Image Steganography

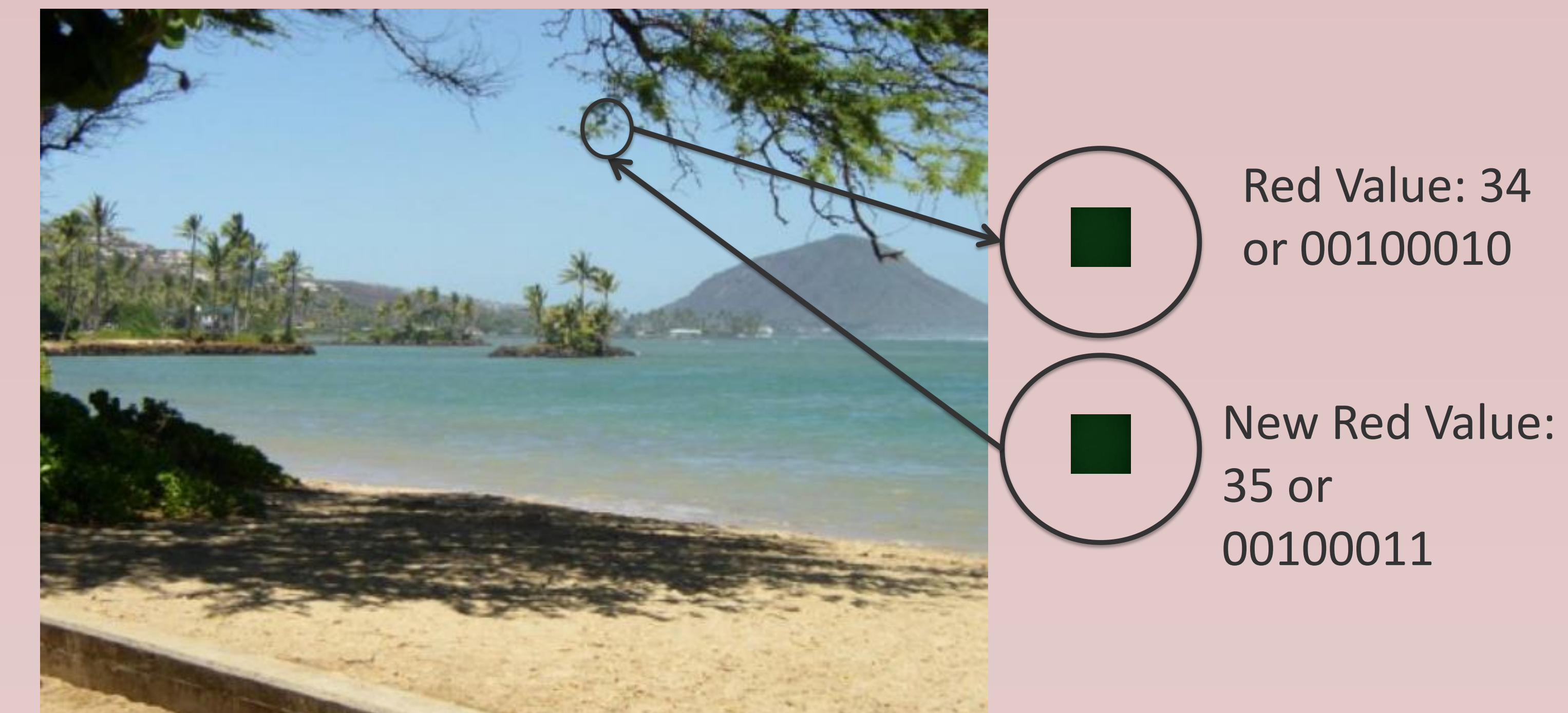Nick Dahl (nmdahl@crimson.ua.edu)   Advisor: Dr. Jeff Gray

Overview

Steganography is the science of hiding a message so that nobody, aside from the sender and recipient, is aware that the message is there. Digital steganography allows information to be hidden in digital files, most commonly image, audio, or text files. In image files specifically, the least significant bits of the color values for each pixel can be modified without being noticed by the human eye. The size of image files allows a large amount of information to be encoded in a single image.

Message contained: Hello. What is your name

Least Significant Bit Modification

- Change all pixel color values to even
- Obtain integer value of each character in a message
- Convert each integer to 8-bit binary string
- Use groups of 8 pixels to store characters
- 1's change color value to odd, 0's remain even

A ⇄ 65 ⇄ 01000001

Extracting Message From Encoded Image

- For each message, loop through pixels for 8 times the message length
- Create array of strings, each string 8 characters long
  - If pixel color value is odd, add character '1' to string
  - If pixel color value is even, add character '0' to string
- Convert each 8 character binary string to integer
- Convert each integer to a character and append to final message string

Encoded Message Size

Red Value: 34 or 00100010

New Red Value: 35 or 00100011

Future Applications

- Each character take 8 bits to store
- Example: Standard 640 x 480 JPEG Image
  - 640*480*3 colors = 921,600 bits available
  - 921,600 bits/8 bits per character = 115,200 characters able to be encoded
- Encoding information in sound files
  - Similar method, modify insignificant bits so human ear could not notice a difference
- Private communication over social media
  - Images could be posted with information only certain viewers could view
- Digital watermark
  - Authenticity of images could be verified by information encoded inside
- Including information about an image inside the image file itself
- Possibility to encode small images inside larger images