

Project Abstract

Steganography for Secure Data Communication

Introduction to Cryptography (CS-1229)

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1. Introduction

The need for secure and private data transmission has become more critical in today's era due to the rapid advancement of digital communications. With traditional cryptographic algorithms, they encrypt data to make it unreadable without proper decryption keys. To solve this problem, Steganography was introduced to for hiding the information within a non-suspicious cover medium, such as images, audio, video, or text, ensuring covert communication.

The project aims on image-based steganography, where secret information is hidden inside digital images without significantly altering their appearance. The main goal is to develop a robust, efficient, and secure method to hide sensitive data while maintaining the image's original quality and preventing unauthorized access of users.

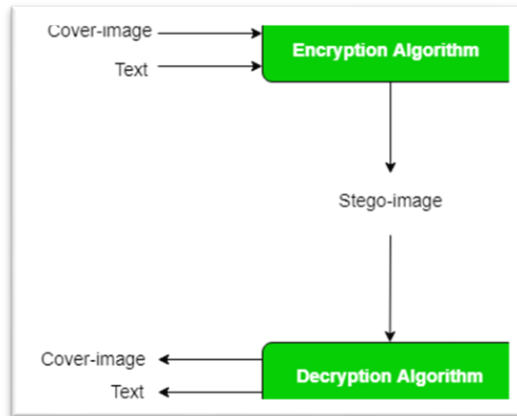


Fig: Showing the basic algorithm of Steganography

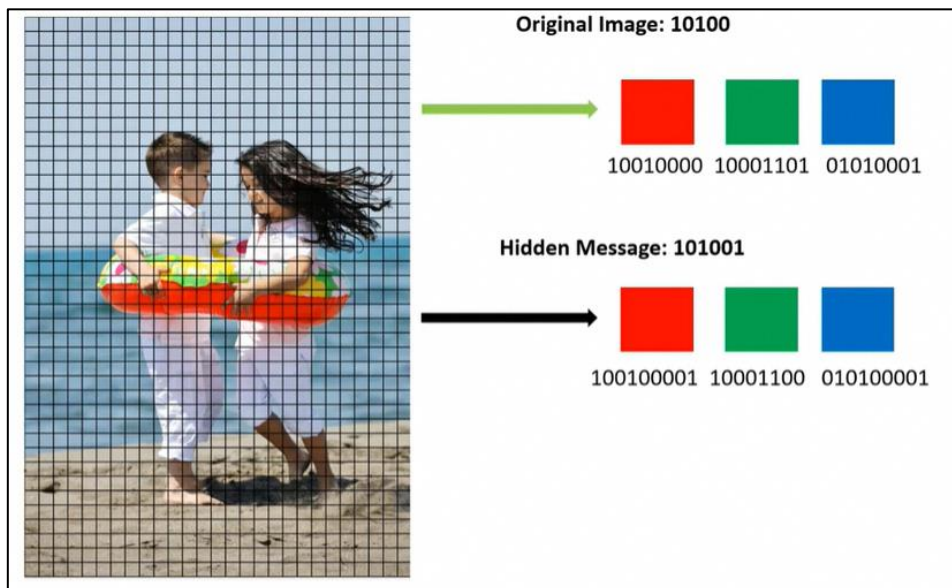


Fig: Showing the example of hiding text inImage

2. Problem Statement

Existing algorithms however provide secure communication but often raise suspicion. Therefore, there is need for a steganographic system that can **embed confidential information within digital media** while ensuring minimal changes in the quality of image. This project aims to develop a steganographic system which can hide data into image ensuring both secrecy and integrity of the hidden information.

3. Objectives

Following are the main objectives of the project:

1. For hiding the secret message, develop a steganography system.
2. To implement different techniques of steganography such as Least Significant Bit (LSB), Discrete Cosine Transform (DCT), and Discrete Wavelet Transform (DWT) to compare their effectiveness.
3. At last, to develop a user friendly UI which allows user to embed and extract secret messages securely.

4. Methodologies

The project follows a structured methodology that includes:

4.1 Selection of Cover Medium:

- a. Firstly, we need digital images of format JPEG, PNG.
- b. Also, the images should be so large enough to embed the secret message without significant distortion.

4.2 Data Hiding Techniques:

- a. **Least Significant Bit (LSB) Substitution:** It replaces some least significant bits of the host image with the secret data.
- b. **Discrete Cosine Transform (DCT) Steganography:** It hides data within an image by embedding information into the DCT coefficients of the image, leveraging the DCT's energy compaction properties, making it difficult to detect.
- c. **Discrete Wavelet Transform (DWT) Steganography:** It is a data-hiding technique where secret information is embedded within the wavelet coefficients of a cover image, making the message invisible to the naked eye.

4.3 Implementation:

- The project will be implemented using Python and libraries such as OpenCV, NumPy, and PIL for image processing.
- Graphical User Interface (GUI) or command-line interface will be designed for easy user interaction.

4.4 Security Enhancements:

- The message which will be hidden inside the image will be encrypted using cryptographic algorithms such as AES (Advanced Encryption Standard) to prevent unauthorized access.
- A password can be implemented which can be used to restrict access to the embedded data.

5. Applications:

- **Medical Data Security:** It can be used to ensure the privacy in medical images transmission.
- **Digital Watermarking:** This can be used to embeds a code to identify ownership or authenticity to protect copyright.
- **Secure Communication:** It is used to stop accessing the hidden sensitive data.

References

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