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Title : Performance of BCH code for random and burst error

1 Introduction

This document reports the result of a study on both random and burst error correcting capability of (511, 493) BCH code. The capability has been evaluated through the computer simulation.

2 Evaluation method

We define the parallel decoder as shown in Fig. 1. The decoder contains both a random error decoder and a burst error decoder. The former decoder can correct random errors whose weight is 1 or 2, the latter one can correct burst errors whose length is less than or equal to 6 for a coded frame using (511, 493) BCH code. The operation of the output selector control is as follows.

① $DS_R(X)$: correct, $DS_B(X)$: correct — $D(X) = D_R(X)$ or $D_B(X)$
② $DS_R(X)$: correct, $DS_B(X)$: detect — $D(X) = D_R(X)$
③ $DS_R(X)$: detect, $DS_B(X)$: correct — $D(X) = D_B(X)$

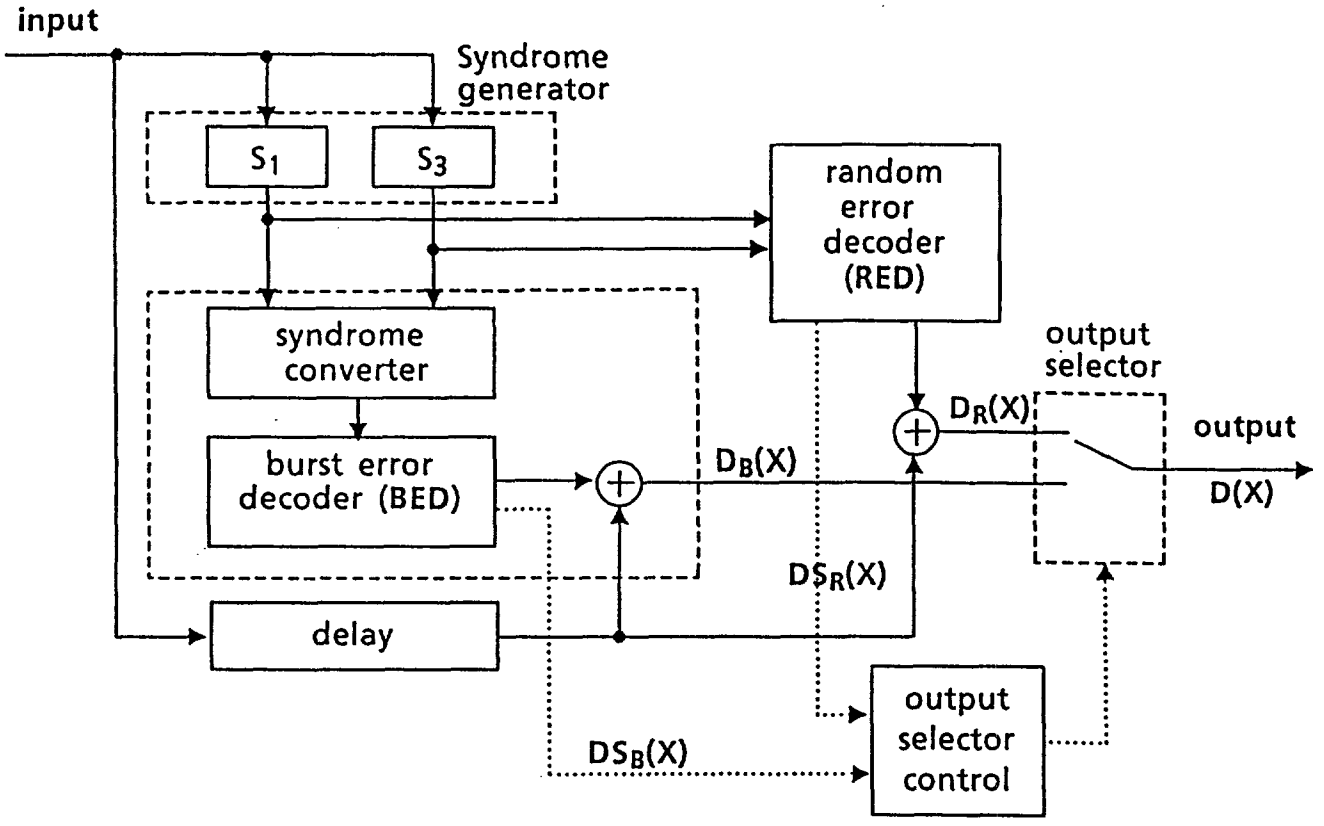
We evaluate the capability of the parallel decoder by means of giving the whole of the above correctable errors to the decoder. The result of decoding can be classified into 5 regions as shown in Fig. 2. The above 3 classes ①, ②, ③ correspond to $I \cup II \cup III$, IV, V respectively.

3 Result of evaluation

Table 1 shows the result of the evaluation. The table indicates that the parallel decoder loses either 7,680 patterns of correctable random errors (region II) or 7,600 patterns of correctable burst errors (region III), that is, it's possible to correct 94.7% of the random and burst errors. We should decide which region to save, region II or III, considering the characteristics of lines.

4 Conclusion

The performance of (511, 493) BCH code for random and burst errors has been shown. The most powerful correction is to switch the parallel decoder based on the characteristics of the transmission lines.



$D_R(X)$ decoded signal by random decoder
$D_B(X)$ decoded signal by burst decoder
$DS_R(X)$ uncorrectable error detection by random decoder
$DS_B(X)$ uncorrectable error detection by burst decoder

Fig. 1 Block diagram of the parallel decoder

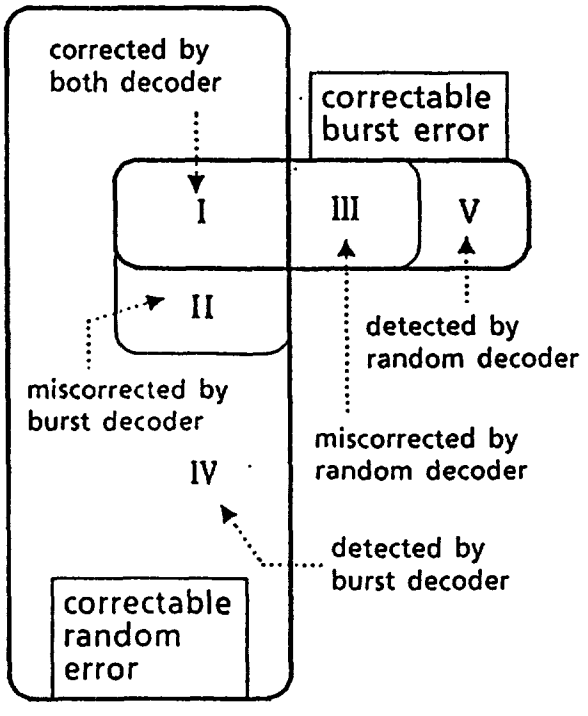


Fig. 2 classification of decoding

Table. 1 contents of each region

Region	decoding class	number
I	corrected by both decoder	3051
II	corrected by RED miscorrected by BED	7680
III	corrected by BED miscorrected by RED	7600
IV	corrected by RED detected by BED	120085
V	corrected by BED detected by RED	5572

RED random error decoder
BED burst error decoder