

CSE 113 A

August 31 – September 4, 2009

Announcements

- ⚙ If you have not picked up a syllabus, please do so
- ⚙ Assignment #1 – sign and return form on last page of syllabus – must be turned in by end of class Monday, September 14th to receive full credit.
- ⚙ Note course website on syllabus – UBlearns will only be used for posting grades (until October 9th), so please make sure to check the website for course schedule and other information (including these slides which will be linked from the course schedule page at the end of each week).



What does a computer understand?

⚙ 0's and 1's (zeros and ones)



Bits and Bit Strings

- ✧ The 0 or 1 is called a binary digit (bit).
- ✧ A sequence of bits is called a bit string.
- ✧ 0100101 is a bit string
 - ✧ What does it mean/represent?

- 37
- 91
- 70



Interpreting Bit Patterns

- ⊛ Binary (non-negative number)
- ⊛ Two's complement (positive & negative integers)
- ⊛ IEEE 754 (approximate floating point values)
- ⊛ ASCII/EBCDIC/Unicode
(text: characters)



Conversion from decimal to binary

37

$$30 + 7$$

$$3 \times 10 + 7 \times 1$$

$$3 \times \underline{10^1} + 7 \times \underline{10^0}$$

111

$$1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$$

$$1 \times 4 + 1 \times 2 + 1 \times 1$$

$$4 + 2 + 1$$

"seven"



$$\begin{array}{r} 66 \\ + 49 \\ \hline \end{array}$$

5 "and carry 1"

1 "and carry 1"

$$1 + 1 = 10$$

$$1 + 0 = 1$$

$$0 + 1 = 1$$

$$1 + 1 + 1 = 11$$

$$\begin{array}{r} 111 \\ 101 \\ 111 \\ \hline 1100 \end{array}$$



Fixed amount of bits creates problems

⚙ Let's go to the spreadsheet



How do we decode this?

☼ 001010101010101010000001011111101010101010
001101001001001001001000111111001011101001
100111010001010010011100110010101111101000
101001010101010101110011100011100100111100
000111110101010111101001010010100100100111
010010010010100101001100010110010001111010
0101110101001010010100101010101111001010100
101010101111010011010010011110100100100100
100100010101101010101010110101101010101010
101010101010101111100001101011101001010010
010100101001011100111001010101010111010110
010101



Question

- ⊛ How many distinct 8-bit wide bit strings are there?

256 distinct bit patterns



Encoding machine instructions

- ⊗ Use bits to encode those as well
- ⊗ When we want the machine to follow those instructions:
 - ⊗ Fetch
 - ⊗ Decode
 - ⊗ Execute



Assembly language

- ⊗ ADD r1 r2
- ⊗ STOR r2 r1
- ⊗ SUB r3 r1



High-level languages

- ⊛ Step closer to natural language from machine language.



Tools

- ⊛ Editor - place to type the program's text
- ⊛ Compiler - translates what's in the editor to a form the computer understands
- ⊛ Execution Environment
 - to run our program



Our Language: Java

- ⊗ High level programming language
- ⊗ Object-oriented

