Huffman

Your LAST Assignment

Announcements

- APT Set 6 – Due November 22
- Huffman – Due November 26
  - Burrows Wheeler Extra Credit – Due December 2
- Exams
  - Grading this weekend

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Today

- Bitwise representations
- File compression
- Huffman coding

  - Things you should know for the Huffman assignment

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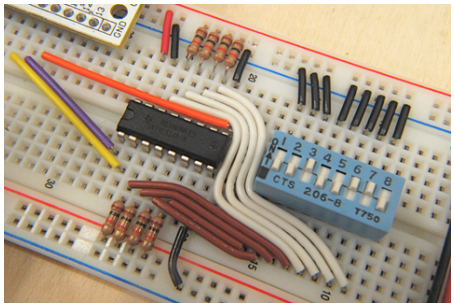
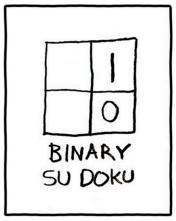
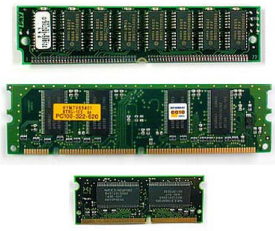
Primitives

- How are characters stored in memory?

  - 011101000110001101110000







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ASCII

- American Standard Code for Information Interchange
  - Character encoding scheme
  - Characters mapped to numbers
    - A – 65
    - a – 97
    - ‘ ‘ (space) – 32

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ASCII

t	c	p
116	99	112
01110100	01100011	01110000

http://en.wikipedia.org/wiki/ASCII

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Primitives

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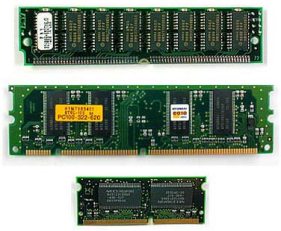

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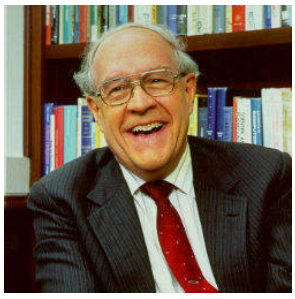
ASCII

- 011101000110001101110000

Each 0 or 1 is a 'bit'

Each character is made of 8 bits

8 bits = 1 byte



Frederick P. Brooks Jr.

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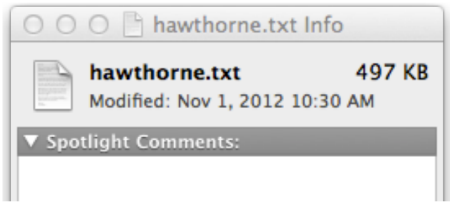
Memory

- 8 bits = 1 byte
- 1024 bytes = 1 kb
- 1 character saved in 1 byte

497 kB (kiloBytes)*

508,928 Bytes

508,928 characters



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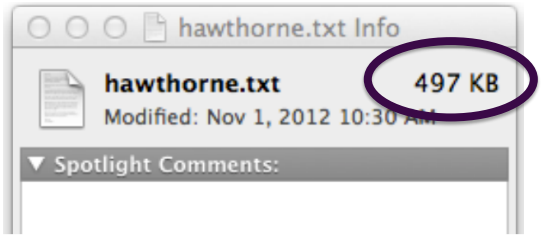
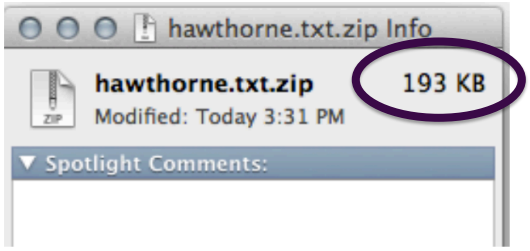
Compression



How do they do that????



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Compression

- ASCII – map each character to number represented as 8-bits
- Have to find a new mapping that uses fewer bits
  - 8 bits represent 256 characters
  - How do we represent 256 characters in fewer than 8 bits per character?

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Game time

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Compression

- What have we learned from Wheel of Fortune?

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Huffman

- Variable length encoding
  - From our file
    - some characters are more common than others
    - encode
      - common characters < bits
      - uncommon characters > bits

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Huffman

- Build a MAP
- AACCCAABDE
  - A : 4
  - C : 3
  - B : 1
  - D : 1
  - E : 1

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Huffman

- Huffman coding

AACCCAABDE

  - generate frequencies
  - make tree for each character
  - add trees to PRIORITY QUEUE
  - while (more than one tree)
    - remove two smallest trees (from PRIORITY QUEUE)
    - merge trees
    - add new tree to PRIORITY QUEUE

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Your turn

- Huffman coding

I've made a huge mistake

  - generate frequencies
  - make tree for each character
  - add trees to PRIORITY QUEUE
  - while (more than one tree)
    - remove two smallest trees (from PRIORITY QUEUE)
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http://goo.gl/hcbmsN

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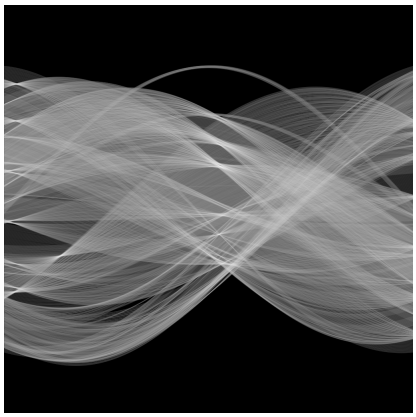
Huffman

- Huffman (Huff) != Hough
- Hough transforms – Shape detection in images



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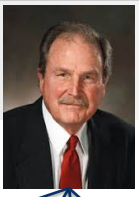
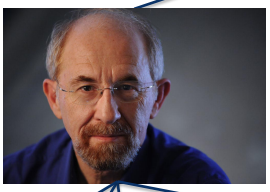
Family Tree





BSP Trees
Pixel Planes
Tele-immersion

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Today

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- Huffman coding

  - Things you should know for the Huffman assignment

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