International Journal on Recent and Innovation Trends in Computing and Communication
Volume: 5 Issue: 7

ISSN: 2321-8169
660 – 663

Data Storage and Retrieval in the form of Geometric Shapes through Implementation of Rainbow Technology

T.Venkat Narayana Rao[1], Kunchakuri Shravani[2] & Annamraju Sruthi[3]
[1]Professor , Dept. of computer Science and Engineering
[2]Student , Dept .of computer Science and Engineering
[3]Student , Dept. of computer Science and Engineering
Sreenidhi Institute of Science and Technology,
Hyderabad, Telangana ,India.

Abstract–This paper focuses on a emerging technology of digital storage. In digital data storage, Rainbow Technology is a quantum leap which enables us to store massive amounts of data nearly 450GB on a piece of paper. It is a bunch of techniques to store data in the form of symbols, colours and its combinations which is called as Rainbow format and the picture developed is called Rainbow picture. The main feature is to use eco friendly and biodegradable paper for storage. There is a possibility of storing audio, video, text and images. This rainbow format can be printed as dense graphics on paper at a density of 2.7GB per square inch and this looks like the modern art. This can be printed using high density printer. The printed Rainbow Picture on paper is portable, biodegradable, eco friendly, low cost. The paper discusses the features, applications and evolution benefits using rainbow technology.

Keywords: *Rainbow technology, rainbow format, rainbow picture, storage, retrieval.*

*****

I. Introduction

Rainbow technology is collection of techniques which aim for cheap, reliable, high speed and density storage and retrieval of data. Unlike, traditional CD's, DVD's and magnetic tapes, this uses a surface paper to store data. This can be achieved by storing them as different geometrical shapes and different colours instead of casual zeroes and ones i.e. binary digits. Any kind of data is converted into format called as Data picture and can be printed on printable media like paper, plastic etc. [1].

Through scanner, paper can be scanned, read and content can be decoded which can be viewed. It is difficult to obtain a complete noise free data, we believe that this technology would reduce the cost very drastically and have high speed storage capacity as well. The pros of having a paper is biodegradability, cost, size and also security. It is possible to view high definition videos also using a single paper [2].

The three things that must be considered while this technology is validated :

Firstly, the paper that is printed and scanned must have high resolution. Both printer and scanner must be able to differentiate between various number of colour values and ranges. The algorithms used must possess lossless compression nature. By this technology, we can create different types of products like RVD (Rainbow Versatile Disk), data centres, Rainbow cards etc. Comparing it with the other existing storages like CD's and DVD's the Rainbow versatile disk i.e. RVD would cost 80% less with enhanced storage capacity [3].

II. The Conversion Procedure

The process of storing and retrieving data is done in 2 levels. In level1 encoding of raw data done into rainbow format. This process make use pulse code modulation technology for conversion of audio signals to digital signals and an algorithm is applied that converts this digital data into coloured geometric images/shapes as shown in figure 1.

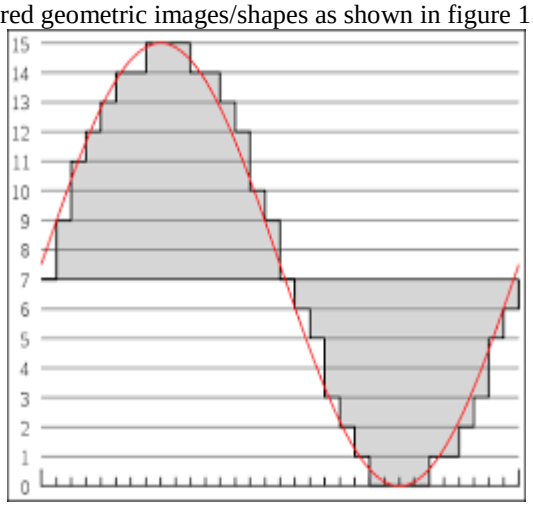

Figure 1: Conversion of analog audio data into digital data by Pulse Code Modulation.

In level 2 step an algorithm to convert scanned geometric shapes undergoes into another process such as digital values techniques i.e. amplitude shift keying or frequency shift keying to decode digital values again into analog signals as shown in figure 2.

 ISSN: 2321-8169
660 – 663

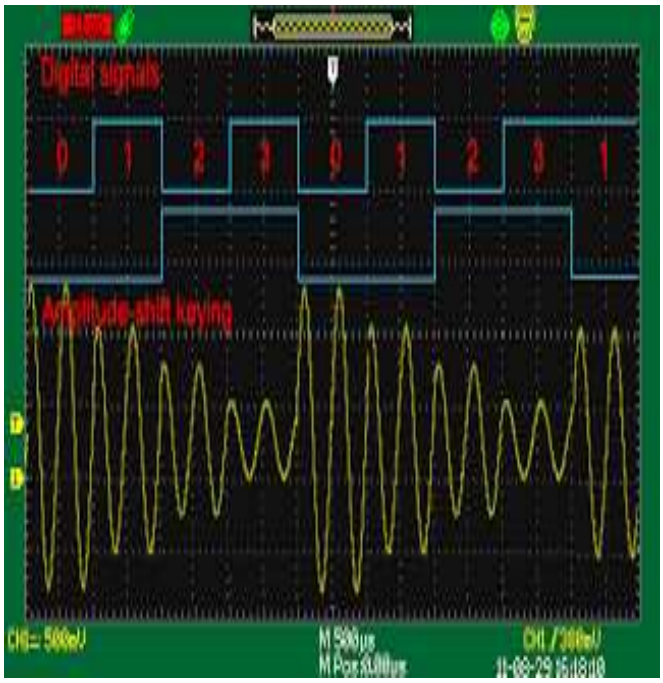

Figure 2: Amplitude shift keying for conversion of digital values to analog signals

Level 1- Data To Data Picture

This stage converts data into a rainbow format data picture which means storing the data in form of colored geometric shapes on paper. Firstly, the audio data which is in the form of analog signals is converted into digital signals using pulse code modulation.

Pulse code modulation is a technique wherein a sample analog waves are converted into digital sine waves. Pulse code modulation involves 3 stages. They are Sampling, quantization and encoding. In sampling sample values on analog wave at regular intervals are obtained. Those sample values are quantized and converted into digital numbers.

These digital numbers are converted to binary numbers. For each different combination of binary numbers, different combination of coloured geometric figures are obtained as shown in figure 3.

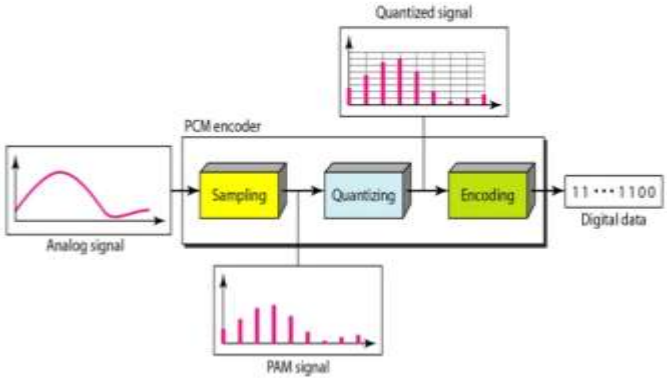

Figure 3: Block diagram of PCM

Now to convert images into rainbow format the convert images must be converted into digital numbers wherein the divide image is transformed into a fine grid of small tiny squares as shown in figure 4.

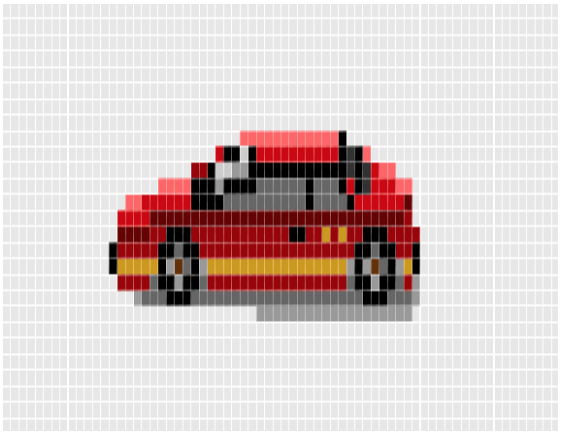

Figure 4:Representation of an image in form of pixels

In the above image the image is divided image into small tiny squares. It is not a picture depicting a car but an array of 256 rows and 128 columns of pixels. Every little square has a prominent colour. The smaller the squares the more precise the conversion it generates. A smaller grid is most likely to hold only single colour. Since, each color is measured in numbers ranging 0-255, for every pixel a number is obtained and is converted to binary numbers and then a sequence of coloured geometric figures are obtained that are printed on the paper.

When subjected to videos, they are considered as images with added another dimension as time. So same as image conversion, videos are also converted by converting each image with time dimension. Hence, obtaining a rainbow format.

Level 2- Data Picture To Data

At this level the scanned data is again converted into raw data form by using computing algorithms.

Firstly scan the paper to attain colored geometric shapes which are converted into digital values based on decoding algorithm. These digital values are used to obtain analog audio signals again. Amplitude shift keying is used to get analog signals from the digital data (figure 5).

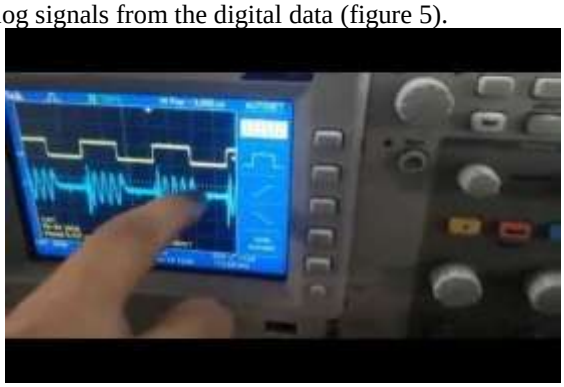

Figure 5: Amplitude shift keying

 ISSN: 2321-8169
660 – 663

In case of pictures the geometric shapes are converted to digital data. These digital data is used to obtain the colour of the pixel and then convert it into array of pixels whose output is an image.

III. The Two Basic Principles

Principle 1 - "Every color or color combinations can be converted into some values and from the values color combination can be regenerated" .
Principle 2 -" Every different color or color combinations will produce different values[4].

IV. The Working Principle and Implementation

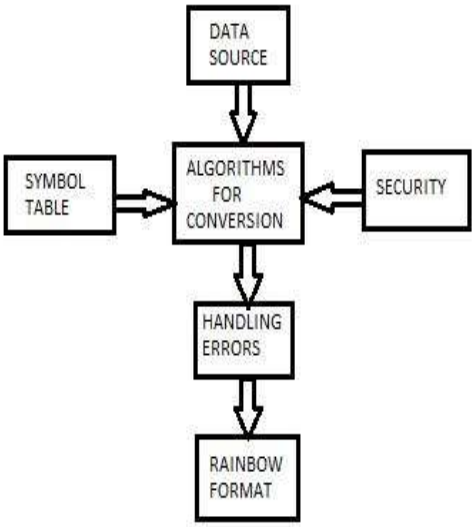

Figure 6:Conversion of data source to rainbow format
The algorithm has two phases(figure 6) :

A. Encoding Data into Data Picture
Step 1: Read the data file to obtain sampled values of data in digital values using pulse code modulation

Step 2: Convert the above data into binary numbers

Step 3: The binary numbers are again converted to different coloured geometric symbols based on algorithm which generates different combination of coloured geometric shapes

Step 4: Each value is replicated two times, so as to control errors, if any

Step 5: For a perfect image these symbols array is converted into a matrix of size 4:3.

Step 6: Obtain a print copy of that image which would work as a final data storage element.

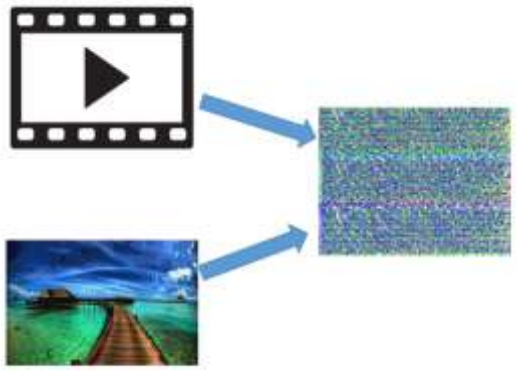

Figure 6 : Encoding of data into a data picture

B. Decoding Data Picture to Data(figure 7):
1. Scan the data picture
2. Read the content on the paper which are in form of geometric shapes
3. The shapes are converted to binary numbers using decoding algorithm
4.The 4:3 matrix is converted into a array.
5. Using two replications , compute average of two successive numbers to get actual value
6. Using amplitude shift keying or frequency shift keying and generate analog signals from digital data
7. The data is reconstructed from data picture
8. The final data can be can accessed as from the canned picture.

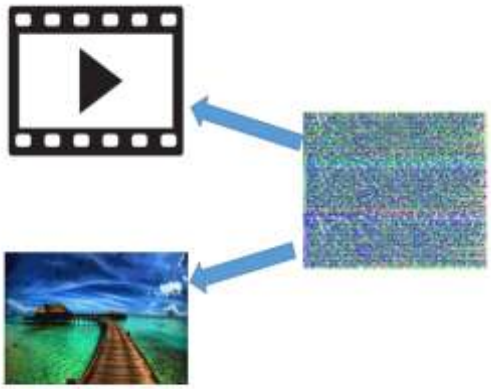

Figure 7 : Decoding data picture to data

Error correction using Absolute Predefined Rainbow Dots:
During encoding some dots are inserted some that have predefined values in the data picture. These dots and a small values and can be used during following :

- Fading of the data picture
- Alteration to the data picture , if any
- Control image attributes
- Reproducing the image

V. Comparison with other Storage Devices and Advantages of Rainbow Versatile Disk

The DVS's are the best mode of storage with the storage capacity of nearly 5GB but are expensive and cannot be used for a longer time for backup and restoring. Rainbow versatile disk (RVD) technology can be used on ordinary paper [i.e. much more cheaper) that can store upto 256GB of data and is 80% cheaper. Paper is eco-friendly and bio-degradable in nature as compared to conventional CD's and DVD's [5].

Advantages

1. An ordinary paper can be used as storage device
2. More data stored in less space.
3. Extremely low cost
4. High speed storage.
5. Data in any format can be stored using this technology.
6. Bio-degradable nature of storage device accounts to reduce e-waste.

VI. Conclusion

By using this technology we can play multimedia content , can view full-length high definition digital content using a single piece of paper. It is forcasted that professionals need not carry CDs DVDs etc. This paper has offered a detailed review on rainbow technology and its future prospects. The major advantage is that this costs less when compared to traditional storage devices. Rainbow cards, data banks etc. can be built using rainbow technology based storage to store huge amounts of data. Rainbow Technology is definitely a breakthrough in digital storage.

References

[1] S.Vijitha,R.Priyanka,V.Sowmya,C.S.Somu,"Implementation of analysis of data storage and retrieval using Rainbow technology",IEEE,978-1-4673-9939-5,2016.

[2] M. A. Siraj,"Data Can Now Be Stored on Paper, Arab News (published November 18, 2006; accessed November 29,2006)

[3] GOPALA, "Rainbow Technology Decidedly Nurtures Storage Trends", International Journal of Technology and Engineering System (IJTES),Vols. 3, no.1.

[4] Vismay pandit, Devansh Sanghvi, Bhargav Mehta, Jinesh Doshi,"Implementation of Rainbow Technology Using Grey scale", International Journal Of Electronics And Communication Engineering & Technology,Volume 4, Issue 5, September – October, 2013, pp. 214-217.

[5] G. Shravani Sharma, T. Pavan Kumar, J.Deepthi,"Rainbow technology",International Journal Of Innovative Technology And Research,vol-5 ,no-2,2017.