Badji Mokhtar University Annaba
Electronics Department

Lecture :Error Detection (2)

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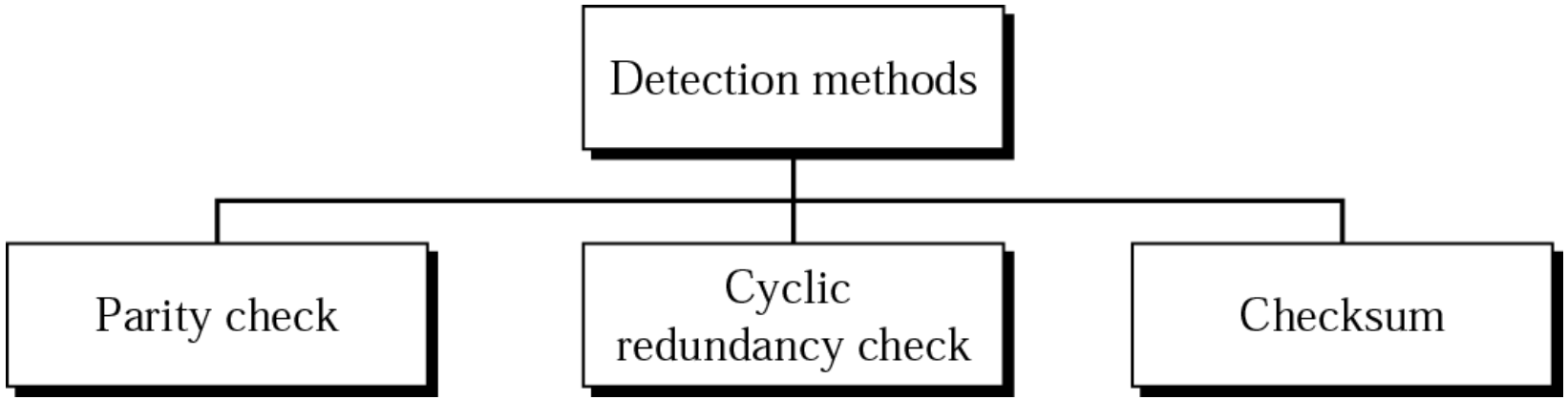
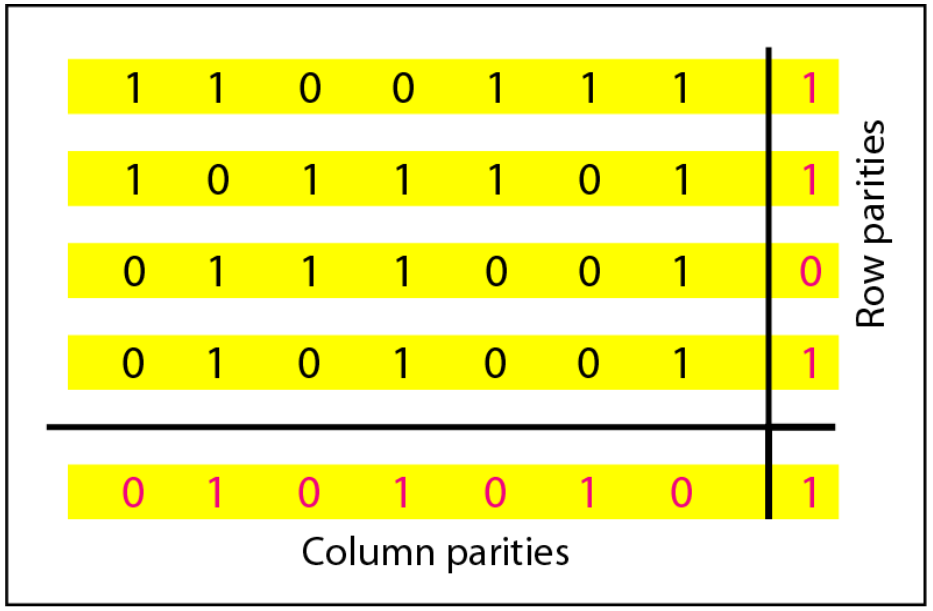
Error Detection methods

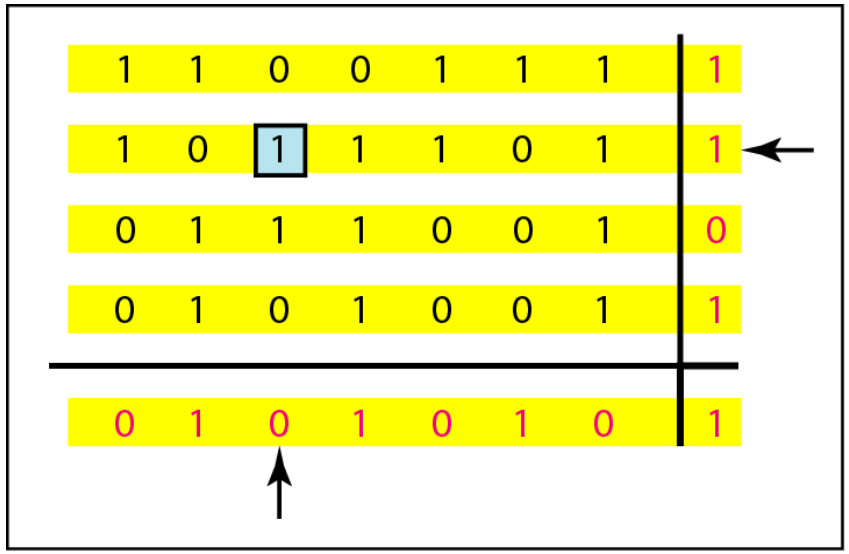


Two-dimensional parity-check code

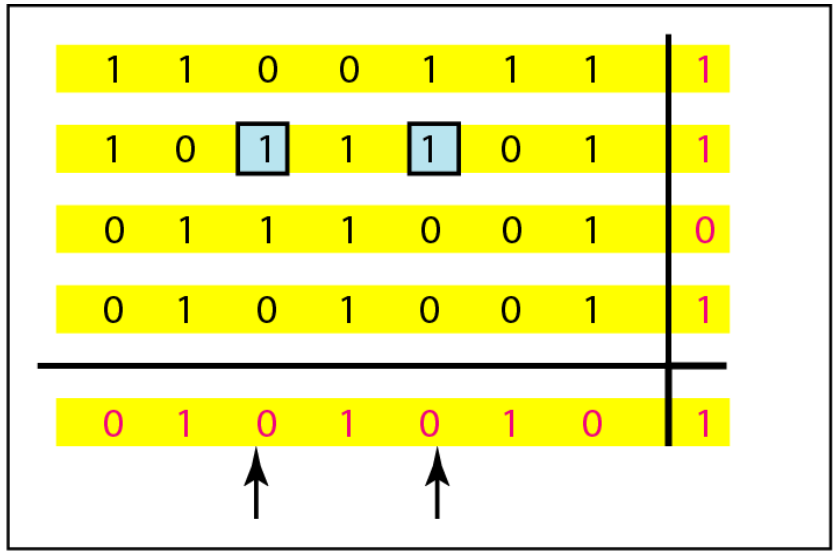


a. Design of row and column parities

Two-dimensional parity-check code

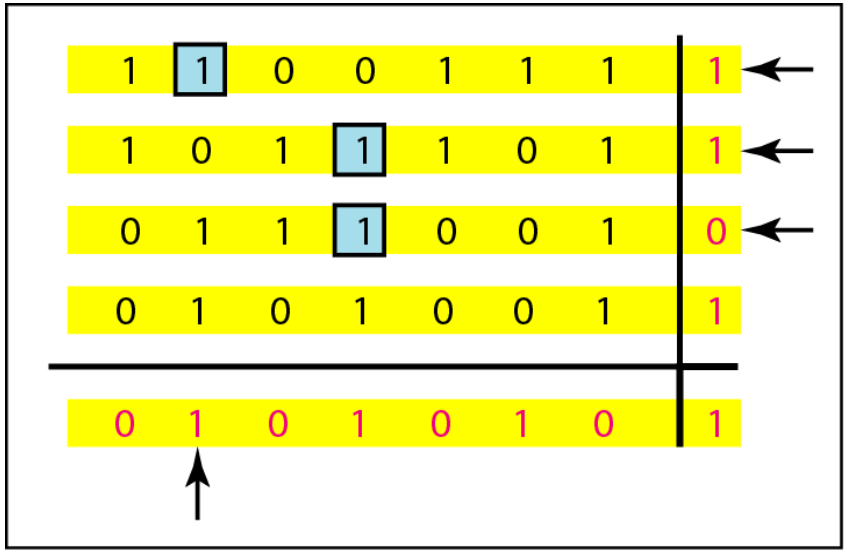


b. One error affects two parities

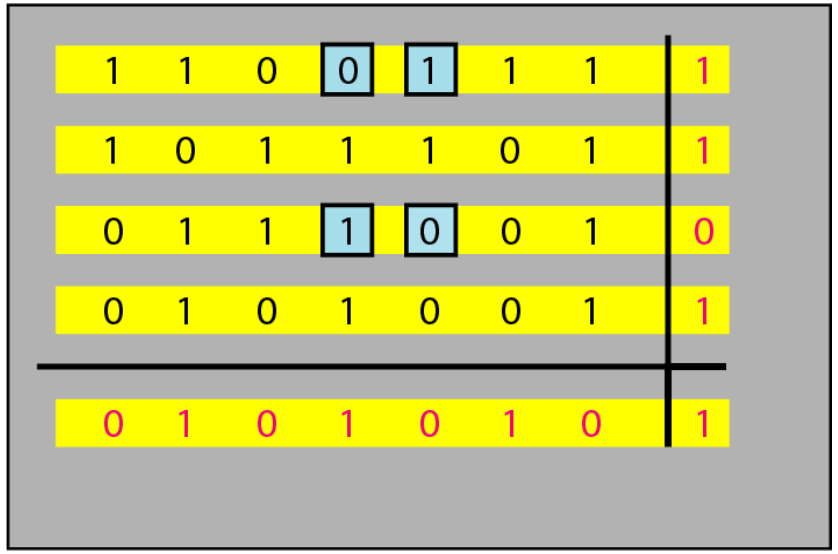


c. Two errors affect two parities

Two-dimensional parity-check code



d. Three errors affect four parities

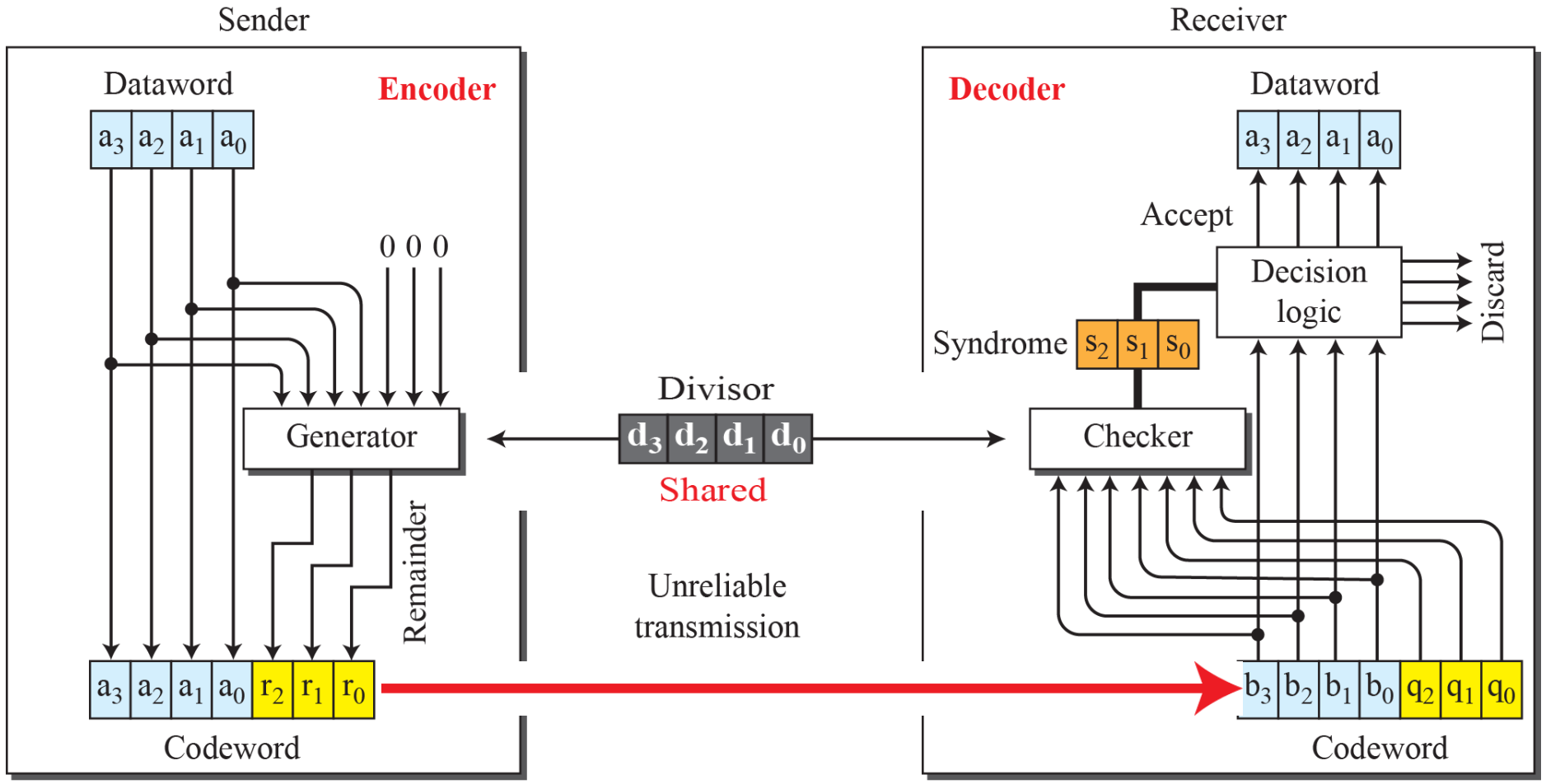


e. Four errors cannot be detected

Cyclic Redundancy Check

We can create cyclic codes to correct errors. However, the theoretical background required is beyond the scope of this book. In this section, we simply discuss a subset of. cyclic codes called the cyclic redundancy check (CRC), which is used in networks such as LANs and WANs.

CRC encoder and decoder



Cyclic Redundancy Check

In CRC generator (At sender)

- A string of n 0s is appended to the data unit
- The number n is 1 less than the number of bits in the divisor
- Divide the data word plus appended zeros by the divisor

Use module-2 binary division:

  - There is no carry when you add or subtract two digits in a column
  - Addition and subtraction gives the same results
  - This means: you can use XOR operation for both Addition and subtraction

- The remainder resulting from the division is the CRC
- The CRC of n bits replaces the appended 0s at the end of the data unit.
- Appending CRC to the end of the data must make resulting bit sequence divisible by the divisor

Cyclic Redundancy Check

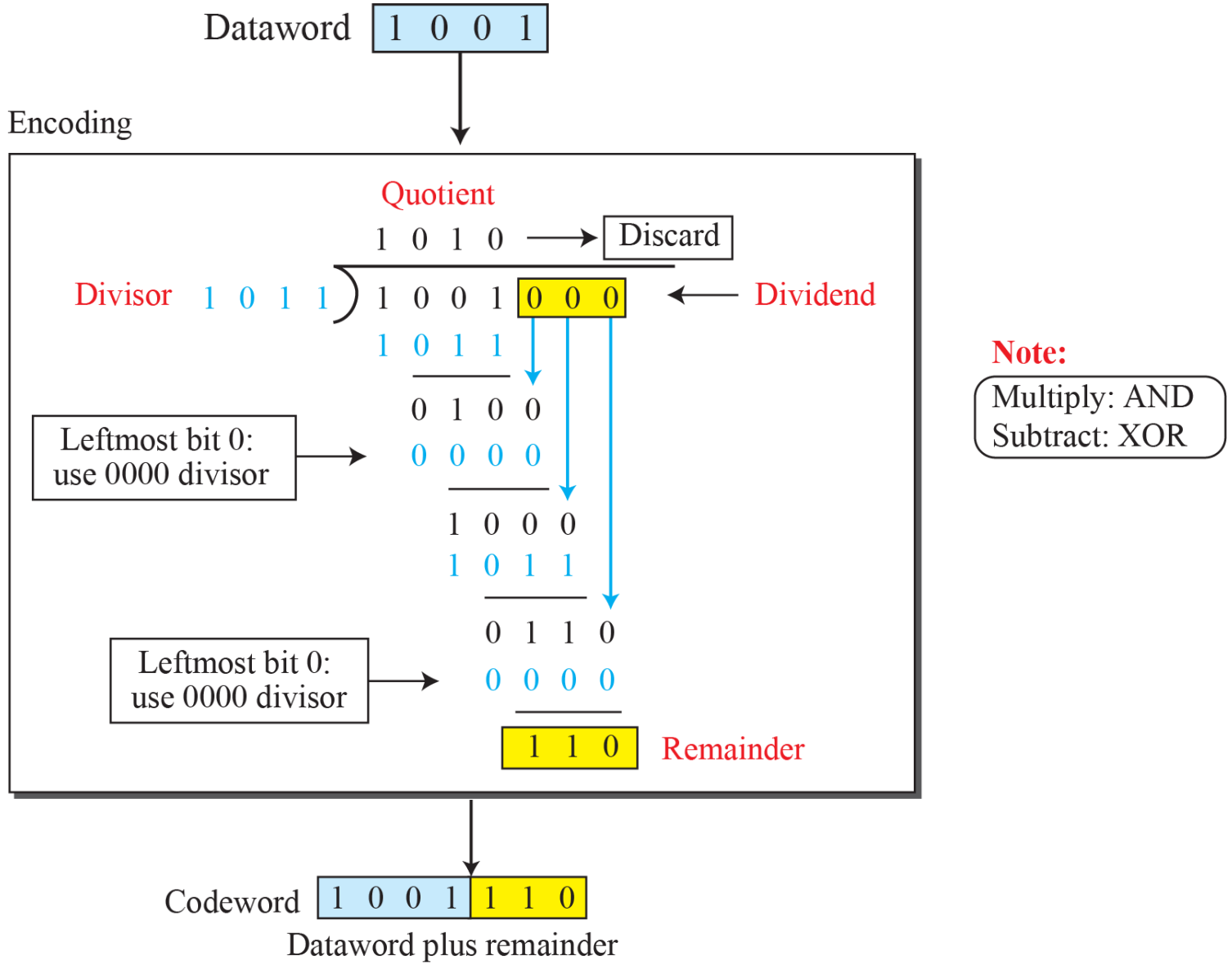
In CRC generator (At receiver)

- After receiving the data appended with the CRC, it does the same module -2 division

- If the remainder is all 0s the CRC dropped and the data are accepted (the data is correct)

- If the remainder is not equal zero, the received stream of bits is discarded and data must be resent (the data is corrupted)

Division in CRC encoder



Division in the CRC decoder for two cases