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# STEGANOGRAPHY SYSTEM FOR HIDING TEXT INTO AUDIO SIGNAL USING I-LSB TECHNIQUE & COMPRESSION ALGORITHM (LZW & ADAPTIVE HUFFMAN)

**Sukhdeep kaur*, Karandeep singh**
* M. Tech, Research Scholar, Department of E.C.E, Baba Farid College of Engineering, Bathinda, India
Assistant Professor, Department of E.C.E, Baba Farid College of Engineering, Bathinda, India

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## ABSTRACT
Steganography is technique to hide the secret data within a cover media such as digital images, sound files, video files in such a way that the existence of the message remains same. Audio stenography technique hides the secret data such as text or images in the audio signals. In this paper we proposed a technique for hiding the text message into audio signals using Improved LSB technique. In the proposed system the combination of Adaptive Huffman and LZW algorithm is used to compress the text message. Various test cases are performed on various inputs and results of the proposed system are evaluated on the basis of SNR and Compression Ratio, Time and MSE. Experiment results shows that the proposed system give better performance than that of existing systems.

**KEYWORDS:** Audio steganography, Improved LSB, Adaptive Huffman and LZW Compression Algorithm.

## INTRODUCTION
The term Steganography is adapted from the Greek word steganography, meaning "covered writing" and is taken in its modern form to mean the hiding of information Inside other information. Naturally these techniques date back throughout history, the main applications being in couriering information during times of war.

Steganography is the technique of concealing the messages in such a manner that nobody, aside from the sender and Expected receiver, identifies the presence of the message. Steganography works by supplanting bits of futile or unused information in standard PC records like sound, content, HTML, text with bits of various, undetectable data. This Shrouded data can be plain content, figure message, or even pictures.

In a PC based sound Steganography framework, mystery messages are implanted in sound. The hidden message is fitted by marginally adjusting the paired arrangement of a sound document. The sound Steganography software can install messages in WAV, AU, and even MP3 sound records. These strategies run from rather straightforward calculations that embed data as flag clamor to all the more effective strategies that endeavor modern flag handling procedures to conceal data.

In this manner the fundamental motivation behind this class is to clarify Audio Steganography and calculations usually utilized for Audio Steganography and its applications.

## ADVANTAGES
**Storage capacity:**
Audio files are generally larger in size than images. So by using improved LSB audio steganography technique large amount of data can be stored.

**Flexibility:**
Another aspect of audio Steganography that makes it so attractive is its ability to combine with existing cryptography technologies.

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**Less degradation:**
Greater measures of data can be inserted without capable of being heard debasement.

**Security:**
Data hiding in proposed system is more secure. Without the message extraction key nobody can recover the hidden data.

## DISADVANTAGES

**Robustness:**
Copyright marks covered up in sound examples utilizing substitution could be effortlessly controlled or devastated if a knave comes to realize that data is concealed along these lines.

**Commercial issues:**
Commercialized sound Steganography have drawbacks that the presence of shrouded messages can be effortlessly perceived outwardly and just certain measured information can be covered up.

**Proposed Methodology:**
Proposed System use Improved Least Significant Bit (LSB) to hide the text message into audio signal. Improved least significant bit (I-LSB) coding technique is one of the easy and simplest ways to hide information in a digital audio file. LSB coding is used to hide the large amount of information in the audio file.

Proposed system has two parts one is used at transmitter and second is used at the receiver to embed the message into an audio signal and to recover back from the emended signal at receiver. Before hiding the text message into an audio signal we have to compress the text message. In proposed methodology we used the following algorithms.

**LZW (Lempel Zev Welch**):
As we know to store a large amount of data or files we need a large data storage capacity. so to utilize the same capacity Compression is the way minimize the data size. Lossless compression method is that data compression method in which no information or data is lost during the compression. LZW algorithm is one of the examples of lossless compression technique.

LZW (Lempel Zev Welch) algorithm is discovered by Ziv and Lempel in 1977. This algorithm carries out the lossless compression by using dictionary.
The whole LZW compression algorithm is as follow:
1) Dictionary is initialized by all basic existing characters {‘A’..’Z’,’a’..’z’,’0’..’9’}.
2) *C* defined the current or first character in character stream.
3) N defined the next character.
4) Next is output which is same as current column.
5) Add to dictionary (*C+N).*

**Adaptive Huffman Compression:**
Adaptive Huffman coding is also called Dynamic Huffman coding is based on Huffman compression. In these techniques the user has no knowledge about the length of the incoming text message. This technique is used to hide the text data into audio signal in live audio, video systems. Steps of Adaptive Huffman coding.
(1) Increment the count,
(2) Update the Huffman tree.

During the updates, the Huffman tree will be maintained its sibling property that mean the nodes are arranged in order of increasing weights. When swapping is necessary, the farthest node with weight W is swapped with the node whose weight has just been increased to W+1.

**I-LSB insertion technique:**
Step1: Select the text information which is to be hide.
Step 2: Compress the text information using LZW and Adaptive Huffman Coding algorithm.
Step 3: selected the .wave file and extract the header from the .wave file.
Step 4: Insert the message bits into selected .wav file by using I-LSB technique.
Step5: join the .wav samples with the header to create the output file.

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Step6: Store the results on particular location and display the file.

**Message extraction process:**
Step 1: select the .wav file in which information is shielded.
Step 2: Extract the bits from LSB in alternate positions from the .wav samples.'
Step 3: Combine the message extracted from LSBs.
Step 4: Decompress the message using Inverse of LZW and Adaptive Huffman coding.
Step 5: display the results.

The proposed system shields the text information into audio samples using I-LSB technique. These are the evaluated parameters:
**Time:** This parameter is defined that how much time is taken to hide the text information into the audio signal.
**MSE (Mean Square Error):** Defined as a signal fidelity measure, the purpose of a signal fidelity measure is to compare two signals by providing a quantitative score that describes the degree of fidelity or the level of error.

**Compression Ratio (CR):** Compression ratio can be defined as the ratio between output bits generated and total number of input bits.

**SNR (Signal to Noise Ratio):** It is a measure of signal strength relative to background noise. The ratio is usually measured in decibels (dB).

## RESULTS

| FILE NAME | TIME | MSE | COMPRESSION RATIO | SNR |
|---|---|---|---|---|
| Steganography | 0.084 | 0.01066 | 0.4976 | 88.89 |
| Audio steganography | 0.107 | 0.01064 | 0.5524 | 88.93 |
| Secured data transmission | 0.047 | 0.01138 | 0.5233 | 87.45 |
| hybrid encryption | 0.12 | 0.01075 | 0.5243 | 88.70 |
| novel video steganography | 0.1 | 0.01133 | 0.5635 | 87.54 |

***Table3. Comparison of compression ratio***

| File name | Huffman + BWT | Dictionary compression | Adaptive Huffman +LZW | |
|---|---|---|---|---|
| bibliography | 0.457 | 0.278 | 0.479 | |
| Technical paper | 0.452 | 0.282 | 0.488 | |
| Source code in"c" | 0.438 | 0.286 | 0.469 | |
| Source code in "pascal" | 0.335 | 0.237 | 0.538 | |
| Text:English text | 0.345 | 0.174 | 0.466 | |

***[Fig.1 Comparison of Compression ratio]***

The above table represents the comparison of the existing and proposed system on the basis of compression ratio parameter. It is shown that the Compression ratio of the proposed system gives better results than that of the existing system on the same type of the data given. The above table represents the compression ratio of the existing and proposed system and their corresponding difference is given

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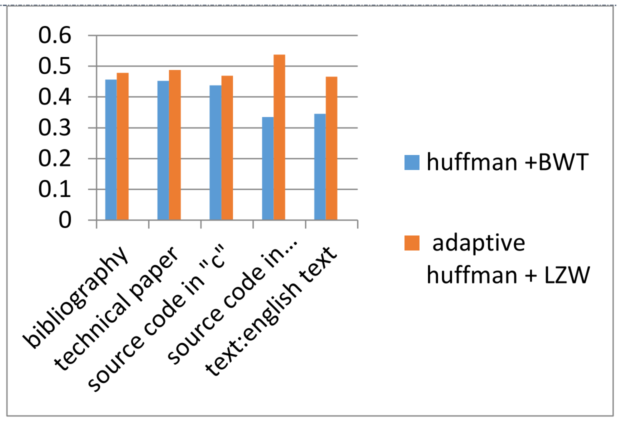
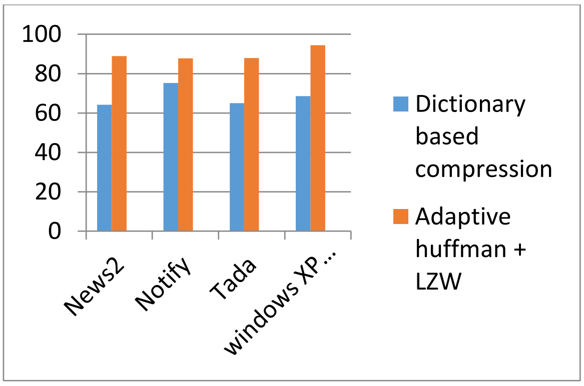



***Table4.Comparison of SNR***

| Cover File Name | Dictionary based compression | Adaptive Huffman+ LZW |
|---|---|---|
| News2 | 64.19 | 88.79 |
| Notify | 75.14 | 87.67 |
| Tada | 64.96 | 87.84 |
| Windows XP windows | 68.57 | 88.03 |

***[Fig.2 Comparison of SNR]***




***Conclusion and Future Scope***

## CONCLUSION

Steganography is an effective way to hide sensitive information. In the proposed work we have used the E-LSB Technique and Adaptive Huffman Compression Technique on audio signals to obtain secure stego-signal. The compression algorithm is used to compress the text data that is to be hidden in the audio signal. With the help of the proposed compression algorithm large text messages can be hidden into the smaller audio signals. Compression ratio is higher than existing system, and SNR also higher than SNR of Existing techniques. Our results indicate that the I- LSB insertion using Adaptive Huffman & LZW Compression is better than simple LSB insertion in case of lossless compression. The audio signal samples don't change much and is negligible when we embed the message into the audio signal.

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## FUTURE SCOPE

Proposed system can be used to hide the text messages into audio signals. Proposed system can only hide the text data into an audio signal. As we know that a large data on various public resources is present in the form digital images that includes location maps, paintings, and architects. This type of data also require some secret way for transmission. In future a more robust system can be developed that can hide text messages as well as images into audio signals.

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