

A Channel Coding Method for DMB File Transmission

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Abstract

It is an important application of DMB (Digital Multimedia Broadcasting) to publish public information for LCD screen. With the promotion of DMB technology, the demand for transparent transmission of video, high-definition pictures and other large files is increasingly strong. Due to the low tolerance of file data to errors, it is necessary to further enhance its channel error correction capability under the existing system framework of DMB. In view of the above problems, considering the low real-time requirements of file transmission in DMB system, this paper designs a channel coding scheme of DMB file transmission by using a variety of coding technology cascading, which can realize the transparent transmission of files and improve the error correction ability.

Keywords

DMB; File transfer; Channel coding.

1. Introduction

Using DMB to push multimedia information wirelessly to LCD screen is a new information release technology in recent years. With the development of multimedia technology, users want to be able to transparently transmit large files such as video and high-definition pictures, but the existing DMB system supports up to 640 * 480 resolution real-time video, and does not support the transmission of large files [1,2]. Therefore, to solve this problem, this paper designs a channel coding scheme for DMB file transmission, which can transparently transmit files and improve the error correction ability.

2. Design of DMB File Transmission Channel Coding Scheme

The DMB file transmission channel coding scheme designed in this paper is mainly used in the public information release system [3,4]. The characteristics of the multimedia information transmitted by the system are: large amount of data, but most of the information has no real-time requirements; because there is no real-time requirements, the information can be transmitted repeatedly.

In the channel coding scheme designed in this paper, when transmitting the file data, the file is first segmented and packed into logical frames. The main purpose of this is to:

1. Limit the error to one logical frame. If the file is not segmented, any errors in the process of receiving the file will affect the entire file, which will lead to file errors. Because the public information publishing system will send the file repeatedly, when a frame is wrong, it only needs to receive the frame again, and does not need to receive the whole file again.
2. Distinguish different documents. It is usually necessary to transfer multiple files in a program, and the size and type of files are not fixed, so it is difficult to distinguish different files by identifying the file header.
3. Provide correctness verification for documents. There is no correctness check for the file itself, and errors may occur in the process of receiving the file. If there is no check mechanism, the correctness of the file cannot be determined. The TDC (Transparent Data Channel) protocol in DMB is used, but the TDC protocol is improved.

In order to improve the ability of error correction, RS code is used after TDC coding, and RS code and DMB convolutional code constitute a concatenated code. The advantage of using concatenated code is that it can improve the error correction ability greatly when the decoding complexity is relatively small. RS code has a strong ability to correct burst errors, which is usually used as inner code in concatenated code. The whole coding process is shown in Figure 1. RS code uses RS (112,96).

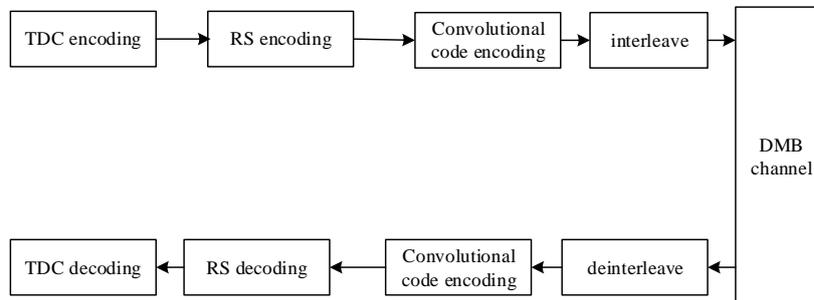


Fig. 1 Overall coding process

2.1 Improved TDC

This paper improves TDC in DMB, and the improved TDC format is shown in Figure 2.

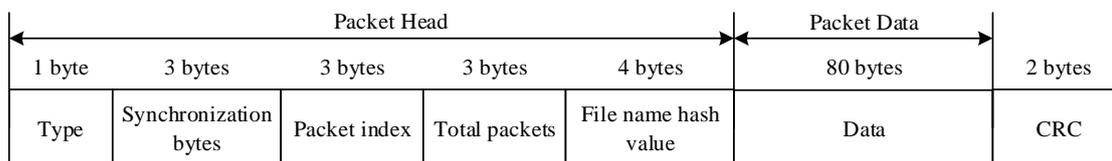


Figure2 Improved TDC format

The following describes the meaning of each field.

Type: indicates the file format of the current transfer file. In the current implementation of this paper, 0x01 represents JPG, 0x02 represents MP4, and 0x03 represents TXT.

Synchronization bytes: the synchronization bytes is used to identify the frame header, and a special value is used to identify it. In this paper, 0x015bf4 is used. Used by the receiver to find the package header.

Packet index: the packet index indicates the frame of the corresponding file.

Total packets: the total packets is used to identify the total number of packets in the sent file.

File name hash value: if the file name is transferred directly, 4 bytes is not enough; if only the first four bytes are taken, it is better that different files have the same 4-byte prefix. Therefore, the hash value of the file name is used as the identification of the file name. Hash value is to map a long piece of data to a shorter and usually fixed length data through a certain hash algorithm, which is the hash value of big data. The selected string hash function here is BKDRHash, which is an excellent string hash function in practical application. The probability of different strings but equal hash values is very small. The algorithm of BKDRHash is very simple, which only needs a few lines of code. The specific code of BKDRHash is as follows.

```

unsigned int BKDRHash(char *str){
    unsigned int seed = 131;
    unsigned int hash = 0;
    while(*str){
        hash = hash*seed + (*str++);
    }
    return hash%0x7FFFFFFF;
}
    
```

Data: the data is the real data of the file.

CRC: According to the 16 bit CRC of packet header and packet data field, the generated polynomial is $g(x) = x^{16} + x^{12} + x^5 + 1$. At the beginning of CRC word operation, the initial value is 0xff. After CRC word calculation, the CRC word needs to be complemented (complemented to 1) and then transmitted.

3. Test

The signal transmitted by DMB is OFDM signal, which is modulated by DPSK, and the signal is interleaved by time and frequency. Because the software designed in this paper is mainly used in static or low-speed terminals, so in the simulation of this paper, the channel model uses Gaussian channel, DMB signal uses DQPSK signal instead.

After coding the simulation script with MATLAB, run the simulation script, and the result is shown in Figure 3. As can be seen from Figure 3, adding RS coding can improve error correction performance.

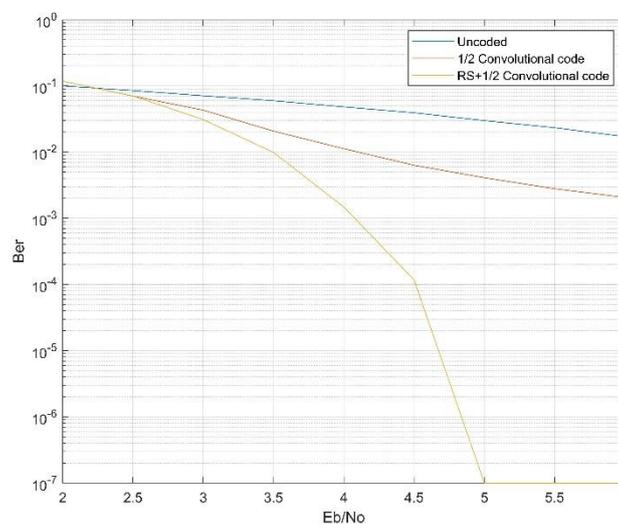


Fig. 3 Performance comparison of RS convolutional code and convolutional code in Gaussian channel

4. Summary

This paper designs a channel coding scheme for DMB file transmission, which can transparently transmit files and improve the error correction ability.

References

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