Algorithms in multimedia and machine learning in the Python environment

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ENIGMA

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HiT
מכון טכנולוגי חולון
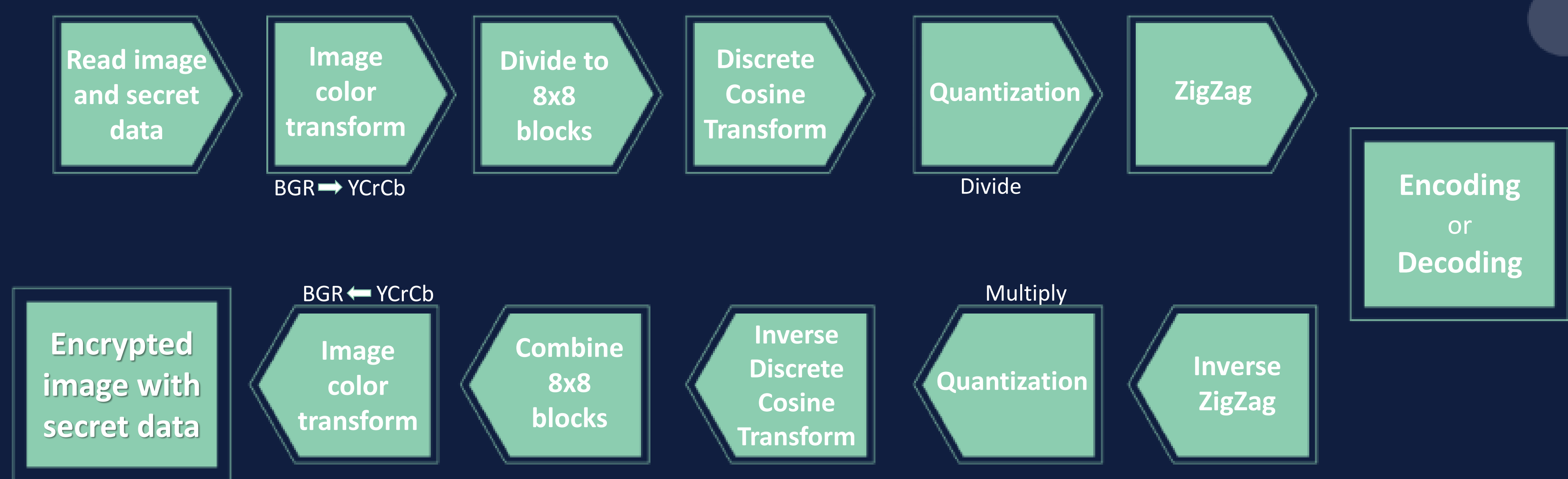Holon Institute of Technology

Intro:

Welcome to ENIGMA, a new creative way to send messages secretly, which raises no concern, by encryption of your data in an image that the human eye can't notice any difference.
This steganography method combines manipulation of jpeg compression algorithm for reducing file size and better encryption.
Steganography is the art and science of secret communication between two sides that attempt to hide the content of messages in an image.

Implementation:

The basic steganography proposed model is to iterate each pixel of an image and substitute the Least-significant bit (LSB) with the Most-significant bit (MSB) of the hidden data, in binary representation.
Our main idea of the project is to manipulate the Discrete Cosine Transform (DCT) portion of the JPEG process in order to embed secret data in the lossy compression procedure.

Read image and secret data → Image color transform (BGR ➡ YCrCb) → Divide to 8x8 blocks → Discrete Cosine Transform → Quantization (Divide) → ZigZag

Encoding or Decoding

Encrypted image with secret data ← Image color transform (BGR ⬅ YCrCb) ← Combine 8x8 blocks ← Inverse Discrete Cosine Transform ← Quantization (Multiply) ← Inverse ZigZag

Conclusions:

PNG Before Encryption

File Size 9.5 MB

Secret Message

"Cryptography is the study of secure communications techniques that allow only the sender and intended recipient of a message to view its contents"

JPEG with Secret After Encrypt

File Size 1.6 MB

As you can see, we took a PNG image, encrypted the secret message, and successfully returned a compressed JPEG image without any human-eye visible difference.

Discussions:

Our vision of further development for this project, is to take it to the next stage, and encrypt an image inside another, instead of text message like we did.
The only different step in the algorithm will be to format the hidden image pixels to binary, and encrypt them in the same DCT coefficients.