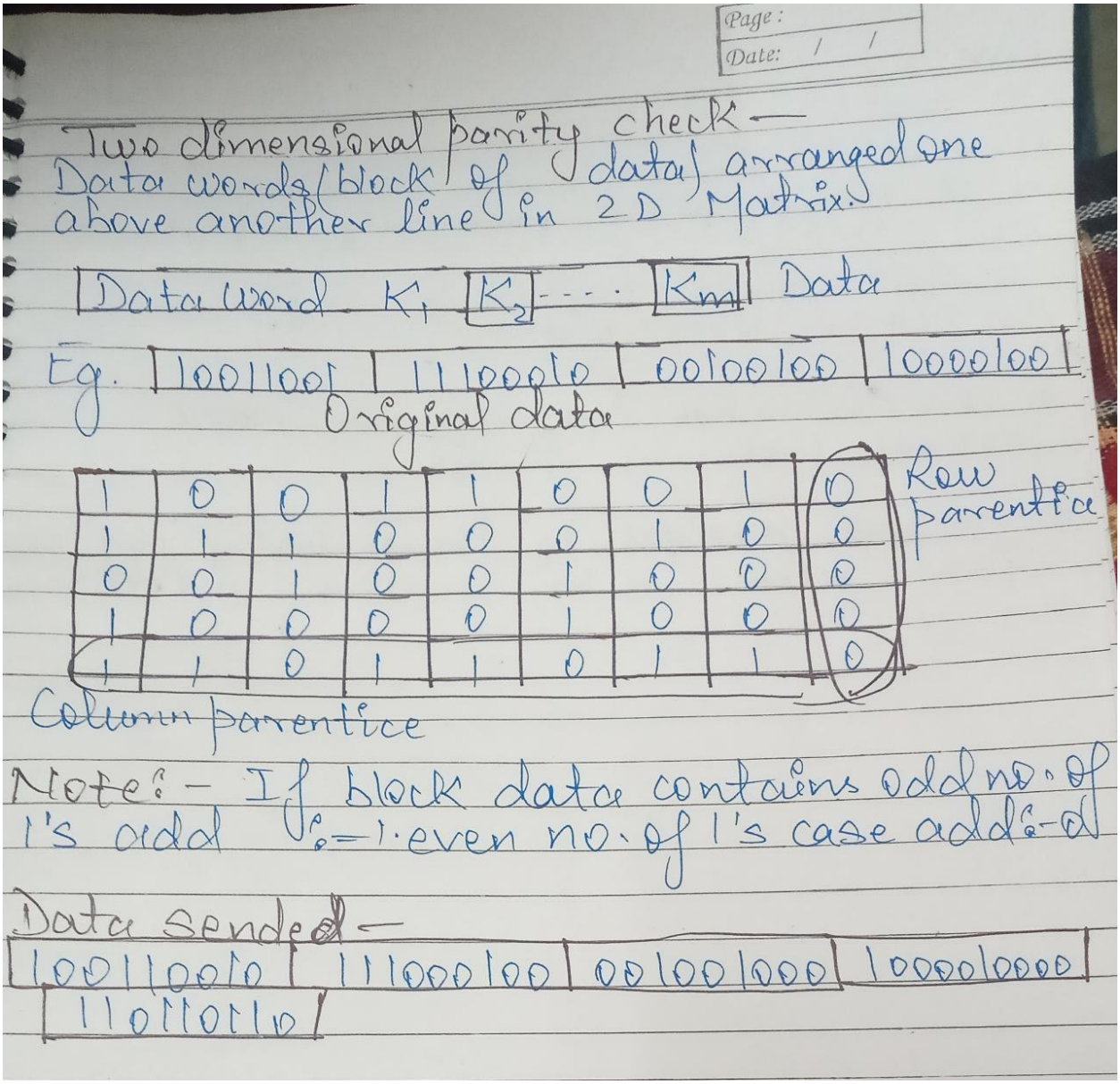
If the original data to send is 10011001 11100010 00100100 10000100. How would it be possible to detect error using two dimensional error detecting technique?



1. Construct an example to explain the parity check method used for error detection.

Your Answer

When the sender transmits data to the receiver, the data might get scrambled by noise or data might get corrupted during the transmission. Some popular error detection methods are single Parity Check Cyclic Redundancy Check (CRC) Checksum Single Parity CheckIn this technique, One extra bit called a parity bit is sent along with the original data bits. The parity bit helps to check if any error occurred in the data during the transmission. Steps InvolvedError detection

using a single parity check involves the following steps step-01: On the sender side, a total number of 1's in the data unit to be transmitted is counted. The total number of 1's in the data unit is made even in case of even parity. The total number of 1's in the data unit is made odd in case of odd parity. This is done by adding an extra bit called a parity bit. Step-02: The newly formed codeword (Original data + parity bit) is transmitted to the receiver. Step-03: On the receiver side, the receiver receives the transmitted codeword. The total number of 1's in the received codeword is counted. Then, in the following cases are a possible total number of 1's is even and even parity is used, then the receiver assumes that no error occurred. If the total number of 1's is even and odd parity is used, then the receiver assumes that an error occurred. If the total number of 1's is odd and odd parity is used, then the receiver assumes that no error occurred. If the total number of 1's is odd and even parity is used, then the receiver assumes that an error occurred. Parity Check ExampleConsider the data unit to be transmitted is 1001001 and even parity is used. Then, At Sender SideTotal number of 1's in the data unit is counted. The total number of 1's in the data unit = 3. Clearly, even parity is used and the total number of 1's is odd. So, parity bit = 1 is added to the data unit to make the total number of 1's even. Then, the codeword 10010011 is transmitted to the receiver. At Receiver SideAfter receiving the code word, total number of 1's in the code word is counted. Consider receiver receives the correct code word = 10010011. Even parity is used and total number of 1's is even. So, receiver assumes that no error occurred in the data during the transmission. AdvantageThis technique is guaranteed to detect an odd number of bit errors (one, three, five and so on). If odd number of bits flip during transmission, then receiver can detect by counting the number of 1's.

2. Question 3

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Differentiate between Error control and flow control mechanism.

Your Answer

Flow control:

0. Flow control is meant only for the transmission of data from sender to receiver.
1. For Flow control, there are two approaches: Feedback-based Flow Control and Rate-based Flow Control.
2. It prevents the loss of data and avoids overrunning of receive buffers.
3. Examples of Flow Control techniques are Stop&Wait Protocol and Sliding Window Protocol.

Error control:

4. Error control is meant for the transmission of error-free data from sender to receiver.
5. To detect errors in data, the approaches are Checksum, Cyclic Redundancy Check, and Parity Checking.
6. To correct errors in data, the approaches are Hamming code, Binary Convolution codes, Reed-Solomon code, and Low-Density Parity-Check Codes.
7. It is used to detect and correct the error that occurred in the code.
8. Examples of Error Control techniques are Stop&Wait ARQ and Sliding Window ARQ.

3. Question 4

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Elaborate sliding window flow control mechanism with example. Also differentiate it with stop and wait method.

Your Answer

The sliding window is a technique for sending multiple frames at a time. It controls the data packets between the two devices where reliable and gradual delivery of data frames is needed. It is also used in TCP In this technique, each frame has sent from the sequence number. The sequence numbers are used to find the missing data in the receiver end. Types of Sliding Window Protocol Sliding window protocol has two types: 1. Go-Back-N ARQ 2. Selective Repeat ARQ Go-Back-N ARQ Go-Back-N ARQ protocol is also known as Go-Back-N Automatic Repeat Request. It is a data link layer protocol that uses a sliding window method. The size of the sender window is N in this protocol. For example, Go-Back-8, the size of the sender window, will be 8. The receiver window size is always 1. If the receiver receives a corrupted frame, it cancels it. The receiver does not accept a corrupted frame. When the timer expires, the sender sends the correct frame again. Selective Repeat ARQ Selective Repeat ARQ is also known as the Selective Repeat Automatic Repeat Request. It is a data link layer protocol that uses a sliding window method. The Go-back-N ARQ protocol works well if it has fewer errors. But if there is a lot of error in the frame, lot of bandwidth loss in sending the frames again. So, we use the Selective Repeat ARQ protocol If the receiver receives a corrupt frame, it does not directly discard it. It sends a negative acknowledgment to the sender. The sender sends that frame again as soon as the receives a negative acknowledgment.

Stop-and-Wait Protocol:

0. In Stop-and-Wait Protocol, the sender sends one frame and waits for acknowledgment from the receiver side.
1. The efficiency of the Stop-and-Wait Protocol is worse.
2. The sender window size of the Stop and-Wait Protocol is 1.
3. The receiver window size of the Stop and-Wait Protocol is 1.
4. In Stop-and-Wait Protocol, sorting is not necessary.
5. Stop-and-Wait Protocol is half-duplex.

Sliding Window Protocol:

6. In sliding window protocol, the sender sends more than one frame to the receiver side and re-transmits the frame(s) which is/are damaged or suspected
7. The efficiency of the sliding window protocol is better.
8. Sender window size of sliding window protocol is N
9. The receiver window size of the sliding window protocol may be 1 or N.
10. In sliding window protocol, sorting may be or may not be necessary.
11. Sliding window protocol is full duplex