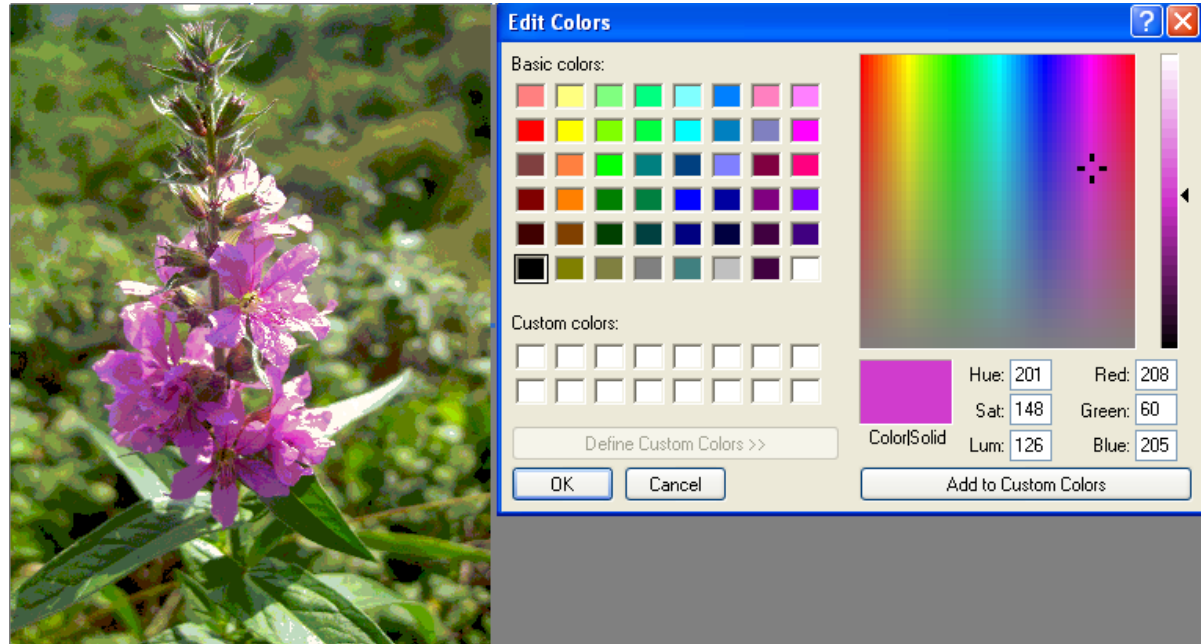


Lecture Outline



- Introducing Steganography
- Steganography Lab

Introduction

- Nothing new:
 - Romans and Greeks and Egyptians – wax tablets
 - War efforts – messages knit

- There are many ways in which messages can be hidden in digital media – some examples are:
 - in unused portion of file headers
 - within digital images
 - within art
 - in text files
 - within video/ audio files
 - pinpricks in maps

- “Carrier files” give no indication of what is hidden within

- Good and bad uses??

Example 1 – Null Cipher

- One common, almost obvious, form of steganography is called a null cipher.
 - the hidden message is formed by taking the first (or other fixed) letter of each word in the carrier/ cover message.
- Imagine the following during wartime – in a newspaper read by all
- PRESIDENT'S EMBARGO RULING SHOULD HAVE IMMEDIATE NOTICE. GRAVE SITUATION AFFECTING INTERNATIONAL LAW. STATEMENT FORESHADOWS RUIN OF MANY NEUTRALS. YELLOW JOURNALS UNIFYING NATIONAL EXCITEMENT IMMENSELY.
- The first letters of each word form the character string: PERSHING SAILS FROM NYJUNE I

Example 2 – the exposed message may not be encrypted

Memo to the Director

Subject: Letter of Recommendation

Jane S., a chief sub editor and editor, can always be found hard at work in her cubicle. Jane works independently, without wasting company time talking to colleagues. She never thinks twice about assisting fellow employees, and she always finishes given assignments on time. Often Jane takes extended measures to complete her work, sometimes skipping coffee breaks. She is a dedicated individual who has absolutely no vanity in spite of her high accomplishments and profound knowledge in her field. I firmly believe that Jane can be classed as a high-caliber employee, the type which cannot be dispensed with. Consequently, I duly recommend that Jane be promoted to executive management, and a proposal will be sent away as soon as possible.

Project Leader

Example 2 – the exposed message may not be encrypted

Later another memo was sent...)

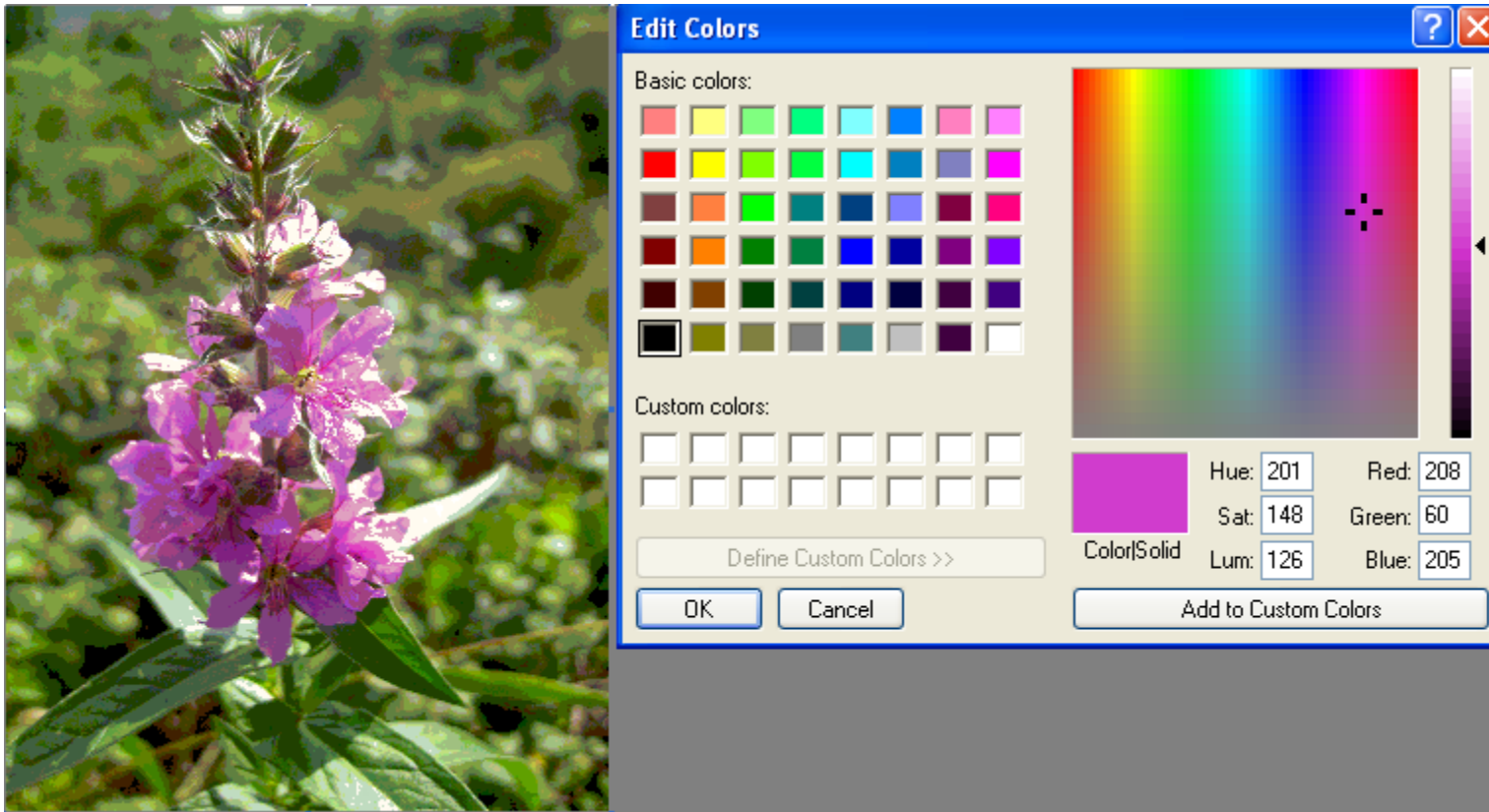
Memo to the Director:

Sorry about the earlier memo. Jane was looking over my shoulder as I wrote it. Kindly read every other line (i.e. 1, 3, 5, 7...) for my true assessment of her.

Regards,
Project Leader

1. Jane S., a chief sub editor and editor, can always be found
2. hard at work in her cubicle. Jane works independently, without
3. wasting company time talking to colleagues. She never
4. thinks twice about assisting fellow employees, and she always
5. finishes given assignments on time. Often Jane takes extended
6. measures to complete her work, sometimes skipping
7. coffee breaks. She is a dedicated individual who has absolutely no
8. vanity in spite of her high accomplishments and profound
9. knowledge in her field. I firmly believe that Jane can be
10. classed as a high-caliber employee, the type which cannot be
11. dispensed with. Consequently, I duly recommend that Jane be
12. promoted to executive management, and a proposal will be
13. sent away as soon as possible.

Example 3 – using images



Least Significant Bit Insertion

- One approach to hiding data within an image file is called *least significant bit (LSB) insertion*.
 - take the binary representation of the hidden data and overwrite the LSB of each byte within the carrier image
 - Using 24-bit color, the amount of change will be minimal and indiscernible to the human eye. As an example, suppose that we have three adjacent pixels (nine bytes) with the following RGB encoding:

```
10010101 00001101 11001001
10010110 00001111 11001010
10011111 00010000 11001011
```

```
10010101 00001100 11001001
10010111 00001110 11001011
10011111 00010000 11001011
```

Carrier and Hidden Images



carrier image

“hidden” image



Carrier and Hidden Images



palette before hidden image



palette after hidden image

