

NAVTEX 시스템을 위한 한자처리에 관한 연구

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A Study on CC Processor for NAVTEX System

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ABSTRACT

국제적으로 NAVTEX 메시지는 영어를 사용하여 518KHz로 정해진 시간에 방송된다. 그러나 많은 지역에서(어선이나 연안선박을 위하여) 다른 언어로 유사한 정보를 전송하는 것에 관심이 있다. 중요한 메시지가 IMO에 의하여 할당된 다른 주파수를 사용하여 특정한 국가의 언어로 송신될 수도 있으며, 어떤 지역에서는 또한 4MHz의 주파수도 송신된다. NAVTEX는 또한 장비의 가격이 부담이 되지 않기 때문에 어선이나 개인용요트와 같은 보다 작은 소형선박에 보다 중요성이 있을 수 있다. 우선 자연재난에 견디는 어부의 능력을 증가시키고, 해상에서의 위험을 피하거나 줄이기 위하여 중국어선에 대한 적당한 NAVTEX의 개발이 필요하다.

한자는 복잡한 상형문자로서 자모문자와 비교하여 볼 때, 문자의 처리, 프로그램의 작성 및 전송에 있어서 많은 차이점이 있다. 지금까지 NAVTEX프로그램중 한자 전송의 관건적인 기술을 해결하지 못하고 있다.

따라서, 본 논문에서는 NAVTEX프로그램중의 한자처리 방법을 모색을 하고자 하였으며, 이러한 프로그램을 이용하면 NAVTEX단말기에서 바로 한자를 인쇄할 수 있게 될 것으로 기대된다.

이론적으로는 일반적인 NAVTEX에 하나의 간단한 기능을 이용하여, 복호화 규칙을 수정하여 직접적으로 CC가 프린터 되게 할 수 있다. 지금까지의 NAVTEX 시스템에 있어 이러한 방법은 최초로 주장하는 것이다.

이외에 CC NAVTEX수신기를 개발하기 위한 합리적인 방법을 제안하였다. 이것은

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CC-Base의 구축과 CC의 전송방법을 개선하고, LCD와 음성처리를 하는 방법으로 display하는 것이다. 이 장치는 다음과 같은 장점을 가지게 될 것이다.

- 1) 어선에 탑재될 수 있는 저가격
- 2) 안정하고 신뢰성있는 기능
- 3) 매우 간단한 운용
- 4) 최소한의 보수

물론 이러한 관점은 정부나 국제기구의 수용이 필요하다.

1. Introduction

1.1 Purpose of study

China is a developing country with a very large population. Although she has 18,000 kilometers long coastline, the sea fishery, the comprehensive exploitation and survey of marine resources are not very well. The equipment of inshore fishery vessels and shipping in coastal waters are not so advanced in technique. The level that many fishermen master the advanced science technique is very low, because they don't know English. As they cannot bring Global Maritime Distress and Safety System (GMDSS)'s faculties into play, so the disasters of the sea are sometimes happened.

If there is a kind of Chinese Character (CC) NAVTEX on board, they can utilize it to obtain more information. The ability of fishermen withstanding natural calamities will be increased greatly, and the disasters of the sea decreased or avoided. So it is very necessary to develop on Chinese Character NAVTEX System.

Therefore, in order to make ships safer and ocean cleaner, and considering the practical condition of China, the purpose of study is that developing a kind of NAVTEX suitable for Chinese fishermen. This installation should be of

- 1). the price that can be afforded by fishermen,
- 2). the stable and reliable function,
- 3). the simplest operation, and
- 4). the least maintenance.

1.2 Contents, scope and method of study

1.2.1 Content of study

An important task, the key of subject, for developing CC NAVTEX is the study of CC processor. It mainly includes:

- 1) to draft the Decoding Rule of CC processor,
- 2) to make the CC Decoding Data Base,
- 3) to design the circuit of CC processor and realize it,
- 4) to program the software of CC processor,
- 5) to simulate the test by means of computers,
- 6) synthetic test.

1.2.2 Scope of study

It involves the theory and technology related to CC processor as the follows:

- 1) The technology of CC encoding and decoding;
- 2) CC transmitting and processing;
- 3) the principle, characteristic and realization of general NAVTEX;
- 4) the international technical standard, laws, rules, Acts, recommendation, and etc.;
- 5) the skill of designing hardware circuit, such as the principle, characteristic of micro-processor, ROM, EPROM, RAM, interface circuit and so on;
- 6) the skill of programming software, such as human oriented language-Visual Basic, assembly language.

1.2.3 Method of study

Because there is not yet a technical specification of standard for transmitting CC NAVTEX in China, so the method of study is that designs an independent a CC processor which can be comprised into the general NAVTEX. This is a twin-microprocessor system, main processor in general NAVTEX and a CC processor.

In point of fact, for realizing CC NAVTEX, to adopt a microprocessor has not any problem in the technology. In the course of researching, the way of twin-microprocessor is for the convenience of making the comparing study of

different interchange codes in CC NAVTEX, for the convenience of improving installation and testing its characteristic, also the need for pushing forward the development of CC NAVTEX in China.

In future, after Chinese Government issues the technical specification about CC NAVTEX, the product is sure to have one microprocessor only.

2. CC transmission and key technology

2.1 CC transmission

Because CC is a kind of Pictograph, so it cannot be transmitted directly. At present, there are two kind of different codes for interchanging CC information between CC processing or communication system, which are the Telegraphic Code and CC Code for Information Interchange.

2.2.1 Telegraphic code

In 1879, the first telegraphic line was set up in Tianjin of China. The Chinese Telegraphic Code Book, which was published in 1880, collected 8075 CCs. Every character is expressed by 4-digit numbers of Arabic alphabet, that is Telegraphic Code (TC). For example,

1129 大 ; 3189 海

In earlier telecommunication department and maritime communication department, this kind of work is finished by the operator, that is operator translating CC into TC; then transmitting the TC to the user, last translating the TC into CC by operator again.

Now, the translator has replaced by computers or microprocessors in many regions.

2.2.2 CC code for information interchange

With the development of computer and network technology, China implemented the standard of CC code for information interchange in 1981, that is GB2312-80, Character Set, Basic Set, of Chinese Character Code for Information Interchange. It

is the most basic code standard for information processing system in China. The Basic Set provides 8836 code places, 94 rows and 94 columns, which each indicates a CC or a graphical symbol. It contains 6763 CCs and 682 graphical symbols, which occupies 2 bytes and the highest bit of every byte is 0. The set of 9494 forms the Code for Information Interchange, shown in Table 2.2, which the code is to be corresponding to each row is called the Area Code, and each column is the Site Code, arranged in 01 to 94 order respectively.

The combination of area and site code formed CC code for information interchange, such as the area code of 大 is 20, site code 83, interchange code 2083; the area code of 海 is 26, site code 03, interchange code 2603.

There is not the simple and regular correspondence relationship between the TC and code for information interchange. The former is an old and traditional way of communication, which is mainly used by the telecommunication and maritime communication. The latter is a method suitable for the developing of computer network and also as an International Standard, which is mainly used by the computer communication. Now it is not clear which will replace the other.

2.2 The key technology

For printing CC directly, we need to set up a relation between TC and CC-Base. Because of the relation between them is no direct, so we need set up a Mapping Data Base, which is called DD-Base.

CC NAVTEX is based on general NAVTEX and added in the functions as follows:

- 1) According to the rule, determine which is TC in ASC code flow;
- 2) For decoding TC and determining CC, need to set up a Decode Data Base (DD Base);
- 3) For printing directly, need to determine the relation ship between CC and CC Base;
- 4) Determine which kind of CC-Base.

For realizing CC NAVTEX, it is important to set up optimum relationship among TC, DD Base and CC-Base. How to make the DD-Base is the key technology in CC NAVTEX and also the center of this paper.

3. Fundamentals of CC processor

3.1 Relation between NAVTEX receiver and CC processor

The difference of CC NAVTEX receiver from general NAVTEX receiver is added with a CC processor. Its main function is that input TC, expressed in ASC II code, is decoded into CC, and controls the printer.

In China, when the technical code B2 was defined as V, that means the national NAVTEX message to be sending.

When receiving unit gets the international NAVTEX message, the technical code B1 is not V, the information processing unit deals with the input data, and decides whether feeds to printer for printing.

3.2 A decoding rule of CC processor

If the technical code B2 is V, CC processor begins to work, a decoding rule as follows

- 1) Directly the masthead part and dont decode.
- 2) If each 4-digit Arabic number is a group and the space between groups is existing, it is decoded into CC and printed.
- 3) When there are one, two, three or four asterisks * in one group, the * is printed at the position of corresponding CC.
- 4) If NAVTEX returns the witching state from printing automatically, it stops to decode, for example, when the error ratio of the code received is more than the special value (30%).
- 5) Directly print English alphabet.
- 6) Directly print Arabic number in the brackets.
- 7) If the code of end of message, NNNN is received, CC processor stops to get signal of message and decode.

3.3 Fundamentals of CC processor

According to the above method, TC and CC-Base are set up a kind of relation by means of DD-Base. When CC NAVTEX is receiving TC, it may do the

addressing of CC-Base by DD-Base and directly print CC.

In theory, it only increases one DD Base (EPROM or ROM larger than 16 kbyte) and one CC Base (standard produce) in general NAVTEX, and amends the decoding rule suitably, it may directly print CC.

The principle block diagram of CC processor mainly contains CPU, I/O (the input/output interface circuit), DD-Base (decode data base), CC-Base (CC font library) and printer driver. The fundamental is described as follows:

Passing through the interface I/O of CC processor, the ASC II code from the information processing unit, which is located at the main board of NAVTEX receiver, is fed into CPU. According to the decoding rule and the relation of flow chart, CPU decodes the input ASC II code and sends the relevant instruction.

When receiving unit gets the international NAVTEX message, the technical code B1 is V, it means that is a national NAVTEX message, so CC processor is excited. ASC II code from the information processing unit is processed in CC processor and is decided whether is feed to printer for printing.

CPU sends the printing instruction to CC-Base through DD-Base and picks up the information about CC dot matrix into the printing driver.

4. Design of hardware for CC processor

4.1 Basic requirement and logic block diagram

Because the working condition on fishery vessels is very bad, the basic requirement of equipment is satisfied in which Chapter 1 described as follows:

- 1) The price that can be afforded by fishermen,
- 2) The stable and reliable function,
- 3) The simplest operation, and
- 4) The least maintenance.

Under the reliability being satisfied, the equipment is required to be simpler in operation, the lower price, and the better.

4.2 Basic theory circuit

The working process of the basic and practical circuit are shown as:

- 1) ASC II codes from the main board of NAVTEX receiver transmit into CPU of CC Processor by means of I/O interface.
- 2) CPU decodes the input ASC II code, calculates the address of DD-Base, and sends the instruction to decoder for searching address.
- 3) Under the address of DD-Base, it has the address of CC-Base dot matrix. CPU sends the printing instruction to CC-Base by means of the DD-Base and picks up the information of CC dot matrix into printing driver.

5. Design on Software of CC Processor

As stated above, the key technique is that sets up a DD-Base (Decode data base). For the convenience of the software debugging, CCDB, Chinese character data base, is set up on the computer, then through a kind of assembly language programming, DD-Base is realized by means of CC-Base in CC processor.

Around the problem of how to set up the CCDB, some programs to be related with it are required, so to set up CCDB is the focal point in this section.

Under Chinese WIN95 and making use of the programming technique of Visual Basic language, Version 4.0, these programs are finished.

6. Test result and improving methods

6.1 Test result

A kind of computer simulating method is adopted in test procedure. The computer on VB platform is utilized as transceiver, which is played the part of a general NAVTEX receiver. The transmitting and receiving special software which file names are TEST_51.VBP & FRM are programmed.

Under VB 4.0 platform, first the computer sends a message to CC processor by series I/O port . Then the message decoded sends back to computer by same port. By the parallel I/O port, the display is same also.

The result means that the work for designing CC processor is all right.

6.2 Improving methods

Now, three reasons are limited to install the general NAVTEX receiver on board of fishery vessels of China, which are only printing English character, bad working condition and the expensive price.

The CC NAVTEX processor can be used to overcome the first one, and if the cost price is decreased by means of the optimum construction, the later will be done, too.

6.2.1 Improving CC-Base

Now a 12*12 Dot Matrix CC-Base is utilized in NAVTEX CC processor. I think it has two defects in future usage. One is that the displaying CC is no clear, and the other is that reading CC Base is difficult as each CC is divided into 4 parts which are stored in different areas.

So I have made another 16*16 dot matrix CC Base. Each CC has 32 bytes in the simple order.

6.2.2 Improving transmission way

The traditional way in CC transmission, such as TC, is encountering the challenge from the computer technology that is developing. According to the National Standard for CC transmission of China, Code for Information Interchange (CII) is fully corresponding with CC Base. In comparison with TC, the CC transmission way by means of CII has simpler facility and better compatibility with China Computer Network.

So I think, the method for replacing TC with CII in CC NAVTEX system is better than traditional TC.

6.2.3 Improving display method

Now the general NAVTEX receiver is a direct printing installation. As the condition of the most fishery vessels is poor, such as the extreme temperature (high or low), heavy moisture and salt in air, unstable power supply, NAVTEX receiver printing on paper may be not suitable for the practical condition of China.

So I think that developing the NAVTEX receiver with LCD display and sound processing is very necessary. As they can reduce greatly the cost price, save power supply and maintenance.

Of course, the change of transmitting and displaying method needs the national government and international organization to accept.

7. Concluding Remarks

In this paper, a method for processing CC in NAVTEX makes printing it possible and easy by means of setting up the decoding data base. The concluding remarks are:

1. It has been demonstrated that the design of the CC processor is correct.
2. A method for processing CC in NAVTEX has first been proposed.
3. The concept of LCD and sound processing CC NAVTEX receiver has first been proposed, too.
4. The result of this research could play a positive role in the development of CC NAVTEX, since there is a potential large market in China.
5. The methods for improving CC NAVTEX need the national authority and international organization to accept.