improve voice coding, achieve high-quality transmission of pictures, faxes, and complete the processing of audio signals. The RF signal in shortwave communication digitizes the signal module with the help of IF signal to complete the transmission of audio signal. In filtered communication, RF signal simulation can effectively convert the signal form, complete the signal conversion into audio or video, and meet people's daily needs.

3.4 Media Communication Field

Due to the unique Harvard structure in the application of digital signal processing technology, the data in it occupies a separate address and data bus, which greatly improves the speed and efficiency of data processing. The attributes of media transmission determine the quality of network system operation. When processing communication signals, digital signal processing technology can not only improve the existing performance, but also

effectively reduce the requirements of signal transmission, storage and other aspects. For example, after the electromagnetic wave signal is transformed, the interference to the system will be reduced due to the addition of a low-pass filter. After signal conversion, the application form becomes stable. On this basis, a virtual cluster model based on virtual machine is proposed, and the simulation of virtual cluster model is realized by using virtual machine technology.

4 Existing Deficiencies

4.1 Boundedness

Considering the limitations of the current technology, the digital signal processing technology also has some shortcomings, such as: the processing signal of digital signal processor is limited by the frequency range, assembly language, high chip cost, low software development efficiency, high power consumption, and the high-frequency clock information in the system will cause high-frequency interference and electromagnetic leakage problems, This has a certain impact on DSP processing some signal information tasks.

4.2 Lack of Technical Personnel

The application of digital signal processing technology in engineering work requires not only the close combination of theory and practice, but also the guidance and demonstration of a large number of professional technicians, as well as the maintenance and repair of DSP equipment by professional personnel. Only in this way can the application of digital signal processing technology in engineering be truly improved. Before the popularization of digital signal processing technology and the application of equipment, it is necessary for some experts and scholars to introduce the contents of structure-related design, hardware, storage processor, etc. to engineers, so as to improve their theoretical literacy, make them fully master the digital signal processing technology and equipment, and let engineers carry out practical operation under the guidance of professionals to gain practical operation experience. However, DSP technology has not been popularized in China. The relevant courses in universities and other institutions of higher learning are insufficient and the talent reserve is insufficient, which leads to the shortage of DSP technology talents.

5 Improvement Measures

5.1 Improve Technology Popularization

In the field of information engineering, in order to better apply DSG technology, relevant enterprise managers need to strengthen the training of DSG technology. Enterprises can hire industry experts to train their employees to have a deeper understanding of the principles and advantages of digital signal processing technology, and then be able to flexibly apply the technology. During specific training, in order to make employees understand the difference between DSP and analog signals, multimedia technology can also be used to provide detailed explanations to employees, providing assurance for their various tasks.

5.2 Improve Management System

Digital signal processing technology has strong versatility and can adapt to the development needs of the field of information engineering. It is beneficial to optimize management methods, establish standardized information management systems, ensure data security, and prevent data loss. Firstly, carry out regular business training to strengthen the cultivation of business personnel's professional abilities; Before entering the company, new employees should receive pre job training to gain a basic understanding of their work content. Secondly, it is necessary to improve the incentive system for personnel, establish supervision posts, and monitor the work performance of staff. At the same time, improve the reward and punishment system, stimulate work enthusiasm, provide appropriate rewards for outstanding performance personnel, and provide appropriate punishment for underperformance personnel.

6 Conclusion

In summary, for the rapid development of modern engineering, a large number of digital signal processing technologies need to be applied. Compared with traditional signal processing technology, digital signal processing technology has great advantages, and is widely used in mobile robots, software radio, short-wave communication, media communication and other fields with its characteristics. In order to further improve the engineering technology, it is necessary to further promote the digital signal processing technology and lay a good foundation for the development of the future engineering field.

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