DEVELOPMENT OF DIGITAL SIGNAL PROCESSING TECHNOLOGY IN MODERN COMMUNICATION SYSTEM

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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 continuous development of modern information technology and the continuous improvement of people's living standards, electronic information technology has been widely used in people's lives. People's lives are inseparable from it. With its continuous development, its application range is getting wider and wider. This article first gives a brief overview of digital signal processing technology, analyzes the advantages and disadvantages of digital signal processing technology in the communication field, and the specific applications of speech compression coding and software radio in communication are analyzed in order to better promote the application of digital signal processing technology in the communication field.
Key words : Digital Signal Processing, Communication

Introduction
Digital signal processing technology, as an important product of the information age, exists in all aspects of the communication field and is an indispensable technology in the communication field. In recent years, China has increased its support for chips. Therefore, it has promoted the development and promotion of DSP chips, making it a control chip for many mainstream software communication products. In the field of communications, the equipment that applies digital signal processing mainly includes systems such as telephone communications, video voice, and voice signals, which effectively promote information exchange and information sharing. In the field of communication, digital signal processing technology is mainly applied to speech compression coding and software radio. Of course, there are still problems such as signal quality and signal transmission speed that need to be resolved. Therefore, in order to solve these problems, it is necessary to continue in-depth research on digital signal technology based on the current research results and promote the healthy development of the communication industry.

Characteristics and Advantages of Digital Signal Processing Technology
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, 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, 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.
Advantages

First, digital signal processing technology has the advantage of wide application range. 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 expand 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, 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. 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 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.

Improvement Measures

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.

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.

Digital signal processing technology

Digital Signal Processing Basic Theory

The core and symbol of digital signal processing technology is digital signal processor. Digital signal processing is a subject that uses computers or special digital processing equipment to process signals using numerical methods. It includes data acquisition, signal transformation, analysis, synthesis, filtering, evaluation and identification, etc., in order to extract information. Compared with the traditional analog processing method, digital processing has incomparable advantages. Digital signal processing systems can process digital signals as well as analog signals. Of course, the analog signal must be converted into a digital signal before it can be processed by a digital signal processing system. A typical digital signal processing flow is shown in Figure 1.
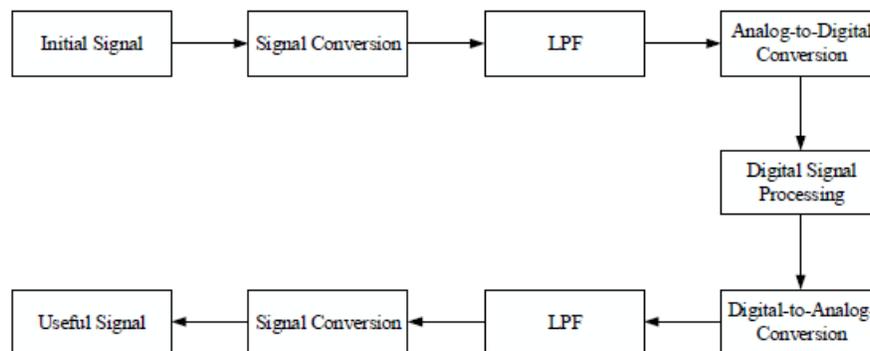
Figure-1 : Digital Signal Processing flow

The basic theory of digital signal processing includes the following:
- Pre-processing of analog signals: filtering unwanted frequency components and noise in the
- input analog signals to avoid spectral aliasing distortion after sampling;
- Time domain sampling and recovery of analog signals: analog-to-digital conversion technology, sampling theorem, quantization error analysis;
- Analysis of time-domain discrete signals and systems: representation and operation of signals, various transformations, description and analysis of time-domain and frequency domains of time- domain discrete signals and systems;
- Fast algorithms in digital signal processing: fast Fourier transform, fast convolution, etc.;
- Design and implementation of analog filters and digital filters;
- Multi-sampling-rate signal processing technology: The basic principle of the sampling rate conversion system and its efficient implementation method.

The quasi-signal processing system can only perform some conventional simple processing on signals, while digital signal processing uses numerical operations to implement signal processing, and many complex processing can be performed using computers. Therefore, digital signal processing applications will be more extensive.

Advantages of digital signal processing technology

Compared to analog signal processing, digital signal processing has many advantages, which are summarized as follows:
- Good flexibility. Digital signals are suitable for computer processing, and can also be realized by programmable devices. It is easy to change the parameters of digital signal processing systems through programming, so that the system can realize various processing functions.
- Stable and reliable, there is no impedance matching problem. As long as the design is correct, you can ensure the stable operation of the digital system, and the characteristics of the digital system arenot easy to change with the changes in the use conditions. And because the digital systems at all levels are coupled through data, there is no impedance matching problem in analog circuits.
- High processing accuracy. The internal noise of the analog circuit and the external environmentwill affect the processing accuracy, while the digital system works in a binary state, so it is basically notaffected by internal noise.
- Easy to encrypt and decrypt. With the increasing requirements of information security, encryption and decryption algorithms are becoming more and more complex, and only digital processingcan solve this problem.
- Facilitate large-scale integration and miniaturization. Because digital circuits have low requirements for the consistency of circuit parameters, the basic units and basic modules that make upa digital system have a high

degree of consistency, so it is convenient for large-scale integration and large-scale production
- Easy to automate and multifunctional. Digital systems can easily perform correspondingoperations based on various states, and a system can implement multiple functions.

Lack of digital signal processing technology
- Although digital signal processing technology is more and more applied in reality, the problems still need to be further improved.
- Deal with speed. The speed of digital signal processing is a relatively common problem. It has been around since the birth of digital signal processing technology. However, due to factors such as equipment, environment, and technology, this problem is gradually being solved to facilitate communication.
- Quality problem. Information quality problems such as bad signal and unclear picture transmission also exist all the time. Digital signal processing technology needs to be better improved, and solutions such as multi-core processing are used to solve it.
- Anti-interference problem. Although the anti-interference ability has been significantly improved in digital signal processing technology, the anti-interference problem of the analog signal from the RF antenna needs to be improved. Improve all aspects of information transmission, ensure signal quality and effects, and provide more convenient services for communication.

Application research in communication

Speech compression coding

The main purpose of speech compression coding is to obtain clear and high-quality speech through corresponding equipment to convert information. Therefore, its transmission signal must have strong anti-interference ability and be able to transmit information in a narrow bandwidth spectrum in order toachieve reception. And fully restore the transmitted voice information to facilitate information communication. At the beginning of the speech coding system, the coding method mainly adopted large waveform coding, fully following the sampling guidelines of discrete Fourier transform, focusing on theuse with the external environment, and ensuring the high-quality state of the speech signal. It is relativelyfast, and it is easy to appear a series of problems in use, which affects the final voice signal quality. Another common form of speech coding is parameter coding. The difference is that the key parametersof the speech signal are used as the coding, but the coding rate is relatively low, which affects the speech effect.

A typical compression-sensing-based speech compression coding and reconstruction framework is shown in Figures 2 and 3.
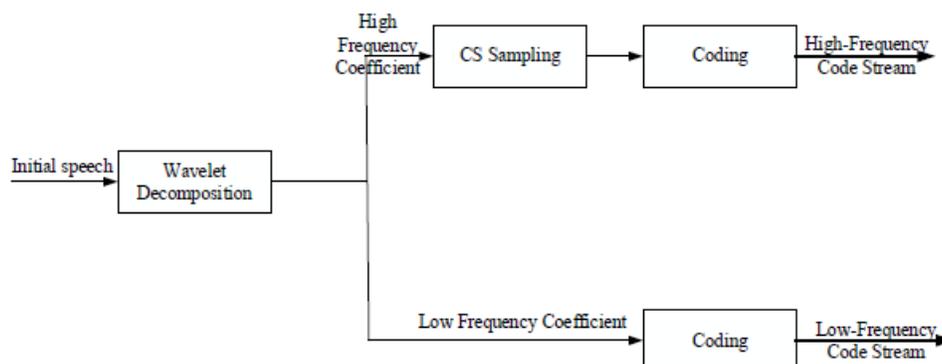

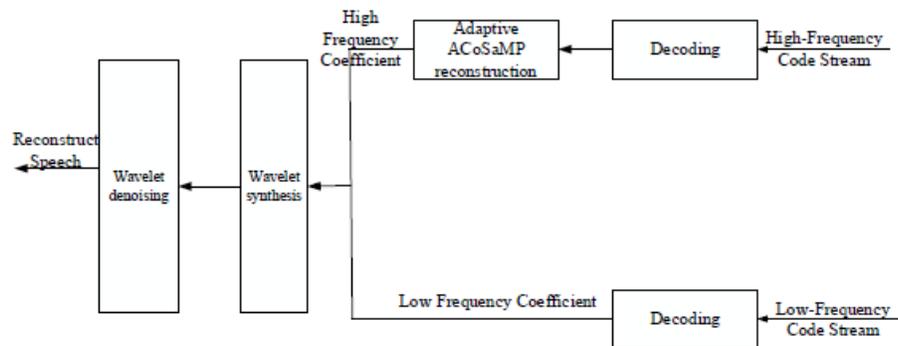**Figure-2 : Sending voice compression and encoding**

Figure 3. Decoding and reconstruction of speech at the receiving end and de-noising.

In a speech compression system, it is mainly composed of a speech encoder, a digital storage medium, and a decoder. The speech input is dominated by the speech encoder, and the speech output is led by the speech decoder. The information transmission process is mainly the speech input of the speech encoder the digital storage medium the speech output of the speech decoder, which is the simplified speech compression coding. With the development of the times, the voice compression system mainly consists of a voice input module, a DSP module, an A / D conversion module, a D / A conversion module, and a voice output module. The key technology is the DSP module, which is the voice. Compression and decompression need to be implemented with the help of special algorithms and techniques to ensure that the voice signal is not damaged. The DSP chip has simple data processing characteristics and can implement multiplication and addition operations in a single instruction cycle. It is more suitable for voice compression systems. In addition, various hybrid encodings have also gradually emerged. For example, linear predictive encoding, as a new type of speech encoding technology, has a processing speed of 4 to 16 kilobytes per second, but it needs to match higher algorithms and digital signal processors. The digital signal processor can solve these problems, effectively improve the problem of voice transmission, and improve the stability and reliability of the voice compression system.

Software radio

Software-defined radio is a solution to the coexistence of multiple systems in the field of radio communications and the inability to formulate a unified standard between different systems. Because software radio implements various functions based on software programming, its main characteristics are manifested in flexibility and openness. Software-defined radio is mainly communication software to rely on. This software can complete functions such as wireless calls and video surveillance with software programming. It has features such as functionalization and modularity. As long as the signal frequency band that its hardware system can process, the communication function in the corresponding frequency band can be increased by software. Digital signal processing technology has the characteristics of stable signal, fast transmission and strong anti-interference. It can be seamlessly connected with software radio and promote the application and development of software radio.

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. In the field of communication, the application of digital signal processing technology is mainly manifested in speech compression coding and software radio. Although its advantages are relatively obvious and it is a development trend in the future, there are still certain shortcomings, such as signal quality and signal transmission rate. Therefore, it is necessary to continue the research on digital

signal processing technology in communication in the future to ensure more convenient and reliable communication.

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