

# Study of 3D Barcode with Steganography for Data Hiding

Megha S M<sup>1</sup>, Chethana C<sup>2</sup>

<sup>1</sup>Student of Master of Technology, Dept. of Computer Science and Engineering & BMSIT&M Yelahanka Bangalore-64,

<sup>2</sup> Assistant Professor, Dept. of Computer Science and Engineering & BMSIT&M Yelahanka Bangalore-64

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**Abstract** - 3D barcode is the one where third dimensional will be added as a color. In the 2D barcode bars and squares are the main features. Steganography is a practice of concealing messages or information within other non-secret text or data in order to give protection to the data from the third person. Steganography takes cryptography a step farther by hiding an encrypted message so that no one suspects it exists. 3D will be used mostly in the process of transmission of data it is very difficult to decode because it uses the high data encrypted messages that cannot be decoded by third person. This paper gives the brief introduction about how the 3D barcodes are to be used in the data hiding using steganography in order to secure from others.

**KeyWords:** stego channel, steganography, Cover channel.

## 1. INTRODUCTION TO STEGANOGRAPHY

Steganography is method of hiding the data in a message in order to give security to the data. It is the practice of concealing a file, message, image or video within another file. The word steganography combines the Greek word steganos meaning "covered, concealed or protected" and graphein meaning "writing". The first steganography was done in the year 1499 by Johannes Trithemius.

The advantage of steganography over cryptography alone is that the intended secret message does not attract attention to itself as an object of security. It includes the concealment of information within computer files. In digital steganography, electronic communications may include steganographic coding inside of a transport layer, such as document file, image file, program or protocol. Media files are ideal for steganographic transmission because of their large size.

Steganography has been widely used for centuries. Here are some examples:

- Hidden messages within a wax tablet: In the ancient days the people used to write on the wood and cover them with the wax in order to protect that from the other middle men and these will be in the form of pictorial representation.
- The messages on the body of a person will also be used in the method of hiding the data.
- The hidden or the important data will be written with the secret inks and those will be corrupted when they use other chemicals.

- Post messages will also be used in the days where those are to be covered by some stamp and those data are not to be disclosed to others in the middle of transmission.
- The signs are to be used to communicate in order to give privacy and those can be decoded by authorized person only.

## 2. LITERATURE SURVEY

### A. 3D Barcodes.

The barcodes are the one where we can hide the data and those data will be reached safely to the authorized person without disclosed to others in the middle. The barcodes are mainly made up of bars and squares in the black and white color format. In 3D barcodes the third dimensional will be added as the color. The main reason for introduction of these 3D barcodes are high temperature resistant.

The 3D barcodes are embossed on the product and the scanner recognizes new character in the string by the lower regions of the code. This work in much the same way as the white lines or spaces in linear barcodes. The 3D barcodes also make it nearly impossible to alter or obstruct the barcodes information and results in fewer inventory mistakes and in turn lowers operating costs of a manufacturing process or applied after with a press.

3D barcode are to be scanned from different scanner where we will use the laser light to scan the barcode. That red height as a function of time the laser light takes to travel to the code section and project back.



Fig 1: 3 D Barcode

**Advantages of 3D barcode are:**

1. It is very difficult to modify the encoded information because is no error correction level in the system.
2. This one will have large amount of data hiding capacity.
3. This will help in encoding image, video and voice message in the barcode.
4. These are high temperature resistant.
5. This will provide high level of security to the expensive products like gold, diamond and some pharmaceutical products.

**Disadvantages of 3D barcode are:**

1. These are costly to generate.
2. The generation requires perfect knowledge of coding and color coding information.
3. These require special type of scanner to scan the barcode.

**B) Classifications of 3D barcode:**

The 3d barcode will be classified into mainly 3 types they are:

1. Paper Memory Barcodes
2. Nano Barcodes
3. High Capacity color Barcodes.

**Paper Memory Barcodes:**

This type of barcode will be introduced by a Japanese company named "content color of Asia" in year 2006. This code is similar to that of 2D barcode where third dimensional is added as color. In his directly we can add image directly. The data capacity of the paper memory code is 0.6mb to 1.8mb.

**Nano Barcodes:**

These are also similar like QR code. This type of barcode was introduced by National Physical Laboratory. The length of the barcode is length of a single skin cell of a person. This will help in making about 90,000 squares. The information will be stored in the system between black and white lines.

**High Capacity Color Barcode:**

This type of barcode was introduced by the Microsoft Company in 2007. These type of barcode help in storing large amount of data than traditional 2D barcode. In creating the barcode they will use eight different colors.

**C. Specification Of QR code:**

The QR code are made up of modules which contains small black and white color squares.

There are some specifications in the barcode they are:

1. Alignment Pattern: It is used when there is a deformation due to displacement of modules.
2. Position Pattern: The three corners of QR codes are used for detecting position. The ratio of black and white modules is used to specify the edge and displacement of code.
3. Error Correction Information: It is used when part of QR code is absent.
4. Margin: The black area around the QR code is called Margin.
5. Timing Pattern: Modules are used to determine the coordinates which are arranged alternatively.
6. Format Information: It includes the error correction code rate and mask pattern.

**D) 3B Barcode Scanner:**

A barcode reader is an electronic device that can read and output printed barcodes to a computer. Like a flatbed scanner, it consists of a light source, a lens and a light sensor translating optical impulses into electronic ones. Additionally, nearly all barcode readers contain decoder circuitry analyzing the bar codes image data provided by the sensor and sending the barcode content to the scanner output port.



**Fig 2:** 3D barcode Scanner

Laser scanners work the same way as pen type readers except that they use a laser beam as the light source and typically employ either a reciprocating mirror or a rotating prism to scan the laser beam back and forth across the bar code. As with the pen type reader, a photo-diode is used to measure the intensity of the light reflected back from the bar code. In both pen readers and laser scanners, the light emitted by the reader is rapidly varied in brightness with a data pattern and the photo-diode receive circuitry is designed to detect only signals with the same modulated pattern.

**E) Decoding Process of Barcode:**

barcodes



**Fig 3:** Decoding process of the barcodes.

The fig3 explains about how the barcodes will be decoded using the scanners. In this the image will be converted into binary format. After converting into binary format the pattern matching will separate into alignment finder and versions of the barcode. Then those data will be used to extract for perspective transformation and these data will be used to extract information. If any errors are present in the extraction those will be debugged and then the decoded information will be used.

**3. PROPOSED SYSTEM**

There are mainly two phase they are

1. 3D barcode generation and embedding phase.
2. 3D barcode extraction phase.

3D barcode generation and embedding phase:

In order to generate the 3D barcode there are some steps they are as follows:

**Step1:** Generate a colored barcode by using three colors barcodes images Red, green, blue with each image individually encoded with information.

**Step2:** Take the generated barcode image as the cover image. Based on some random key Extract red, green, blue component. **Step3:** Calculate the Euclidean distance of each individual channel using formula:

$$(x_2 - x_1)^2 + (y_2 - y_1)^2$$

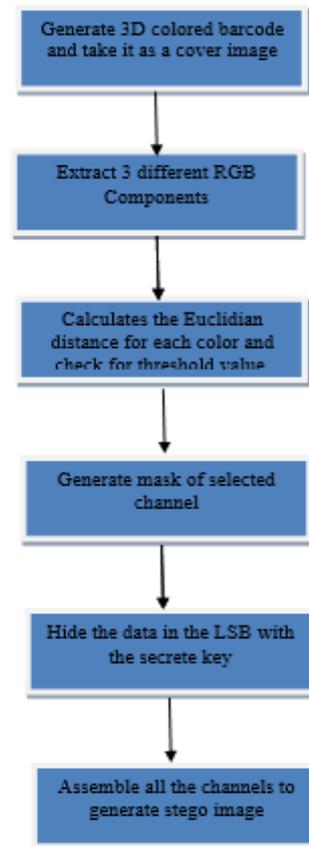
**Step 4:** choose some threshold value. For  $d < 100$  Generate the mask of the cover image.

**Step5:** Hide data into the least significant bits of the mask.

**Step6:** Finally combine all the segments to generate the stego image.

Where  $origimg$  is the original image and  $disting$  is the recover image. These are steps that are to be used to create a 3D barcode to hide the data to give privacy and

security to the data. The systematic representation of generation phase is shown below.



**Fig 4:** 3D Barcode Generation

**3D Barcode Extraction Phase:**

At receiver side, following steps are used to extract the embedded secret message and source image from the stego image. The steps for the extraction phase are as follows

**Step 1.**Take stego Image as an input. The stego image is the image generated after concealing secret message in the cover image.

**Step 2:** In this step, the image is segmented into a number of segments.

**Step 3:** Then we have to recognize the segment in which the sensitive information or secret message is hidden.

**Step4:** After recognizing the segment in which the data is hidden, we have to identify the least significant bits in which data is embedded.

**Step 5:** In this step, by using the same key as used in the embedding phase we can decrypt the secret message.

**Step 6:** All the segments are then assembled.

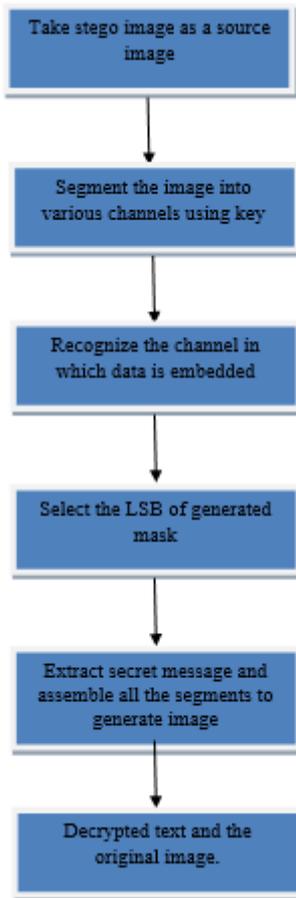


Fig 5: Extraction Phase of data

The two methods are to be explained that how the data will be hidden in the container where the 3D barcode will be used as the cover image. The generation phase will explain about how the data will be hidden using LSB and secret key. In this method XOR encryption method will be used. In the data extraction phase, it will explain about how the data will be extracted from the system to get the secret message. The 3D barcode will be high temperature resistant and it will be very much secured because the data cannot be changed or altered by any third person while transmission.

**3D Colored Barcode Generation** We proposed a procedure for creating 3D Barcode. The procedure includes the generation of colored barcode from three red, green, blue color barcodes with some encrypted information in them Equations

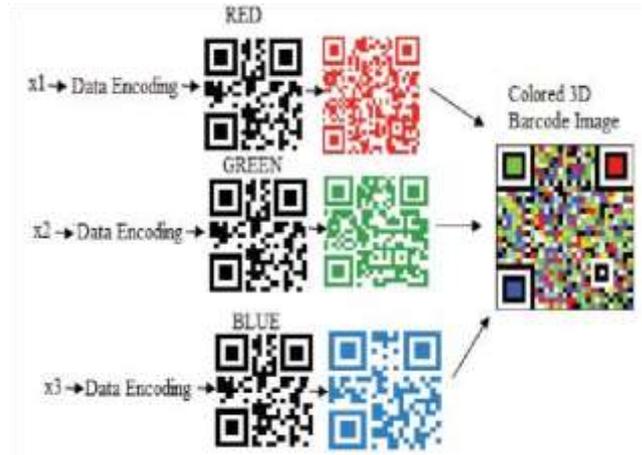


Fig 6: 3D barcode Generation

#### 4. CONCLUSIONS

This paper gives about the idea about how the data can be hidden using 3D steganography where 3D barcode is taken as the cover image. This paper gives about the brief introduction about how the data can be encoded its phases and the use of secret key in order to get hidden message in the system. Here the data will be hidden in the last significant of binary representation. The 3D barcode is high temperature resistant so the main benefit is using 3D barcode as the cover image.

In this paper only one hidden message will be used to hide. We can also take more hidden messages to hide. In future this approach can be improved by using several optimizing algorithms for enhancing the embedding capacity and quality of stego image with less distortion in the image. Several secret messages can also be concealed in a single cover image.

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