CS101 Lecture 01:
Computer Science
and Computers

Aaron Stevens
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What You’ll Learn Today

– What is computer science?
– What are data and information?
– What is a computer?
– What are hardware and software?
What is Computer Science?

**computer science**, n.  the science that deals with the theory and methods of processing information in digital computers, the design of computer hardware and software, and the applications of computers.

CS is NOT Science!

The fundamental ideas of CS are:
- Encoding Information
- Algorithms
- Protocols
- Abstraction
Flashlight Messaging

Imagine you are 10 years old, in 1980...
Your best friend lives next door.

Easy as ABC, 123

13 5 5 20
13 5
1 20
19 20 1 18 2 21 3 11 19
Numbered Code

Replace each character with a number…

| A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10| 11| 12| 13| 14| 15| 16| 17| 18| 19| 20| 21| 22| 23| 24| 25| 26 |

Coded Message Example:
13 5 5 20 13 5 1 20 19 20 1 18 2 21 3 11 19

Encoding is about converting data into a coded form. Decoding is about converting from coded to normal form.

Algorithm

An algorithm is a sequence of clear and precise step-by-step instructions for solving a problem in a finite amount of time.
Encoding Algorithm

while more characters in message:
  \( c = \) next character in message
  \( n = \) number corresponding to that letter
  send \( n \) flashes
  pause
done: no more flashes

Decoding Algorithm

while observing more flashes:
  \( n = \) count number of flashes until pause
  \( c = \) character corresponding to \( n \) flashes
  write down character \( c \)
done
Numbered Code: Good Enough?

What’s good about the numbered code?

What’s not so good about it?

Protocols

A protocol is a set of rules governing the exchange or transmission of data between devices.
Example Protocol: Morse Code

Invented by Samuel Morse for the telegraph in 1840s:

1. A dash is equal to three dots
2. The space between parts of the same letter is equal to one dot
3. The space between two letters is equal to three dots
4. The space between words is equal to seven dots

Example of telegraph key/sounder and Morse code: http://www.youtube.com/watch?v=Lki3jxNLVCI

Encoding Example: Braille

Each character is up to 6 dots.
Each dot is either on or off.

Invented by Louis Braille (1809-1852).
What are we looking at?

No, *this* is the matrix!
Your web browser interprets the coded data (1s and 0s) and renders the Facebook webpage.
Abstraction

Abstraction is about hiding unnecessary details and retaining only the relevant information.

Data and Information

Data is a fact pattern:

Information is how we interpret that pattern: Facebook helps you connect and share with the people in your life.
What is a Computer?

What is a computer, anyway?

A computer takes an input, applies a process, and produces an output.

Give some examples:
Hardware

Software
What You Learned Today

- Computer Science is NOT a Science
- Algorithms, Encoding Information, Protocols, and Abstraction.
- Data vs. Information
- Computers
- Hardware/Software

Setting up a CS account
Announcements & To Do List

– Lab 0: Sign up for lab account
  • Go during your scheduled lab meeting time on Thursday.
  • Meet your TF at the undergraduate lab and sign in.
– Readings:
  • Reed chapter 1 (today)
  • Reed ch 4, pp 64-79 (for Friday)
  • Reed ch 2, pp 19-26 (next Monday)

Analog or Digital

**Analog Computers**
Information is processed directly in its indigenous form.

**Digital Computers**
Information processing and storage occurs using a symbolic representation of the data.
Example: Analog Computer

The slide rule is a mechanical calculator. It works by aligning two logarithmic scales. Align the inputs, and read off the output.

Digital Computers

Symbolic Representation
Using a limited set of symbols to represent any original text/information.

Digital computers process and store information as a discrete pattern of electrical charges.