

# *Design and Analysis of Navigation Computer Data Communication Based on DSP*

**Weilin Zhang, Yi Zhao, Hao Bai, Danyang Zhang**

*People's Liberation Army 91206, Qingdao 266000, China*

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**Abstract:** At present, navigation systems are widely used in many social production and life fields. This paper analyzes the navigational processing of computer data and explores the scheme of high-precision data acquisition. Based on DSP technology, the communication design of navigation computer data processing system is studied. A high-precision A/D converter is used to realize the micromechanical falling off. The accelerometer control process and the actual sampling control process of the temperature sensor are the main control realization path. The navigation computer data communication processing system is designed through DSP technology to promote reasonable data processing and ensure effective application of data communication.

As far as the application of navigation system is concerned, according to the navigation parameter settings, the master computer control is carried out in the same application of information processing. With the help of the application of relevant data information collection system, based on the form of navigation computer, work with relevant components to ensure that the navigation parameters are set reasonably and promote the effective use of data communication [1]. Research and design an efficient data processing computer data communication processing system. This system can ensure the timeliness of information processing, propose a navigation computer data processing system based on DSP technology, and provide a new idea and scheme for navigation computer data communication processing.

## **1. Overview of DSP system**

### **1.1. Introduction to DSP system**

Digital signal processing (DSP) is a comprehensive discipline, which has also been widely used in modern society. As far as the DSP system is concerned, the system is based on digital signal processing, its corresponding interface and programming are simple, and the system data processing progress is very high. In the long-term development and application, it has been widely used in communication, numerical analysis, probability calculation and other fields [2]. The rapid development and application of DSP technology are closely related to the birth of programmable DSP chips.

## 1.2. DSP system structure

As far as the structure of DSP system is concerned, its specific system structure is shown in Figure 1:

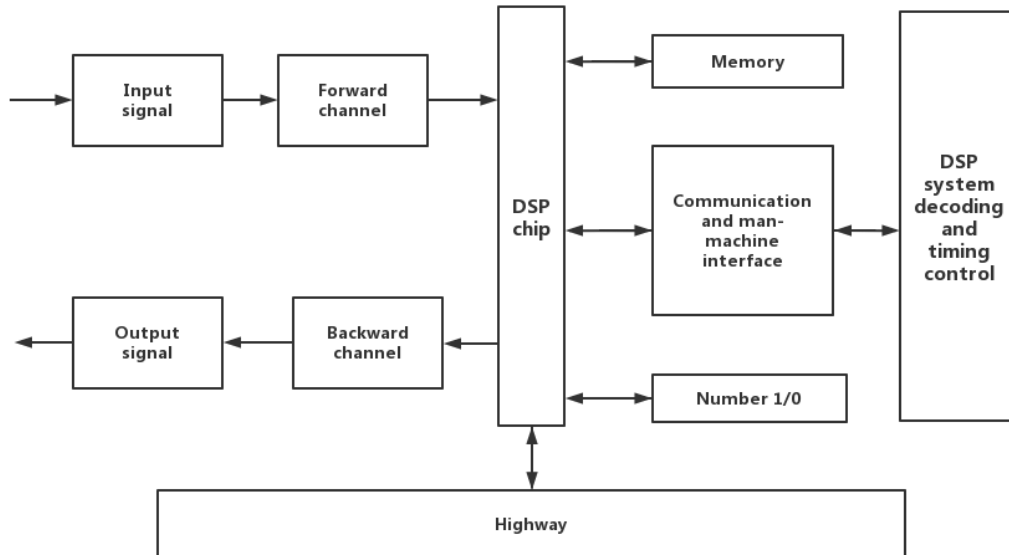


Figure 1: DSP System Structure

In this way, the DSP chip system is mainly composed of one DSP and peripheral bus, and may also include multiple DSP, which is mainly determined by the different processing requirements of DSP. The function of the DSP chip system here is to perform corresponding algorithm processing on the signals transmitted to the front channel, and then output the processing results in the form of data stream, so that the following channels can receive relevant information [3].

## 1.3. Advantages of DSP application

In terms of the application advantages of DSP system, it mainly includes the following points:

First, high precision. With the help of DSP and D/A to replace the analog network in the system, the accuracy of A/d and D/A can be effectively improved, which also plays a positive role in improving the overall accuracy of the system.

Second, the interface is convenient. The interface technology is a key part in the system design. Considering that the DSP system and other system equipment supported by modern digital technology are mutually compatible, this ensures the convenience and applicability of the system interface [4].

Third, good confidentiality. In the design of relevant system software, confidentiality is one of the key indicators to measure its application value [5]. DSP, FPGA and other devices in DSP system have good confidentiality performance, which can improve the security of system data information.

In general, the DSP system has reliable performance and low cost, and its comprehensive benefits are more prominent than the analog system.

## 2. Design of navigation computer data processing system

### 2.1. General idea

In the process of high-precision navigation parameter acquisition, according to the form of AD677, do a good job in the application of temperature sensor analog signal to make it a digital signal. Based on the AD677 sampling control function, the satellite navigation is generally based on the inertial sensor to achieve basic internal measurement, determine the initial value of motion, and quickly calculate the satellite instantaneous speed in combination with relevant algorithms, so as to achieve the information processing goal of the health navigation computer. In the specific system control, based on the navigation information processing system, the acquisition command is sent to realize the conversion of sampling parameters [6]. In information navigation, it is necessary to adjust the carrier speed to ensure the ground test and application effect of the system.

### 2.2. Hardware design of navigation computer data processing system

#### 2.2.1. Power module design

In this navigation computer data communication system, there are many kinds of chips, such as DSP chips, AD chips, etc. Different chips need different voltages. Therefore, it is necessary to design a power module that can meet the requirements of multiple independent power supplies and voltage supplies. In addition, optocoupler isolation chip is also used in the system, which can isolate the whole circuit into independent units without electrical connection, and no electrical connection is set for different independent units.

#### 2.2.2. Data acquisition module design

In the hardware design of the navigation computer data processing system, in order to achieve the acquisition of temperature or analog signals, it is necessary to amplify or convert the signals and achieve the processing goal through FPGA. At the same time, quartz flexible accelerometer can be used to collect the acceleration signal, which can ensure the measurement accuracy, but because the output is analog signal, the signal needs to be converted and processed before it can be collected by FPGA. In the collected signal conversion, I/F or A/D is generally used to convert the analog signal collected by the system to digital signal [7]. In the use of the two signal converters, the I/F conversion method is based on the charge balance theory, which can form an inverse integral charge with the help of standard current, and can continuously correct the integral charge output by the speedometer. As shown in Figure 2 below, the circuit is designed for hardware:

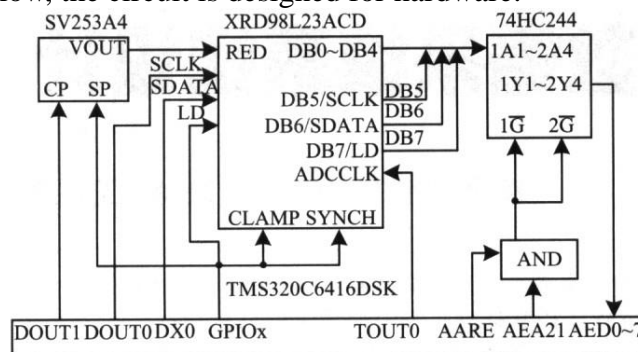


Figure 2: Hardware Design Circuit

## 2.3. System software design

### 2.3.1. General software design

The software design of relevant navigation computer data processing system shall meet various requirements:

First, according to the initial data requirements of the navigation system, the initial position information and attitude angle are obtained through external components. Realize the conversion of the analog signals output by the accelerometer and gyro to digital signals.

Second, angular velocity and acceleration should be calculated according to actual requirements.

Third, combined with GPS and the speed and position information output by the system, combined with the analysis of the relevant error equation, the system is compensated to obtain accurate speed and attitude information, and the relevant information is transmitted to the control unit.

### 2.3.2. DSP boot loading module

This is a unique application running mode in DSP. After the DSP is powered on, the applications in the FLASH chip will be gradually transferred to RAM or internal, and the external RAM will execute relevant programs. Considering that the applied chip contains 1K byte space [8]. Therefore, the designer can edit the program to ensure the implementation of the following operations:

First, set EMIF parameters, which is also an initialization operation for expanding RAM;

Second, move the relevant applications in FLASH to the effective part, and transfer the program control right to the RAM application. At this time, the small programs and navigation programs edited by the user need to be edited in turn, and the compiled programs need to be burned into the FLASH chip, so that the system can start loading after power on.

### 2.3.3. GPS information receiving module

GPS can obtain a lot of information, including time, location, speed, etc. These information are strings of data, and these data bytes are composed of information header, information body and end. The general information header is a fixed structure, and the corresponding information length and information number bytes are one; the information body can contain multiple bytes and can represent the non-stop positioning information. Generally, it contains 8 double precision floating-point numbers and 4 single precision floating-point numbers. In multi byte data, the low byte is generally placed at the front and the high byte is placed at the rear. After the navigation computer receives the relevant byte data, it is necessary to adjust the data bytes of the series in combination with the above definition and arrangement to convert them into longitude and latitude information [9]. With the help of GPS receiver, multiple groups of data information can be sent, and relevant information can be distinguished with the help of information header.

## 2.4. LED display module design

In the design of the navigation computer data communication processing system, the LED display module is also an important human-computer interaction unit of the system. The LED molecules are effectively controlled by the LED display current to ensure that they are sorted according to certain rules, and the content and screen display are reliable by matching with the backlight. The corresponding module design needs to ensure the overall effect, avoid excessive power consumption, and ensure the reliable function and convenient operation of the human-computer interface. The LED display model used in the design of the navigation computer data communication processing system is FYD12864-0402B. The interface program corresponding to this display is relatively easy to write,

and the cost required is relatively lower. In the design of this display module, serial and parallel communication modes are mainly used, allowing users to freely choose different modes to meet diversified needs. The corresponding internal text library and graphic characters can ensure the richness of the overall content, make users feel convenient in human-computer interaction, and improve the interactive experience [10].

### 3. Navigation computer data communication processing system test

Test the designed relevant navigation computer data communication processing system. Generally, CCS6000C language is used to debug the system to test whether the design is up to standard. This debugging simulation software can not only simulate the CPU of the system, but also simulate the peripheral circuit of the system or the condition that there is no relevant circuit. Considering that more attention is paid to program operation and circuit working process and results in the corresponding topic design simulation debugging, this simulation debugging software can effectively compensate for the disconnection in practice and practical application. On the basis of system module design and programming, after completing the hardware and software design, it is necessary to ensure the normal operation of the corresponding design and working principle of the module. There is no need to repeatedly check each module. Finally, the PCB file is sent to the manufacturer for production, and then the hardware functional circuit test of the corresponding components is carried out. After the test is completed, the code debugging of the software can be carried out after confirming that there is no abnormality, observe the operation effect of the system to see if it meets the design requirements. During the system test, the deficiencies and problems in the system design can be found in time. Using this debugging system to test, you only need to edit the navigation algorithm, and do not need to collect relevant data. You can test the operation time of the navigation algorithm in the system hardware platform. According to the relevant test analysis, this test method is more efficient.

### 4. Conclusion

The navigation system plays a vital role in many fields, and it is also an important part that affects the performance of related products. The design of the navigation computer data processing system with the help of DSP technology can optimize the processing of the program, and can also promote the navigation progress and accuracy. Based on the analysis of the characteristics and performance advantages of DSP technology, the research puts forward the relevant design ideas and software and hardware design schemes of the navigation computer data processing system, and tests the designed system to verify whether the system design is effective, providing some ideas and references for the relevant topics.

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