

COMPRESSION

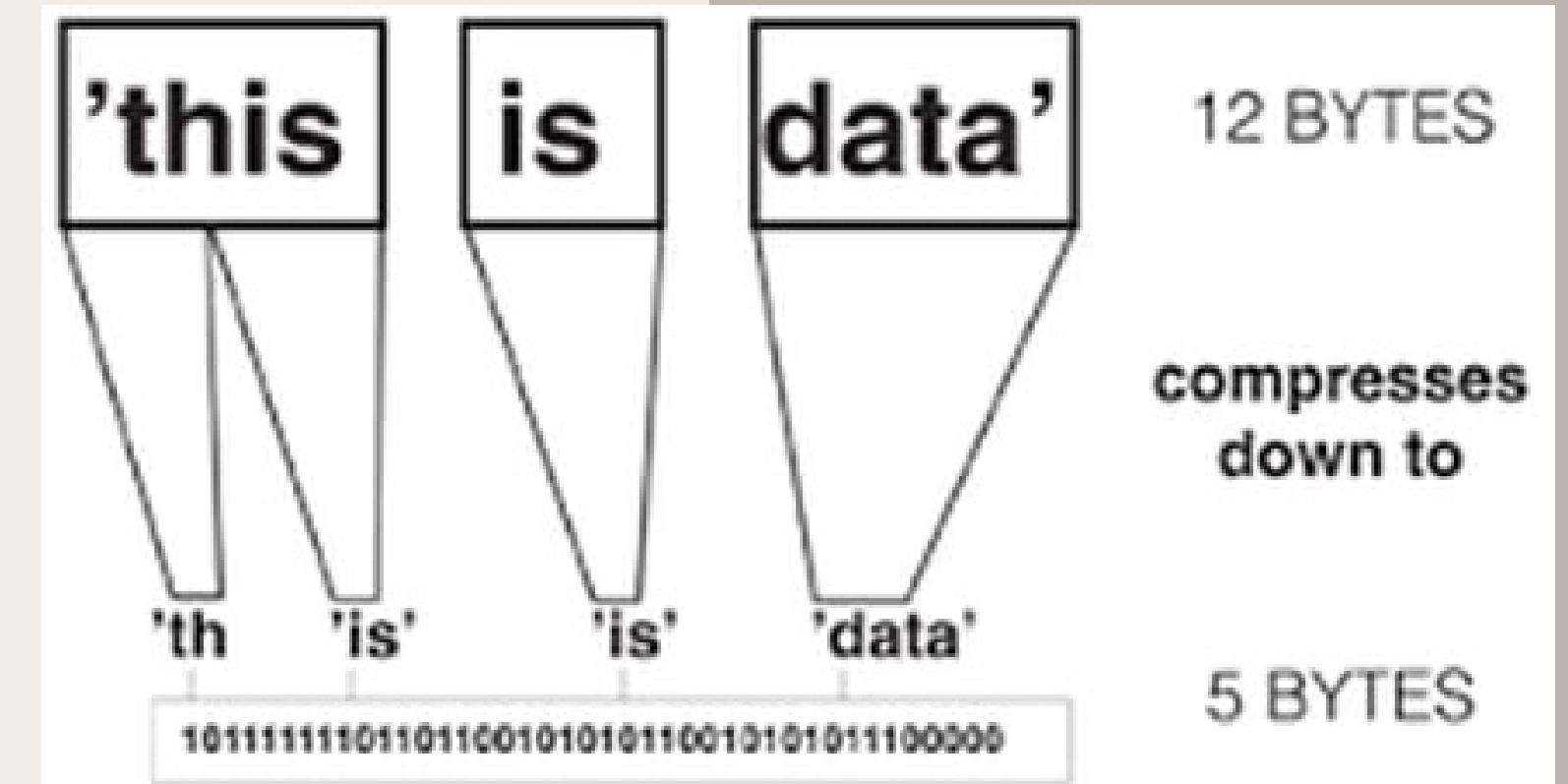
EVERYTHING TO KNOW

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WORKING

- How Data Compression Works?
- Why we need data compression



HISTORY

1940s:

Modern work on data compression began with the development of information theory.

1949:

Claude Shannon and Robert Fano devised a systematic way to assign codewords based on probabilities of blocks.

1951:

An optimal method for doing this was then found by David Huffman in .



1990s:

Lossy compression also began to be widely used. Current image compression standards include: FAX CCITT 3 coding from a definite distribution of; GIF ; JPEG ; BMP; TIFF (FAX, JPEG, GIF, etc.).

TYPES OF COMPRESSION

Lossless Compression:

This type of compression reduces the size of a file without losing any data or information.

Lossy Compression:

This type of compression reduces the size of a file by permanently discarding some of the data.



APPLICATION & USAGE

Audio:

- Amount of data in a recorded waveform is reduced to differing extents for transmission.
- Trade-off between loss of audio quality and transmission or storage size.

Image:

- Removing Pixels
- Muting colors
- Lossy: JPG
- Lossless: PNG



Text:

- Reducing the size of a text file by encoding it in a more efficient manner.
 - Huffman coding
 - Lempel-Ziv-Welch (LZW) compression.

Video Compression:

- Reducing the size of a video file by removing redundant or unnecessary data.
 - MPEG
 - H.264.

E X A M P L E :

"bookkeeper"

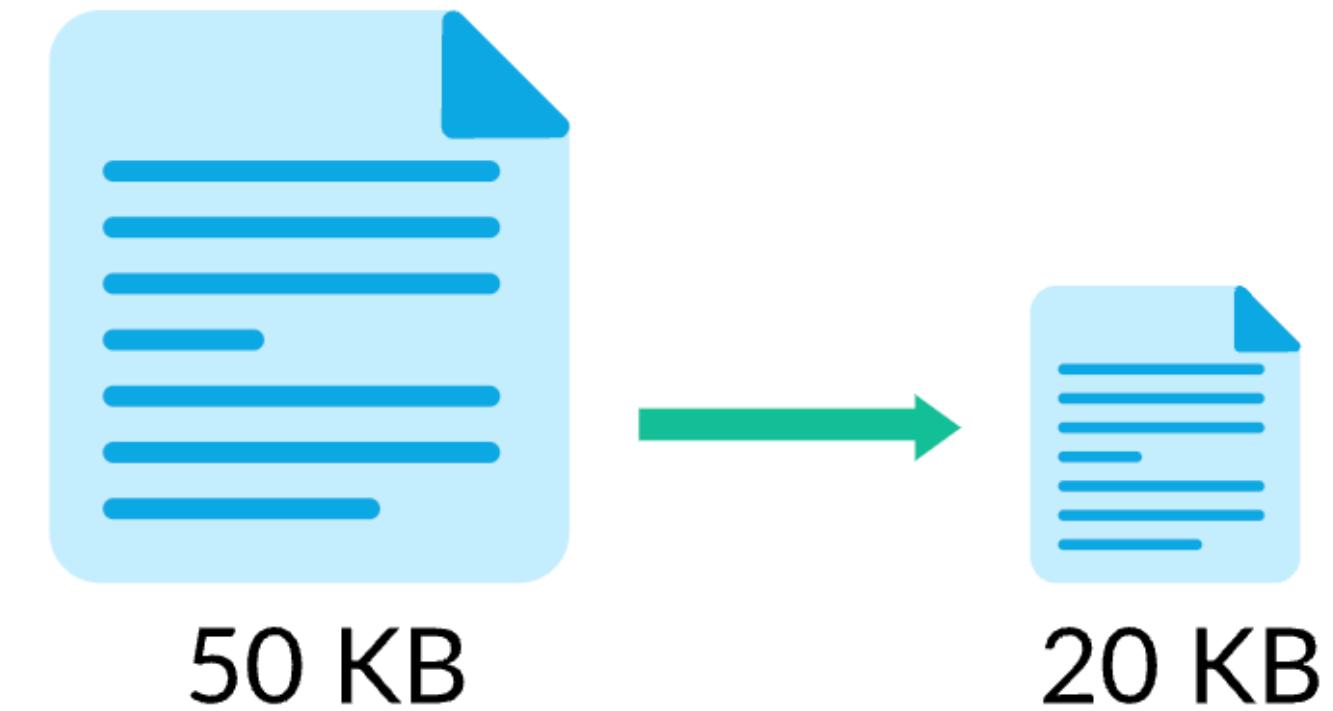
- Using ASCII :This word would require 10 bytes of storage, with each character represented by one byte.
- Using Huffman coding:Assigning shorter binary code to the more frequent character.

'o': 0

'k': 10

'e': 11

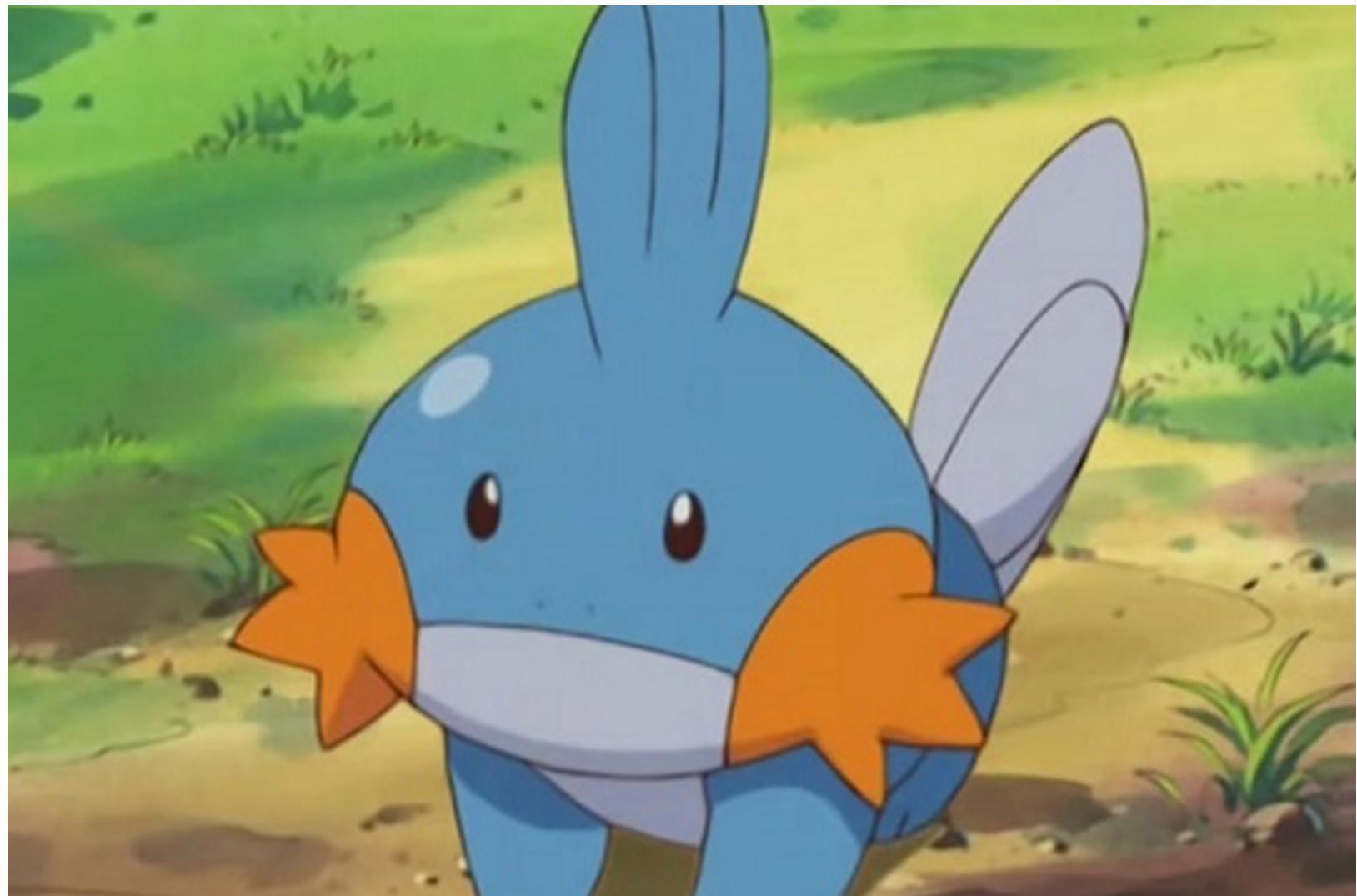
"0110101100011110"



- requiring only 16 bits of storage instead of 80 bits (10 bytes). This represents a compression ratio of about 80%, which is quite significant for such a short word.

DIFFERENCE:

JPG:



Size:

46.0 KB (47,107 bytes)

Size on disk:

48.0 KB (49,152 bytes)

PNG:



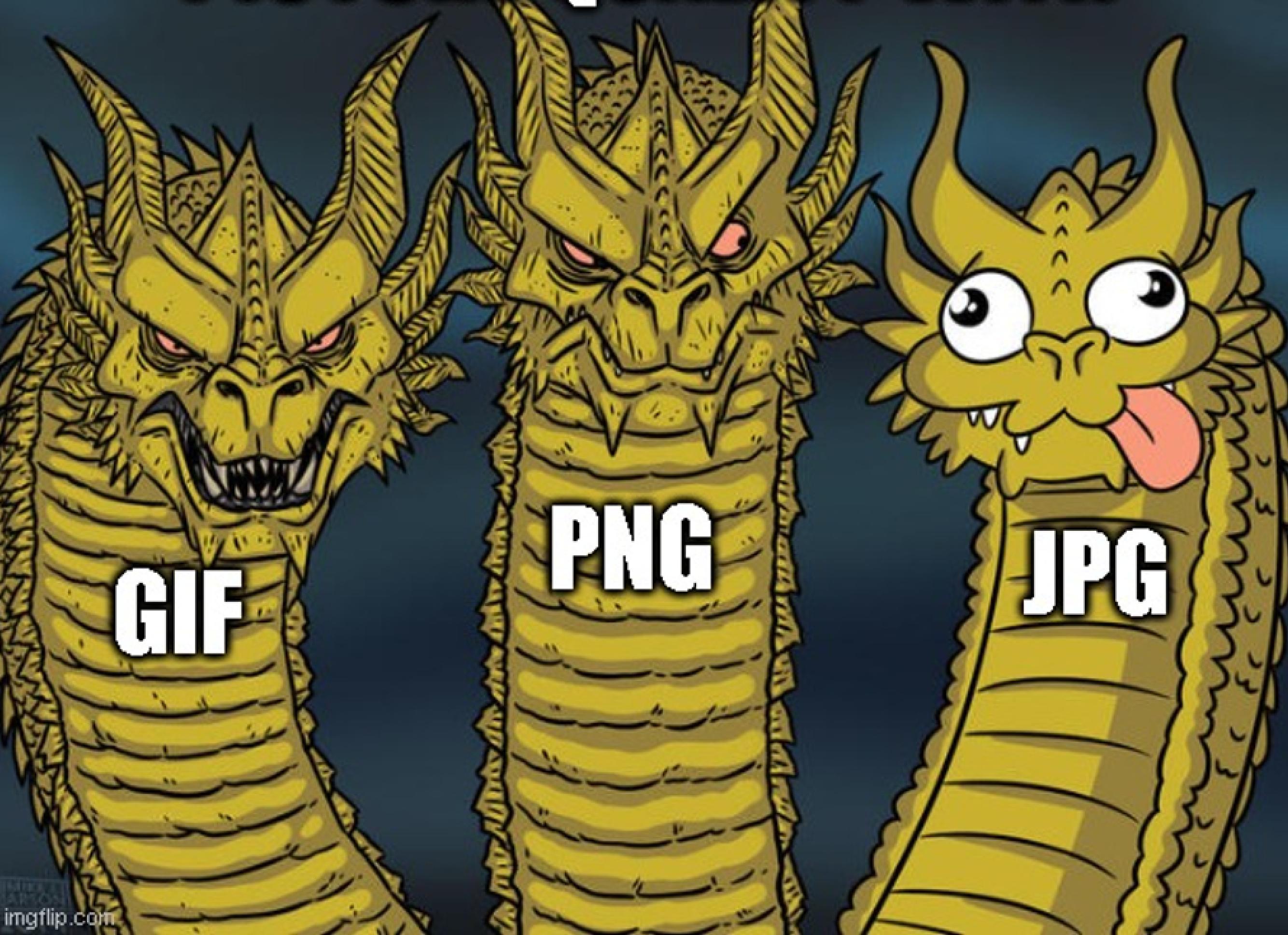
Size:

1.26 MB (13,30,313 bytes)

Size on disk:

1.26 MB (13,31,200 bytes)

PICTURE QUALITY WITH



ADVANTAGE:

- 01** Reduces storage space requirements
- 02** Decreases transmission time for data
- 03** Improves overall system performance

DISADVANTAGE:

- 01** Can degrade the quality of the compressed data
- 02** Compression and decompression can be computationally intensive
- 03** Some compression algorithms may be subject to security vulnerabilities

LITERATURE REVIEW

Literature Review for Data Compression (BCVS)

Sr. No.	Title	Methods	Advantages	Limitations	Results	Remarks
[1]	<p>Data Compression Publisher: UCI ICS <u>University of California, Irvine</u></p> <p>Author: Debra A. Lelewel and Daniel S. Hirschberg</p>	<ul style="list-style-type: none"> •UNIX utilities compact and <u>compress</u> •Huffman coding scheme 	In most cases, only worst-case analyses of the methods are feasible.	Susceptibility to error is the main drawback of each of the algorithms presented here.	Data compression routines developed with specific applications in mind have achieved compression factors as high as 98%.	The algorithms have been evaluated in terms of the amount of compression they provide, algorithm efficiency, and susceptibility to error.
[2]	<p>Text Data Compression Algorithm using Hybrid Approach Publisher: IJCSMC DOI: Vol.3 Issue.12, December- 2014</p> <p>Authors: Amandeep Singh Sidhu and Er. Meenakshi Garg</p>	<ul style="list-style-type: none"> •Dynamic Bit Reduction method •Improved Huffman Coding 	Consumes less time while provides more compression ratio as compared to existing techniques.	The existing bit reduction system provides poor compression results. Most of the lossy data compression techniques suffer from generation loss which means decreasing the quality of text because of repeatedly compressing and decompressing the file.	The proposed system shows very good compression results in terms of Compression Ratio and Saving Percentage as compared to the existing techniques for all the datasets that have been considered.	The compression results shown by the proposed system are better than the existing systems (Bit reduction and Huffman coding) as it is using dynamic Bit reduction technique in the first phase and Huffman coding is applied in the second phase to further improve the performance of the proposed system and to achieve better compression results.

[3]	<p>"A Survey of Data Compression Techniques" by M. S. K. Sahoo, S. S. Satapathy, and A. Bisoi</p>	<ul style="list-style-type: none"> • Comprehensive review of data compression techniques, including lossless (Huffman coding, Lempel-Ziv, and Arithmetic coding) and lossy (JPEG, MPEG, and MP3) 	<ul style="list-style-type: none"> - Huffman coding is the most commonly used lossless compression technique - Lempel-Ziv is preferred for compressing text files - JPEG is the most commonly used lossy compression technique for still images - MPEG is preferred for video compression 	<ul style="list-style-type: none"> - Compression efficiency varies based on the type of data being compressed - Lossy compression techniques may result in lower quality compressed data 	<p>The choice of compression technique depends on the specific requirements of the application, such as the type of data being compressed, available storage space, and desired level of compression</p>	<p>Provides a comprehensive overview of data compression techniques and their applications</p>
[4]	<p>"A Comparative Study of Data Compression Techniques" by A. Kumar and R. Yadav</p>	<ul style="list-style-type: none"> • Comparison of different data compression techniques based on compression ratio, speed, and quality of compressed data 	<ul style="list-style-type: none"> - Hybrid compression techniques may provide a balance between compression efficiency and quality - The choice of compression technique depends on the specific requirements of the application. 	<ul style="list-style-type: none"> - Compression efficiency varies based on the type of data being compressed - Some techniques may not be suitable for certain types of data 	<p>The choice of compression technique depends on the specific requirements of the application, such as the type of data being compressed, available storage space, and desired level of compression</p>	<p>The study highlights the importance of data compression and suggests future research should focus on developing more efficient and adaptable techniques.</p>

KEY TAKEAWAY FROM REVIEW

Title

1. Data Compression

Keypoint

Data compression routines developed with specific applications in mind have achieved compression factors as high as 98%.

by

Debra A. Lelewer and Daniel S. Hirschberg

2. Text Data Compression Algorithm using Hybrid Approach

The proposed system shows very good compression results in terms of Compression Ratio and Saving Percentage

by

Amandeep Singh Sidhu and Er. Meenakshi Garg

3. A Survey of Data Compression Techniques

The choice of compression technique depends on the specific requirements of the application

by

M. S. K. Sahoo, S. S. Satapathy, and A. Bisoi

4. A Comparative Study of Data Compression Technique

The choice of compression technique depends on the specific requirements of the application

by

A. Kumar and R. Yadav

FUTURE SCOPE

Artificial Intelligence (AI)-based compression:

AI and machine learning algorithms have already shown promising results in various fields, and data compression is no exception.

Multi-stage compression:

involves compressing the data multiple times using different algorithms or techniques.

Context-based compression:

Context-based compression is a relatively new approach that considers the context of the data to be compressed, such as the file type, data format, or language.



Predictive compression:

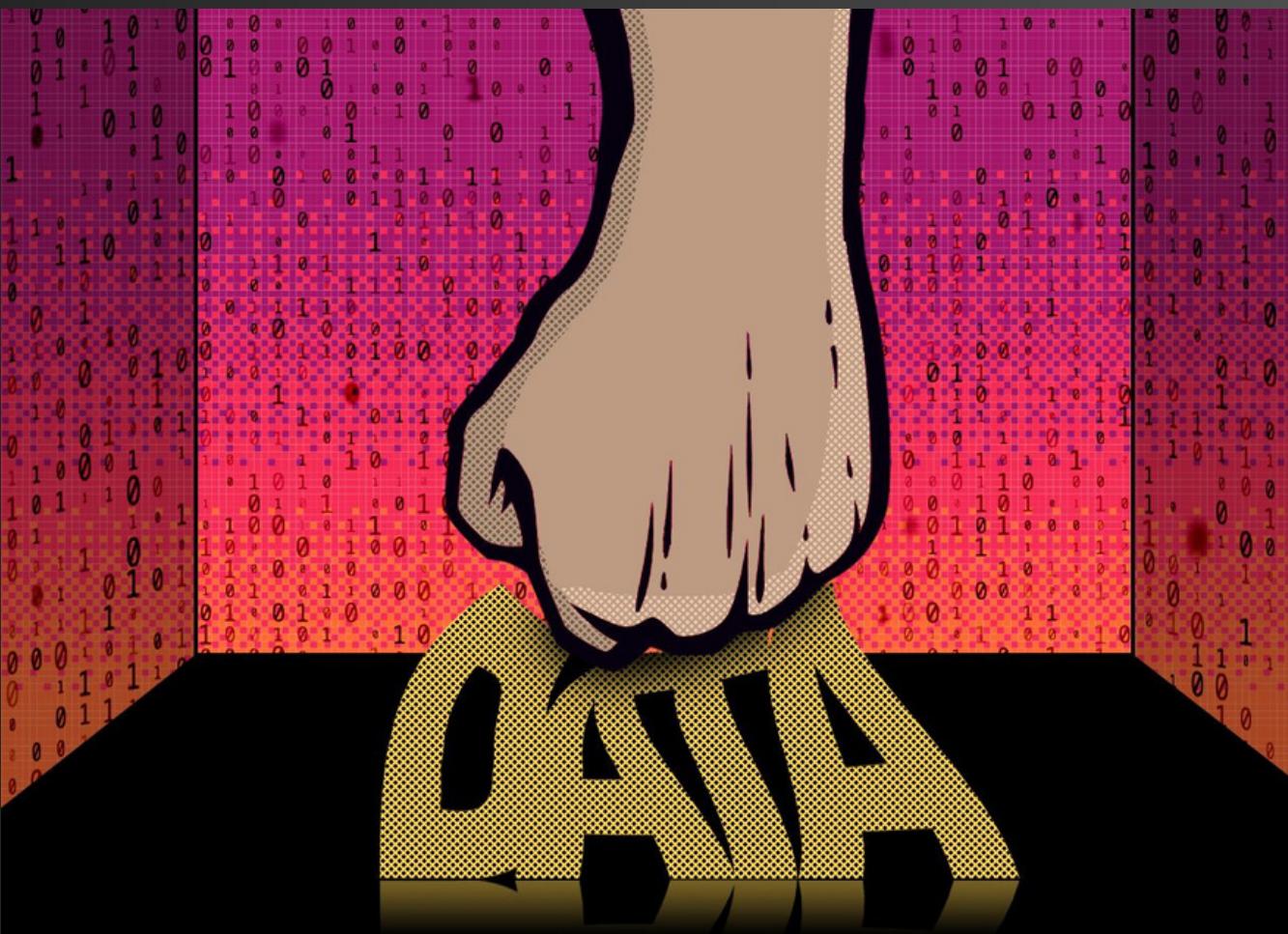
Predictive compression involves predicting the future data values based on past values and using this information to compress the data more effectively.

Cloud-based compression:

Cloud-based compression involves compressing data on remote servers, reducing the need for local storage and processing power.

Quantum compression:

Quantum computing has the potential to revolutionize data compression by providing significantly higher compression ratios and faster processing speeds.



CONCLUSION

End of summary