



Sadiq Public School

Do the right, fear no man

Subject: Computer Science

Class: C1

Wednesday, 15th September 2021

Lesson: This lesson is about Lossless file compression using RLE. [Chapter#01 Data Representation]

Inquiry: With this technique all the data from the original uncompressed file can be reconstructed. This is particularly important for files where any loss of data would be disastrous (e.g) when transferring a large and complex spreadsheet or when downloading a large computer application. Lossless compression compresses the data in such a way that when data is decompressed it is exactly the same as it was before compression *i.e.* there is no loss of data.

RLE is probably the simplest method of compression. It can be used to compress data made of any combination of symbols. It does not need to know the frequency of occurrence of symbols and can be very efficient if data is represented as 0s and 1s.

The general idea behind this method is to replace consecutive repeating occurrences of a symbol by one occurrence of the symbol followed by the number of occurrences.

Information:

1. **Definition:** A lossless compression is used to compress file data such as executable code, text files, and numeric data, because programs that process such file data cannot tolerate mistakes in the data.

Lossless compression will typically not compress file as much as lossy compression techniques and may take more processing power to accomplish the compression.

Lossless Compression Algorithms

The various algorithms used to implement lossless data compression are :

1. Run length encoding
2. Differential pulse code modulation
3. Dictionary based encoding.

Today, we are going to learn about Run Length encoding.

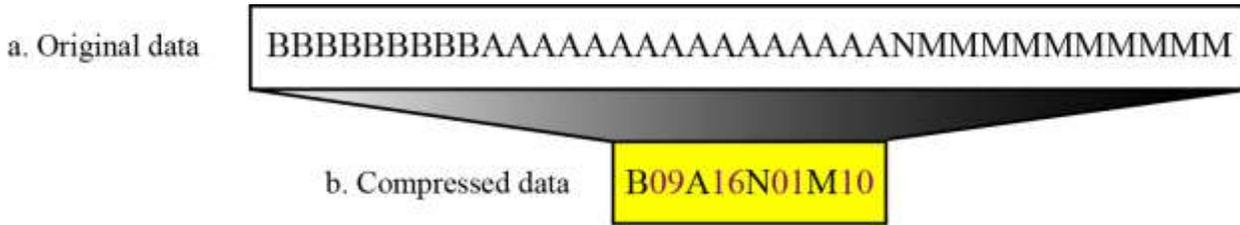
Run length encoding This method replaces the consecutive occurrences of a given symbol with only one copy of the symbol along with a count of how many times that symbol occurs. Hence the names 'run **length**'.

For example, the string AAABBCDDDD would be encoded as 3A2BIC4D.

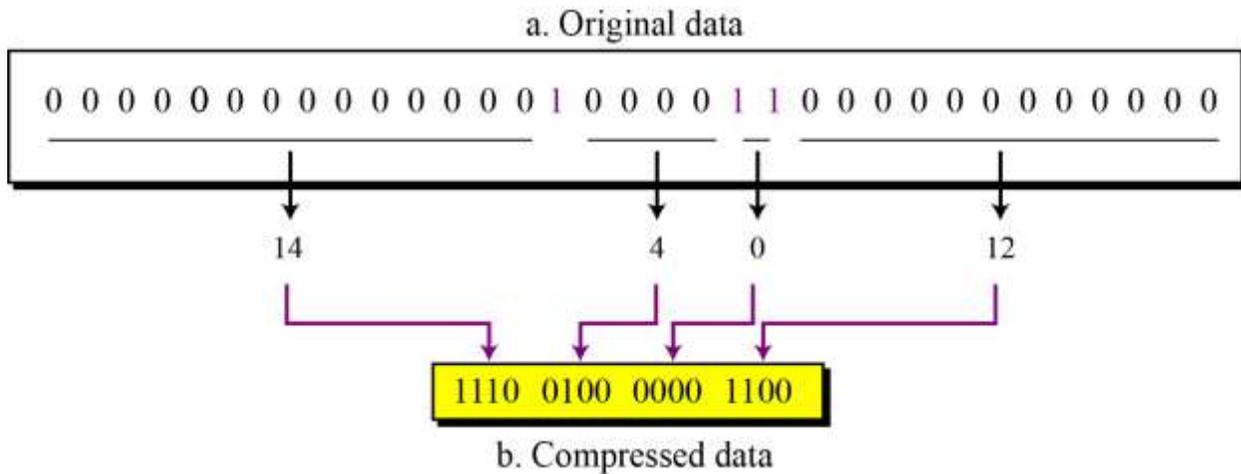
A real life example where run-length encoding is quite effective is the fax machine. Most faxes are white sheets with the occasional black text. So, a run-length encoding scheme can take each line and transmit a code for white then the number of pixels, then the code for black and the number of pixels and so on.

This method of compression must be used carefully. If there is not a lot of repetition in the data then it is possible the run length encoding scheme would actually increase the size of a file.

The method can be even more efficient if the data uses only two symbols (for example 0 and 1) in its bit pattern and one symbol is more frequent than the other.



Run-length encoding example



Run-length encoding for two symbols

- 2. Please read what your text book says about Lossless file compression using RLE. (Page# 35and 36)
- 3. Please watch these brief you tube videos on Lossless file compression using RLE.

<https://www.youtube.com/watch?v=ssn7ggljXQ>

https://www.youtube.com/watch?v=S3_71h0zJjU

Synthesising/absorbing the information:

Write answers in your notebook based on the information what you have learnt from lesson, textbook and YouTube video on Lossless file compression using RLE.

1. The music sound clips need to undergo some form of data compression before the music editor can send them via email. Which type of compression, lossy or lossless should use. Give a justification of your answer.

Practising:

Convert the following and write answers in your notebook.

1. What is meant by RLE?

Activity: Convert names into binary (ASCII), this binary data is then subjected to Run Length Encoding and encoded binary compared to the original.

Fill in the table below with:

- Your name
- Your name in BINARY
- Your name 'compressed' using **RUN-LENGTH ENCODING**
- How many bits storage space your name takes UNCOMPRESSED
- How many bits storage space your name takes COMPRESSED
- The compression %age

MY NAME (ASCII characters)		HOW MANY BITS?
MY NAME (in BINARY - uncompressed)		___ bits
MY NAME (in BINARY - compressed)		___ bits = ___ % compression

* COUNTING BITS IN THE 'UNCOMPRESSED' NAME → EACH LETTER = 1 BYTE = 8 BITS

Students: please if you have any questions at all about this topic, any words you didn't understand, anything at all please send me an email and I will reply ASAP.

Class	Teachers' Names	Teachers' Abbreviations	Teachers' Email Addresses	Instructions
C1A	Junaid fayyaz	MJF	Junaidfayyaz_mjf_sadiq@protonmail.com	C1A students will send their home assignments to their subject teacher (MJF) for checking and getting feedback.
C1B	Junaid fayyaz	MJF	Junaidfayyaz_mjf_sadiq@protonmail.com	C1B students will send their home assignments to their subject teacher (MJF) for checking and getting feedback.
C1C	Junaid fayyaz	MJF	Junaidfayyaz_mjf_sadiq@protonmail.com	C1C students will send their home assignments to their subject teacher (MJF) for checking and getting feedback.
C1GA	Zahra Abbasi	ZA	Abbasi_ZA_Sadiq@protonmail.com	C1GA students will send their home assignments to their subject teacher (ZA) for checking and getting feedback.
C1GB	Zahra Abbasi	ZA	Abbasi_ZA_Sadiq@protonmail.com	C1GB students will send their home assignments to their subject teacher (ZA) for checking and getting feedback.