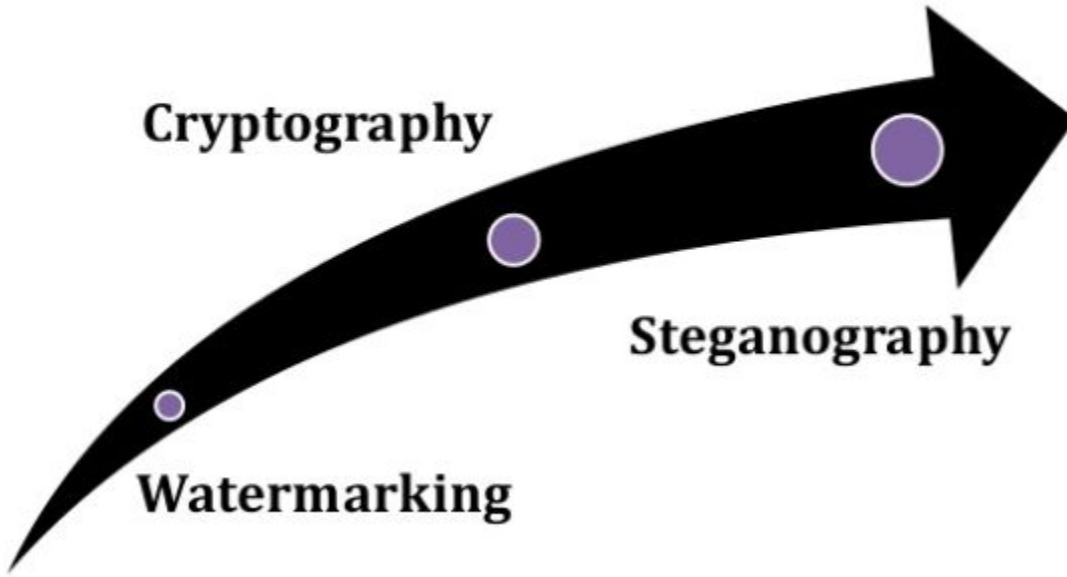


Audio Steganography

Outline :

1. Audio Steganography introduction
2. A brief about present algorithms
3. LSB encoding algorithm
 - 3.1. Advantages
 - 3.2. Implementation results
 - 3.3. Limitations
4. Phase encoding algorithm
 - 4.1. Advantages
 - 4.2. Implementation results
 - 4.3. Limitations
5. Comparison of both algorithms

Evolution of steganography :



Why Steganography over Cryptography?

- A. Cryptography: When you see an unknown text, you'll STOP reading and say "What's the secret behind those letters?" then you'll start your journey to answer this question by follow the source and destination and trying to figure out the relations between the letters and so on you may reach the goal.
- B. Steganography: When you see an image or video, you'll say "Wow! What's a photo?" even if it contains an encrypted text you didn't notice.

Steganography is a data hidden within data. Steganography includes the concealment of information within computer files. In digital steganography, electronic communications may include steganography coding inside of a transport layer, such as a document file, image file, program or protocol.

Audio steganography algorithms :

1. LSB coding
2. Parity coding
3. Phase coding
4. Spread spectrum
5. Echo hiding

Audio file format :

.wav file ??

- Most popular audio format
- No compression
- Doesn't lose any quality in recording
- Easier format for development

.mp3 file ??

- converting any audio to MP3 will reduce its original quality and also reduce the size
- The overall sound quality is usually OK
- Lossy compression

LSB coding

Why LSB coding ?

- Low computational complexity, good data rate
- Easy implementation
- Variation in LSB

Limitations of LSB ?

- Low robustness against intentional attacks which try to reveal the hidden message.
- Low robustness against distortions with high average power (unintentional attacks).

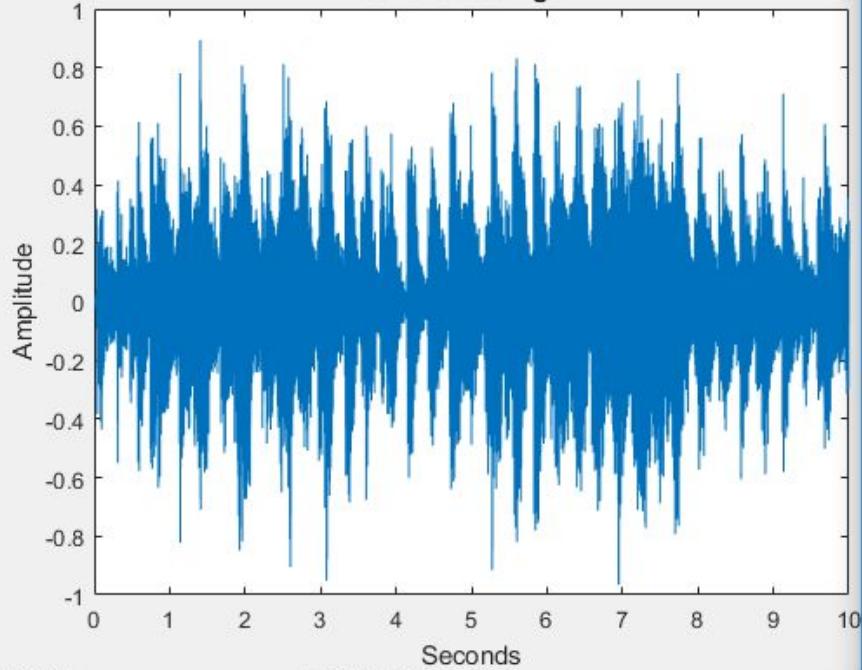
Solution ? encode bits other than LSB or MSB

Figure 1

File Edit View Insert Tools Desktop Window Help



Before encoding



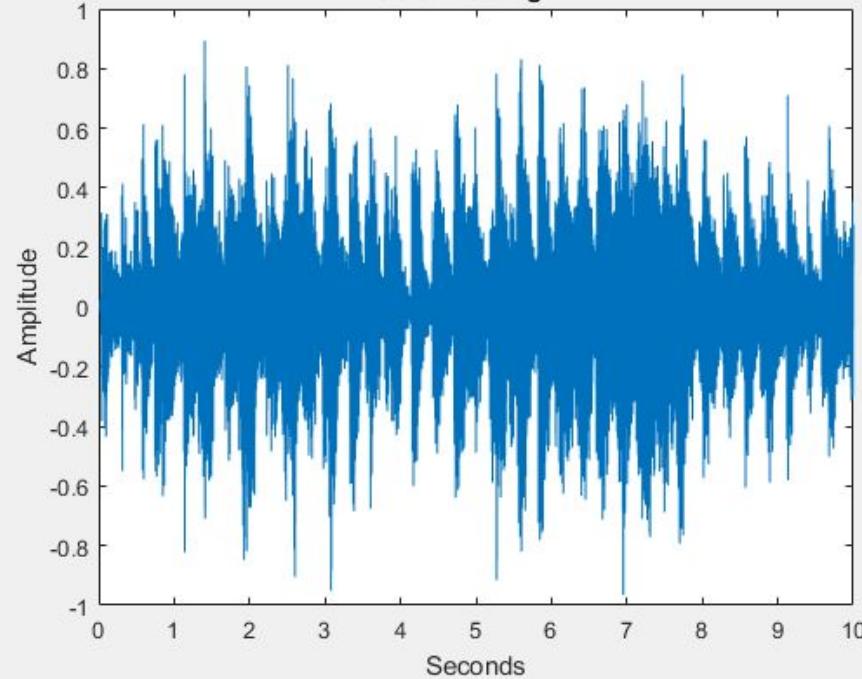
'test.wav'

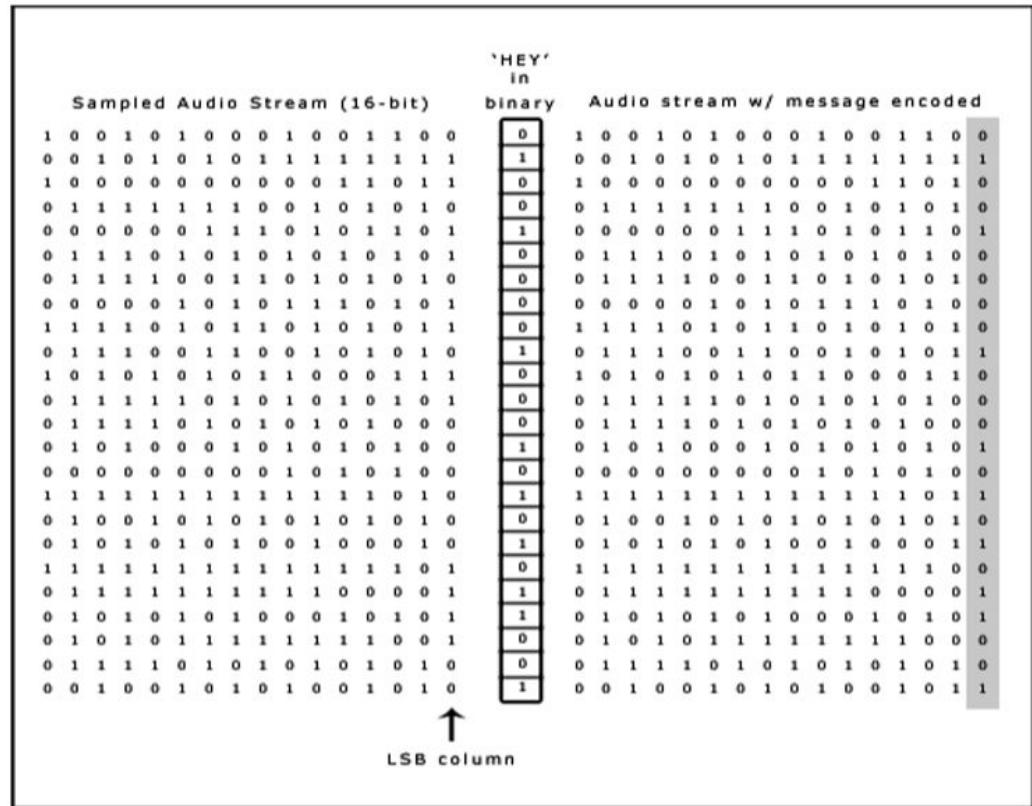
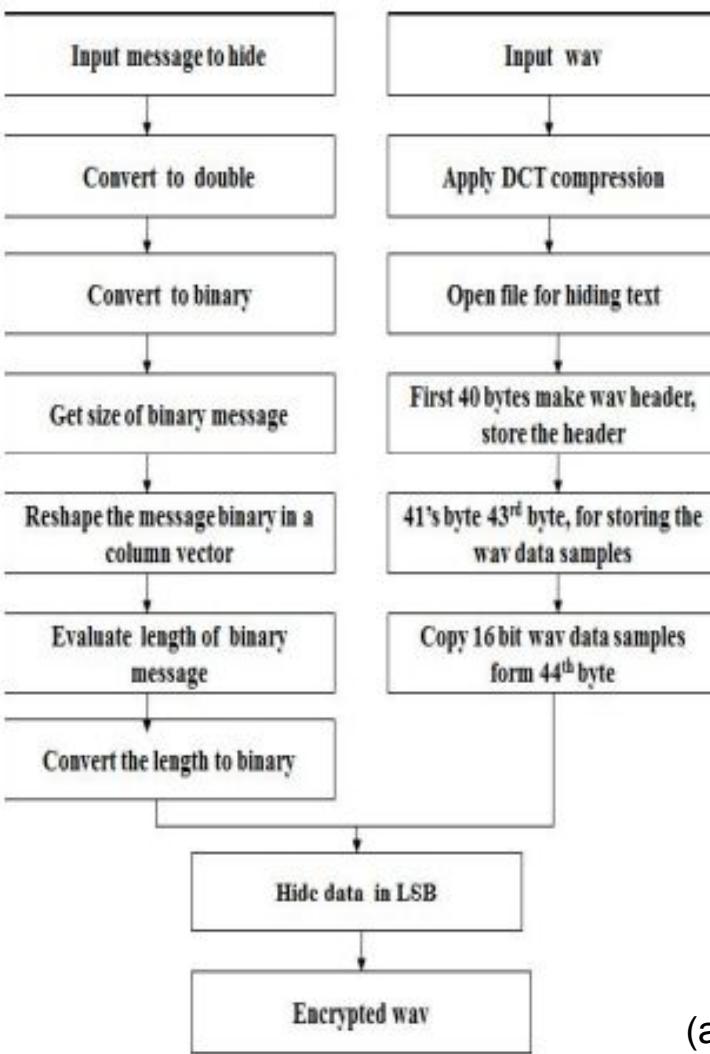
Figure 2

File Edit View Insert Tools Desktop Window Help



After encoding





(a) LSB coding algorithm and (b) LSB coding example

Phase Encoding?

Step 1: The phase coding method works by substituting the phase of an initial audio segment with a reference phase that represents the data

Step 2 : The original sound sequence is broken into series of N short segments.

Step 3 : A discrete Fourier transform is applied to each segment, to break create a matrix of the phase and magnitude.

Step 4 : The phase difference between each adjacent segment is calculated.

Step 5 : For segment S0, the first segment, an artificial absolute phase p0 is created.

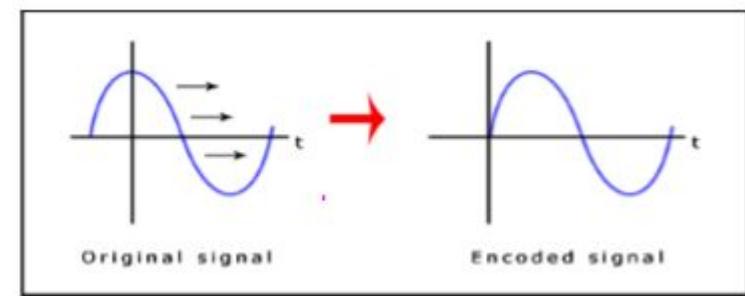
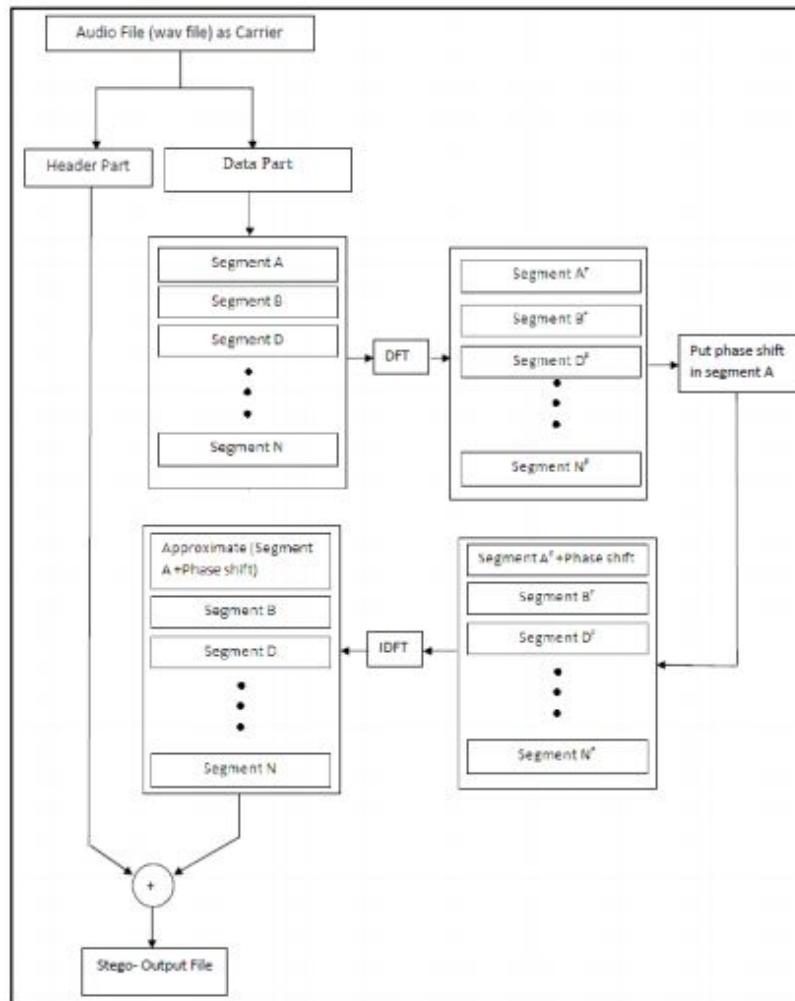
Step 6 : For all other segments, new phase frames are created.

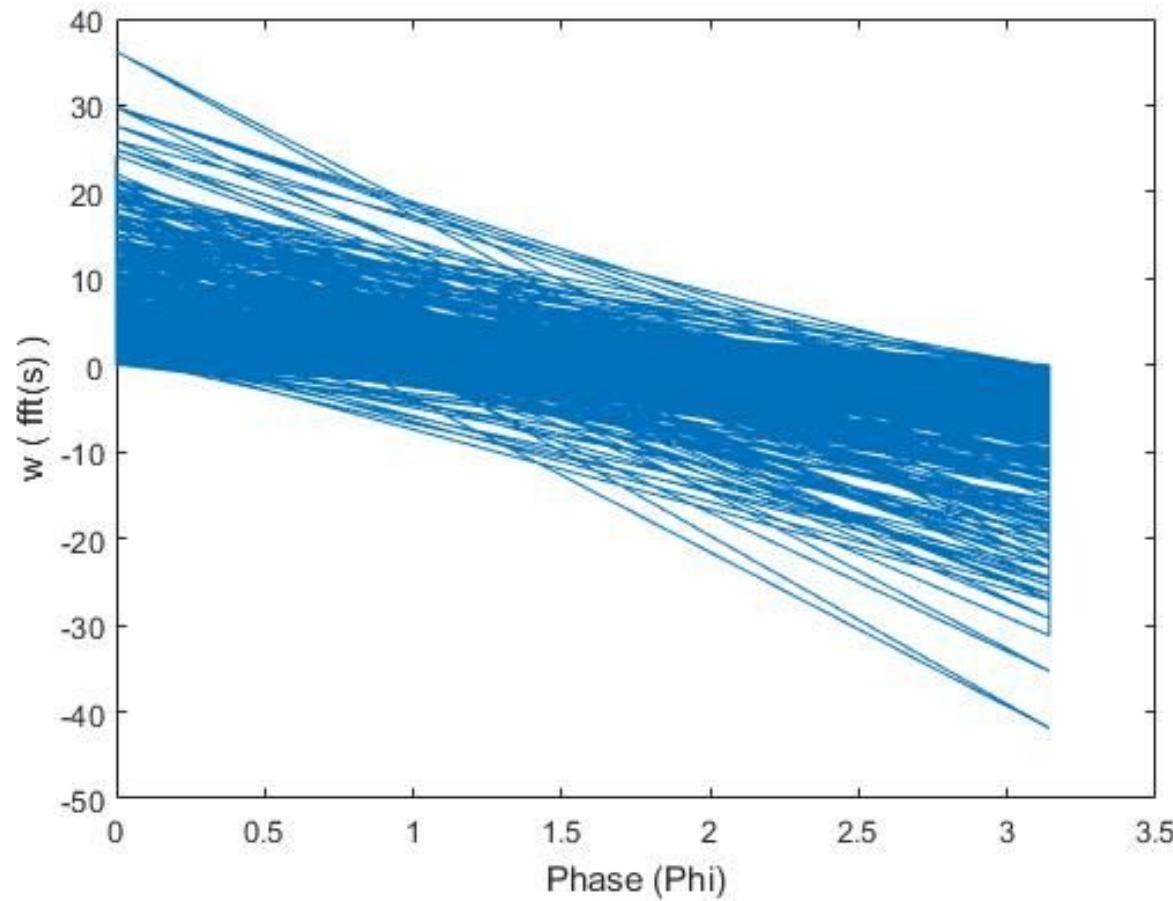
Step 7 : The new phase and original magnitude are combined to get a new segment, Sn.

Step 8 : Finally, the new segments are concatenated to create the encoded output.

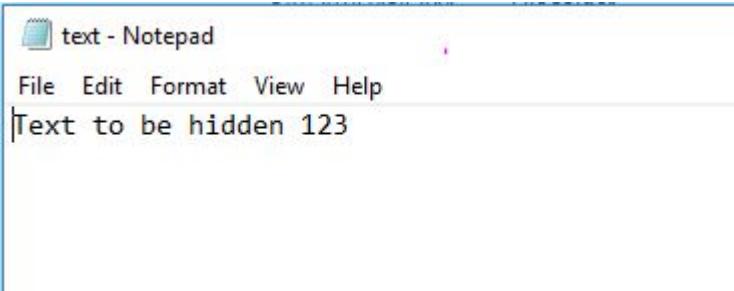
Limitations:-

- The disadvantage associated with phase coding scheme is that the transmission rate is low.
- The amount of data that can be stored in a segment is fixed.
- So, the message that can be stored will be constrained too.





Text to be encoded



Text that is retrieved

Command Window

```
enter password : Bn_123@!'\nRetrieved message: Text to be hidden 123\nBER : 0\nNC : 1\nfx >>
```

The screenshot shows a command-line interface window titled "Command Window". It displays the command "enter password : Bn_123@!'\n", the retrieved message "Retrieved message: Text to be hidden 123", and performance statistics "BER : 0" and "NC : 1". At the bottom left, there is a small icon labeled "fx" with a downward arrow.

LSB and Phase coding comparison :

Audio size (.raw) : 861 Kb

Duration : 10 secs

Audio size (.mp3) : 695 Kb

Duration : 22 secs

	LSB coding	Phase coding
Breaking point	56 bytes	56 bytes
BER (.wav file)	0	0
BER (.mp3 file)	0	1.562500e-00
NC (.wav file)	1	1
NC (.mp3 file)	1	9.806433e-01

Future Scope:

- Steganography, though is still a fairly new idea.
- There are constant advancements in the computer field, suggesting advancements in the field of steganography as well.
- In the future, it is hoped that the technique of Steganalysis will advance such that it will become much easier to detect even small messages within an audio file.

Thank you !