

CAPSTONE PROJECT

Steganography using Python

Presented By: Rugved Bharat Gaikwad
Student Name : Rugved Bharat Gaikwad
College Name & Department : Ajeenkya DY Patil School
of Engineering, Computer Department

OUTLINE

- **Problem Statement**
- **Technology used**
- **Wow factor**
- **End users**
- **Result**
- **Conclusion**
- **Git-hub Link**
- **Future scope**

Problem Statement

Hiding confidential messages inside an image to ensure secure communication.

- In today's digital world, data security is a major concern.
- Traditional encryption methods can be detected and intercepted.
- Steganography provides an alternative by concealing messages inside digital media.
- This project embeds a secret message within an image without noticeable changes.
- This project focuses on hiding text messages inside an image file and retrieving them using a password-protected decryption process.

Technology used

Programming Language & Libraries :

- Python 3.11 – Main programming language
- OpenCV (cv2) – Image processing library
- NumPy – Data handling and pixel manipulation
- OS Module – File handling

File Formats Supported :

- .bmp, .jpg, .png for images
- .txt for message input (future enhancement)

Wow factors

Why is this project innovative?

- Undetectable to the human eye – The image looks the same!
- Password protection – Only authorized users can decrypt the message.
- Minimal file size increase – Efficient data embedding technique.
- Customizable for different image formats (JPG, BMP, PNG).
- Future integration with AI-based steganalysis to detect hidden messages.

End users

Who can use this technology?

- Cybersecurity experts – Secure transmission of sensitive data.
- Military & Government – Covert intelligence and secret communication.
- Journalists & Activists – Prevent censorship by hiding sensitive reports.
- Corporate Companies – Protect confidential business data.
- Developers & Researchers – Learn about steganography techniques.

Results

The screenshot displays the Visual Studio Code (VS Code) interface with a Python script named `Steno.py` open in the editor. The script is located in a project named `myStego-main`. The script's functionality is as follows:

- Imports `cv2`, `os`, and `numpy as np`.
- Attempts to load an image from `"mypic.bmp"` using `cv2.imread()`.
- If the image is not loaded, it prints an error message: `"Error: Image not loaded. Check the file path and format."` and exits.
- If the image is loaded successfully, it prints: `"Image loaded successfully!"`.
- Prompts the user to enter a secret message and a password.
- Creates two dictionaries, `d` and `c`, for encryption and decryption.
- Calculates the image dimensions (`height`, `width`, `z`) and initializes variables `n`, `m`, and `z` to 0.

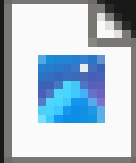
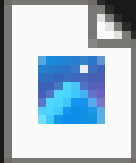

The terminal output shows the successful execution of the script:

```
PS C:\Users\RUGVED GAIKWAD\OneDrive\Desktop\myStego-main> & "C:/Users/RUGVED GAIKWAD/AppData/Local/Microsoft/WindowsApps/python3.11.exe" "c:/Users/RUGVED GAIKWAD/OneDrive/Desktop/myStego-main/Steno.py"
Image loaded successfully!
Enter secret message: rugved
Enter password: 1204
Enter passcode for decryption: 1204
Decrypted message: rugved
PS C:\Users\RUGVED GAIKWAD\OneDrive\Desktop\myStego-main>
```

On the right side of the VS Code window, a preview of the image `Encryptedmsg.jpg` is shown. The image displays a close-up of several faceted, reddish-pink gemstones.

Image loaded successfully!
Enter secret message: rugved
Enter password: 1204
Enter passcode for decryption: 1204
Decrypted message: rugved



 Encryptedmsg
 mypic
 Steno

Conclusion

Key Takeaways

- Steganography is a powerful method for covert communication.
- This project successfully embeds text inside images without altering their appearance.
- Password-protected decryption ensures only authorized access.
- Can be further enhanced with encryption techniques.
- Practical applications in cybersecurity, journalism, military, and more.

GitHub Link

Github Link : <https://github.com/Rugved1204>

Project Link : <https://github.com/Rugved1204/Image-Steganography.git>

Future scope(optional)

Possible Enhancements

- Support for larger text messages with better compression.
- Implement AES encryption for additional security.
- Develop a GUI-based tool for non-technical users.
- Extend the project to audio & video steganography.
- Advanced Encryption – Use AES-256 for enhanced security.
- Steganography in audio & video – Extend to hiding data in music & videos.

THANK YOU !