

Video Steganography for Secure Data Hiding

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Overview:

This project focuses on creating a simple and secure system that hides secret data inside a video in a way that is completely invisible to viewers. The hidden data can only be extracted by someone who knows the correct key. The system will embed and extract data using controlled randomness and basic encryption for enhanced security.

Problem Statement:

Image-based steganography has limited capacity and can be more easily detected. Videos, however, offer thousands of frames, providing more space and better concealment. To increase security, we will also avoid predictable embedding patterns by using key-based randomness.

Concept:

The user will provide:

1. A video
2. A text/file to hide
3. A secret key

Our system will use the provided key in two ways:

- First, generate a derived internal key from the user's key to encrypt the data.
- Second, use the original user key as a seed to randomly select which pixels in the video frames will be modified for hiding data.

This ensures the embedding pattern is unpredictable and only reversible with the same key.

How We Plan to Implement It:

1. **Input:** User uploads video, secret data, and a key.
2. **Data Preparation:**
 - Derive an internal encryption key from the user-provided key.
 - Encrypt the secret data using this derived key.
3. **Embedding:**
 - Read the video frame by frame.
 - Use the original user key as a seed to generate random pixel positions.
 - Modify the least significant bits of those pixels to embed the encrypted data.
4. **Extraction:**
 - Use the same user key to reproduce the same random pixel sequence.
 - Extract the encrypted bits and decrypt them using the derived key.
5. **Output:** A normal-looking video containing the hidden message, and a tool to retrieve it using the same key.

Scope:

- Hide and extract text or small files.
- Key-based random embedding for security.
- Basic encryption of the hidden data.
- Maintain video quality with minimal visible changes.
- Keep overall design simple and understandable.

Tools / Technologies:

- Python
- OpenCV

Expected Outcome:

A secure demonstrative system where a message can be embedded into a video using key-based randomness and encryption, and later recovered accurately using the same key. The final video will appear unchanged to the human eye while safely carrying hidden data.