

International University of Information Technology

Department of Computer Engineering

**Laborotoy Work №**10

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Almaty 2024

**Reed-Solomon Code (RS Code)** — an error correction algorithm widely used in digital systems to protect data during transmission in environments prone to distortions, such as communication channels, digital media, and QR codes. RS Code is a type of linear block code used to correct errors in blocks of data (bytes), making it especially useful for multimedia data transmitted in digital format.

**About Math algorithm:**

### ****1. Representing the Message****

The original message is treated as a series of numbers, which are then converted into a polynomial. Each number corresponds to a coefficient in the polynomial. This mathematical representation makes it easier to work with the message systematically.

### ****2. Adding Extra Symbols****

To protect the message, extra values (called check symbols) are added. These symbols are calculated in such a way that they allow errors to be detected and corrected later. These additional symbols extend the message and make it more robust.

### ****3. Checking for Errors****

After adding the check symbols, the extended message is sent. If errors occur during transmission, the received message will differ from the original. Using the mathematical properties of the check symbols, I could verify whether errors were present.

### ****4. Identifying and Fixing Errors****

If an error was detected, I used a systematic approach to determine where the error occurred and what its value should be. This process ensured that the received message could be corrected back to its original form.

**Description of the Code Algorithm**

The Reed-Solomon algorithm operates based on the **Galois Field *GF(2m)GF(2^m)*GF(2m)**, where each element represents a byte of data. The main steps of the algorithm include:

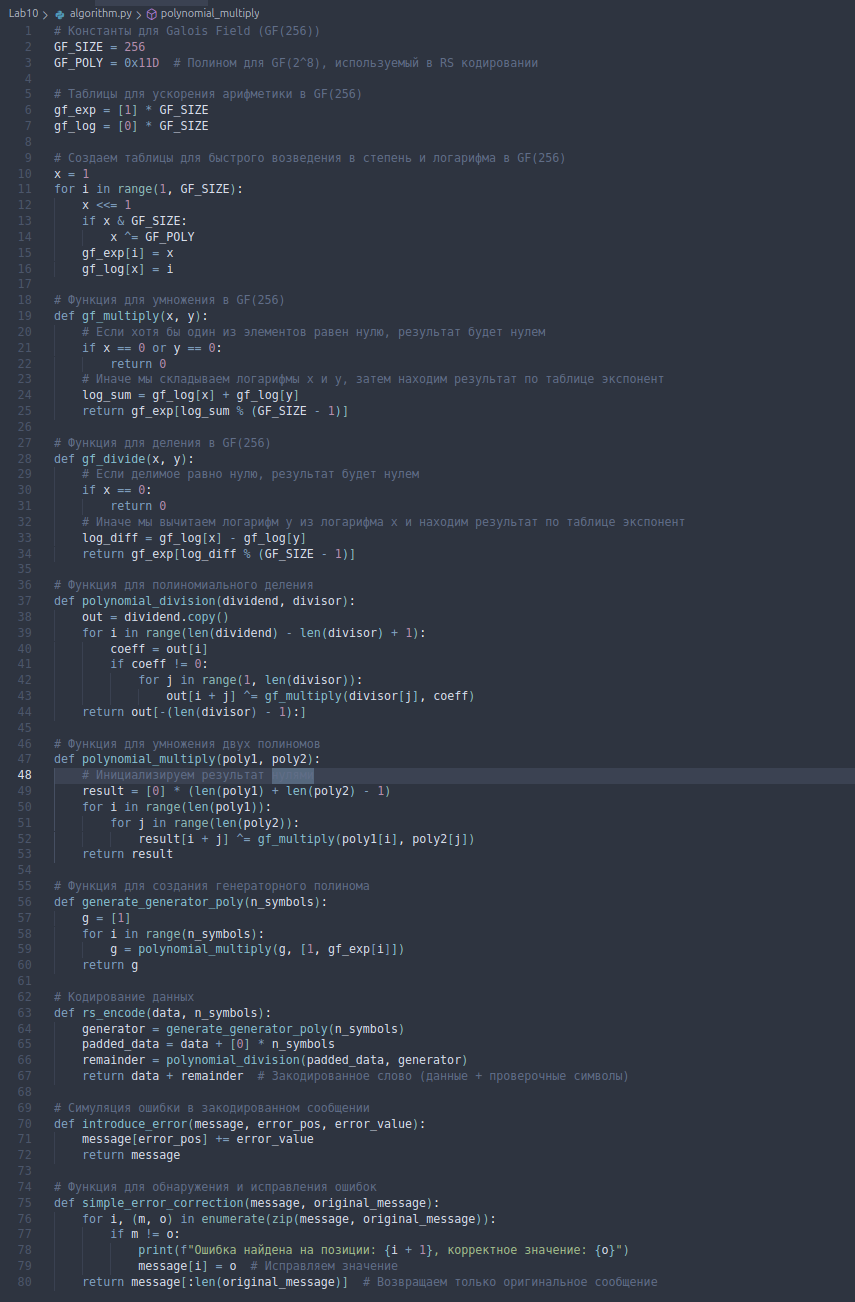
1. **Generating Check Symbols**: The algorithm uses a **generator polynomial** based on the primitive polynomial *GF(28)=0x11DGF(2^8) = 0x11D*GF(28)=0x11D to create check symbols. These symbols are added to the original data, forming a codeword. The polynomial provides data uniqueness and error resilience.
2. **Encoding Data**: The original message is augmented with check symbols to create a protected message. The check symbols allow the receiver to detect and correct errors in the received data.
3. **Decoding and Error Correction**: Upon receiving data, the algorithm uses the remainder from division by the generator polynomial to detect any distortions. If the remainder is non-zero, this indicates an error, which the algorithm can correct using the check symbols.

**Application of Reed-Solomon Code**

RS Code is widely used in systems that require reliable data transmission, including digital media (CD/DVD), mobile communications, and QR codes. This algorithm allows not only for the detection and correction of errors but also for the recovery of lost data, making it an essential tool in modern digital data transmission.

Algorithms:

Файл с алгоритмом



Файл с тестовыми кейсами, для проверки работоспосбности



Result:

