Bit Stuffing of a Bit Stream

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Introduction to Bit Stuffing

Bit stuffing is a technique used in communication protocols to avoid confusion between data and control information. It ensures that the flag sequence used to mark the start and end of a frame (commonly `01111110` in HDLC) does not appear in the transmitted data.

To achieve this, whenever a sender encounters five consecutive 1's in the data stream, it automatically inserts a '0' bit after these 1's. This '0' bit is referred to as the *stuffed bit*. On the receiver side, the extra '0' bit is removed to retrieve the original bit stream.

Problem Statement

Given the following bit stream:

`010101111110100000101111101`

We need to apply the bit stuffing process and indicate the positions of the stuffed bits.

Solution

The given bit stream is:

`010101111110100000101111101`

To apply bit stuffing, we follow these steps:

1. Scan the bit stream.
2. Insert a '0' after every sequence of five consecutive '1's.

Let's highlight the five consecutive '1's and the stuffed bits in the bit stream:

Bit Stuffing Process

Original bit stream: `01010111111010000000101111101`

- Between positions 6 and 11, there is a sequence of `11111`.
- After this sequence, we **insert a '0'** to avoid confusion.

Thus, the stuffed bit stream becomes:

`010101111110010000000101111101`

Final Answer

After applying bit stuffing, the bit stream becomes:

`010101111110010000000101111101`

The **stuffed bit** is highlighted in red.

Note: The stuffed bit is added after every sequence of five consecutive '1's to ensure that the control flags are not misinterpreted.

Conclusion

Bit stuffing is a vital process for reliable communication protocols. By inserting a '0' after five consecutive '1's, we ensure the integrity of data transmission.