STEGANOGRAPHY TOOL FOR IMAGE/FILE HIDING

Abstract

This project presents a Python-based tool for hiding and extracting **text or files inside images** using the **Least Significant Bit (LSB)** technique. The application features a **Tkinter GUI** with drag-and-drop support, password protection, and compatibility with **PNG and BMP** formats. It demonstrates how steganography can be applied for **secure and invisible data storage**.

1. Introduction

Encryption protects content but often reveals that a secret exists. **Steganography**, however, conceals the very presence of hidden data. This project applies LSB steganography to embed text or files into digital images, ensuring changes are imperceptible to the human eye. The aim is to provide a secure yet user-friendly application.

2. Objectives

- Develop a GUI tool for hiding and extracting data.
- Support both **text and file embedding**.
- Enable **optional password protection**.
- Implement **drag-and-drop functionality**.
- Ensure lossless image formats are supported.

3. Tools & Technologies

- **Python 3**
- **Tkinter + TkinterDnD2** (GUI, drag & drop)
- **Pillow (PIL)** (image handling)
- **Hashlib + Base64** (encryption & encoding)

4. Methodology

Hiding Data

1. User selects image and message/file.
2. Data converted to binary.
3. Embedded into pixel LSBs.

4. Saved as PNG/BMP.

Extracting Data

1. Load stego-image.
2. Extract binary sequence.
3. Convert back to text/file.
4. Decrypt if password is set.

Password Protection

- SHA-256 generates a key from the password.
- XOR-based encryption protects hidden content.

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5. Results

- Successfully hides/extracts text and files.
- Password ensures secure recovery.
- GUI supports drag-and-drop and dark theme.
- Works best with PNG/BMP; JPEG not recommended.

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6. Conclusion

The tool demonstrates practical use of **steganography for secure communication**. It combines ease of use with security features, though limited by simple XOR encryption and format constraints.

Future Enhancements:

- Stronger encryption (AES).
- Support for audio/video steganography.
- Optimizations for larger files.

References

- Python Docs – https://docs.python.org
- Pillow – https://pillow.readthedocs.io
- TkinterDnD2 – https://github.com/pmgagne/tkinterdnd2