

Run-Length Encoding (RLE)

Run-Length Encoding (RLE) is one of the simplest **lossless data compression** techniques. It works by replacing sequences of **repeated elements** (called “runs”) with a single value and a repetition count.

Run-Length Encoding cannot be attributed to a single inventor; rather, it is based on one of the earliest and simplest general principles of data compression, developed and first used in the 1950s for computer image processing.

Basic Idea

When a sequence contains the same value multiple times in a row, instead of storing it multiple times, we store only the value and the number of times it repeats.

For example:

```
AAAAABBBCCDAA → 5A3B2C1D2A
```

Here:

- 'A' repeats 5 times → 5A
- 'B' repeats 3 times → 3B
- 'C' repeats 2 times → 2C
- 'D' repeats 1 time → 1D
- 'A' repeats again 2 times → 2A

The original message had 12 characters, but the encoded version has only 10, so there is some compression (especially for longer runs).

Binary Example

RLE is especially effective for **binary data**, such as black-and-white images.

Example (0 = white pixel, 1 = black pixel):

```
Original: 000000001111100000011111110000000000  
Encoded : 8 0s, 5 1s, 6 0s, 8 1s, 7 0s → (8,0)(5,1)(6,0)(8,1)(7,0)
```

This binary form is what early image formats (like **PCX**, **TGA**) and **FAX machines** used.


```
        while (i < length - 1 && input[i] == input[i + 1]) {
            count++;
            i++;
        }
        // Print the count followed by the character
        printf("%d%c", count, input[i]);
    }
    printf("\n"); // New line after encoding
}

int main() {

    // Example string to encode
    char input[] =
    "WWWWWWWWWWWWWBWWWWWWWWWWWWBBBWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWBWWWWWWWWWWWWWW";
    printf("Original String: %s\n", input);
    printf("Run-Length Encoded: ");
    runLengthEncoding(input);
    return 0;
}
```

From:

<https://edu.iit.uni-miskolc.hu/> - Institute of Information Science - University of Miskolc

Permanent link:

https://edu.iit.uni-miskolc.hu/tanszek:oktatas:techcomm:rle_coding

Last update: **2025/11/10 14:51**

