# Einstein's Image Compression Algorithm: Version 1.00

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**Abstract**

***Purpose:*** *The Einstein's compression technique is a new method of compression and decompression of images by matrix addition and the possible sequence of the sum. The main purpose of implementing a new algorithm is to reduce the complexity of algorithms used for image compression in recent days. The major advantage of this technique is that the compression is highly secure and highly compressed. This method does not use earlier compression techniques. This method of compression is a rastor compression. This method can be used for astronomical images and medical images because the image compression is considered to be lossless.*

***Design/Methodology/Approach:*** *The idea uses the previous literature as a base to explore the use of image compression technique.*

***Findings:*** *This type of compression can be used to reduce the size of the database for non- frequently used important data. This technique of compression will be in future used for compression of colour images and will be researched for file compression also.*

***Social Implications:*** *This idea of image compression is expected to create a new technique of image compression and will promote more researchers to research more on this type of compression*

***Originality/Value:*** *The idea intends to create a new technique of compression in the compression of image research.*

***Keywords:*** *Image Compression; Einstein's Image Compression; New Compression Technique; Matrix Addition Based Compression.*

***Paper Type:*** *Technical*

## Procedure

The image is gained as an input preferably black. The value of colour will range from 0 to 255 as 0 is completely blank and 255 full.

The image is processed in to the system and is converted in table of rows and columns of pixels preferably .jpg or .bmp. The input image will be in the form of **Fig 1** and converted values will something be like **Fig 2**

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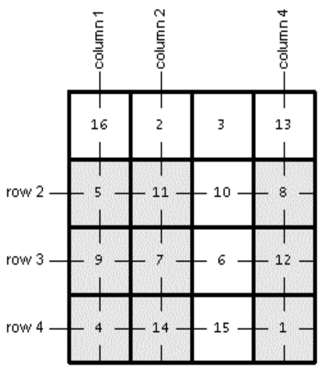
**Fig 1:**

*Courtesy: www.mathworks.com*

**Fig 2:**




*Courtesy: www.mathworks.com*

The image may be of any number of rows and columns but all the rows must have the same number of columns and vice versa. According to our example we have taken a matrix of **255 x 255**

**Compression**

**Calculation of Rows and Columns**

A counter will be assigned to calculate the number of rows and will be stored in a variable as **ρ**

Another counter will be assigned to calculate the number of columns and will be stored in a variable as **χ**

**ρ** is nothing but the number of cells in each column and **χ** is the number of cells in each row

According to our example the pattern will be:

$$\rho = \chi$$

**The Database**

A database of all the possible sum is created. This is one time creation of database.

As our example image is 255 x 255 when processed will have [1 × (255 × 255)] and the maximum possible values as our image is black and white is 255 so the maximum possible sum of the matrix is 16581375.

So the database is created for the values ranging from sum of all the columns ranging from 0 to 16581375.

For every possible value there is number of possible values i.e. according to permutations for sum **σ** and **μ** columns in the row matrix we get **ν** combinations

i.e. $$\nu = \sigma + (\mu - 1)\ c\ (\mu + 1)$$

For example if there are 4 columns and sum of the matrix is 10 we get 715 combinations. And an extra column is added in the table for generating sequence number **Λ.** The table is stored in ascending order considering as digits **(Table 1)**

**Table 1**

| MATRIX VALUES | | | | Λ |
|---|---|---|---|---|
| 0 | 0 | 0 | 2 | 1 |
| 0 | 0 | 1 | 1 | 2 |
| 0 | 0 | 2 | 0 | 3 |
| 0 | 1 | 0 | 1 | 4 |
| 0 | 1 | 1 | 0 | 5 |
| 0 | 2 | 0 | 0 | 6 |
| 1 | 0 | 0 | 1 | 7 |
| 1 | 0 | 1 | 0 | 8 |
| 1 | 1 | 0 | 0 | 9 |
| 2 | 0 | 0 | 0 | 10 |

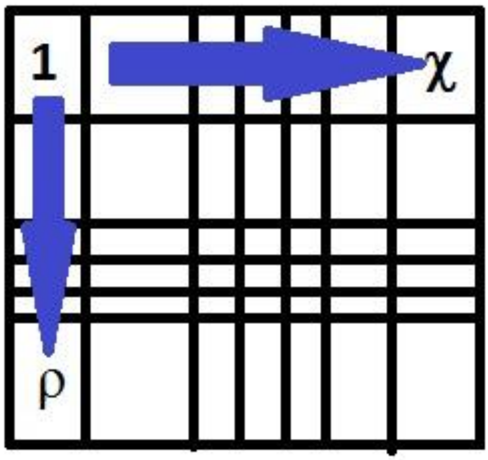
**Table 1** forms as a look up table for example if the sum of the matrix is **2** and the matrix is **[0 2 0 0 ]** then the sequence number of the matrix will be **6** i.e. **Λ = 6**

Similarly, a database of all the possible values is generated. The database is found to be so important that it is even required for decompression also.

**The Second Step**

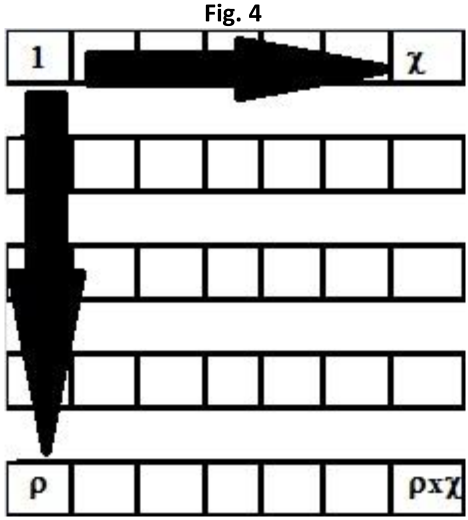
The second step involves the conversion of **[ ρ × χ ]**image into **[ 1 × (χρ)].** The actual image will be in the form of **Fig 3.**

**Fig. 3**



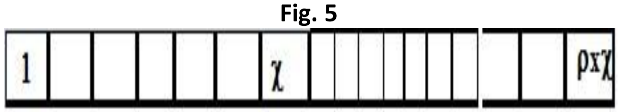

On the first stage of conversion the image is cut into each row matrices so that we get **ρ [ 1 × χ]. (Fig. 4)**

**Fig. 4**




Then the row matrices formed is lined one after the other to form a **[ 1 × (χρ)]** row matrix **(Fig. 5)**

**Fig. 5**



**Adding for σ and Generation of Sequence Λ**

As the row matrix is generated from the previous step. The values of the cells in the rows are added and are stored in **σ.** This forms a new cell in the compressed image

The next cell in the compressed image comprises of the sequence number **Λ.** This number is generated by some random search algorithm referring to the table created as database and the original image.

**Extra cells**

Some extra cells like **τ** which refers to the type of image compressed; the extensions of the uncompressed images are converted and stored as ASCII values.

Two cells containing the counter values like **ρ** and **χ,** and an extra cell number of colours or the layers present in the cell i.e. 1 denote black and white image and 3 denotes RGB.

The output image for a black and white image will be in the form of **Fig. 6.**

**Fig. 6**

| | | | | | |
|---|---|---|---|---|---|
| σ | Λ | τ | ρ | χ | α |

**σ** =sum of matrix cells

**Λ** = sequence generated for the sum

**τ** =Type of image

**ρ** =Number of rows in the original matrix

**χ** =Number or columns in the original matrix

**α** =Number of colors in the image

**Decompression**

The image compressed by the above technique can be decompressed by this method

**The compressed image received if black and white (Fig 7)**.

**Fig. 7**

| | | | | | |
|---|---|---|---|---|---|
| σ | Λ | τ | ρ | χ | α |

On seeing the value stored in last cell it understands whether the image is colour or black and white. If the value is 1 it understands the image is black and white and allots a single table for pixel storage else it allots 3 tables, each one for red, green and blue respectively

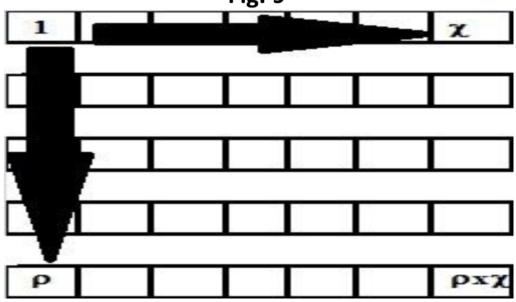
**For Black and White Images**

The table or the matrix allotted is in the form of
**[1 × (χρ)]** cells **(Fig. 8).**

**Fig. 8**

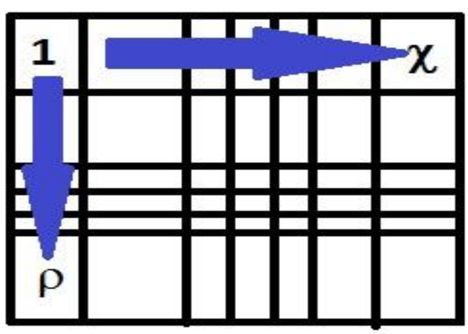

Then the programs search the database of the sum **σ** and goes to the value **Λ** and fills the table with the values stored in the table.
Then the **[1 × (χρ)]** matrix is cut at each **χ** and makes a new row **(Fig. 9).**

**Fig. 9**




Then the rows are joined to form the complete image **(Fig. 10).**

**Fig. 10**




Then the value of **τ** are converted into extension and the image is stored following the Dot (.) i.e. .jpeg etc.

**Other Notes**

- This type of compression is calculated to be highly compressible and forms a lossless image when compressed.
- The software is calculated to be heavy as the database is heavy.
- The thumbnails of the compressed image are not possible as the image is stored as a table.

- The compression can be also secure if the value of **Λ** is sent separately.
- Multiple compressions are not possible for the image as onetime compression is compressed on maximum basis.
- The compression technique does not use any previous method of compression.

## Conclusion

Simplicity of matrix addition is the major advantage of the Einstein's image compression algorithm. The images compressed can be stored in the database with less space. The technique is based purely upon a new idea and does not contain any previous type of compression. The next version of the compression technique will be in research for the compression of colour images.

**Acknowledgement**

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## Additional Readings

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