

Introduction to Digital Media

DMS 102: Programming Digital Media

Lecture 7

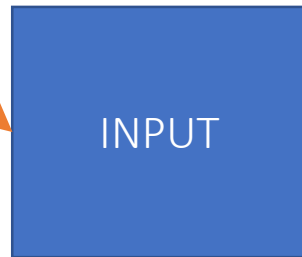
There are ONLY six things computers can do

- Store data
- Store and follow instructions
- Take data apart
- Transform data
- Follow a set of instructions repeatedly
- Test data (true or not)

Basic Computer Model for Digital Media

MEDIA IRL

text
pictures
sound
video
...more



Keyboard
Touch Screen
Mouse
Camera
...more



1. Store data
2. Store/run instructions
3. Separate data
4. Transform data
5. Repeat instructions
6. Test data



Display
Speakers
Printer
...more



MEDIA IRL

text
pictures
sound
video
...more

What computers understand

- Computers are exceedingly stupid
 - The only data they understand is 0's and 1's
 - They can only do the most simple things with those 0's and 1's
 - Move this value here
 - Add, multiply, subtract, divide these values
 - Compare these values, and if one is less than the other, go follow this step rather than that one.
 - Done fast enough, those simple things can be amazing.

Why digitize media?

- Digitizing media is encoding media into numbers
 - Real media is analogue (continuous).
 - To digitize it, we break it into parts where we can't perceive the parts.
- By converting them, we can more easily manipulate them, store them, transmit them without error, etc.

How can it work to digitize media?

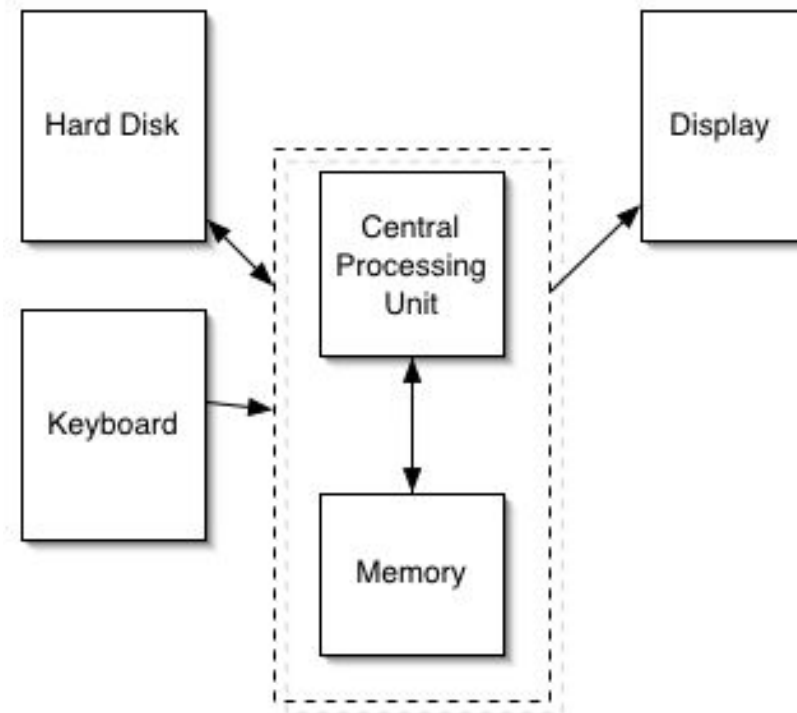
- Why does it work that we can break media into pieces and we don't perceive the breaks?
- We can only do it because human perception is limited.
 - We don't see the dots in the pictures, or the gaps in the sounds.
- We can make this happen because we know about physics (science of the physical world) and **psychophysics** (psychology of how we perceive the physical world)

How Computers Work

Hardware and Software

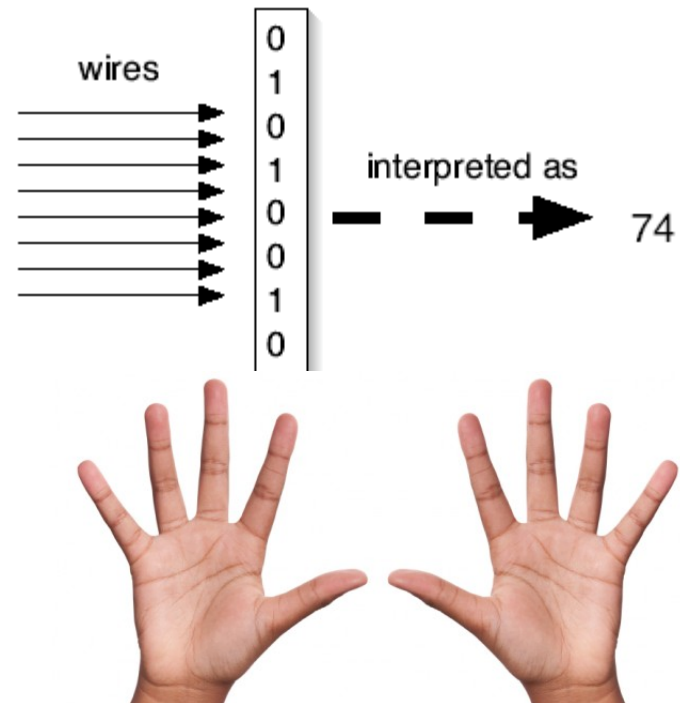
How a computer works

- The part that does the adding and comparing is the *Central Processing Unit (CPU)*.
- The CPU talks to the *memory*
 - Think of it as a sequence millions of mailboxes, each one byte in size, each of which has a numeric *address*
- The *hard disk* provides 10 times or more storage than in memory (20 billion bytes versus 128 million bytes), but is millions of times slower
- The display is the monitor or LCD (or whatever)



Key Concept: Encodings

- We can interpret the 0's and 1's in computer memory any way we want.
 - We can treat them as numbers.
 - We can encode information in those numbers
- Computers are really, really stupid
 - 0s and 1s: voltages on wires
 - The most basic unit of information
- Computers: Base 2 e.g. 01001010 (binary)
- Humans: Base 10 e.g. 74 (decimal)



Computery numbers

- “Encode” – representation of media using a computer
- Media:
 - Text
 - Pictures
 - Sound
 - Video
- 11111111 (255) is 8 bits (a.k.a 1 byte)
 - Commonly used to encode text
- 11111111 11111111 (65,535) is 16 bits
 - Commonly used to encode sound
- 11111111 11111111 11111111 (~16.7 milion) is 24 bits
 - Commonly used to encode images (color)

For next time...

More focus on Python...

- Chapter 3 - p57-67, and review the summaries, p68

Try: all the programs

Learn:

- using indices
- len() and range()
- ASCII and Unicode concepts

NOTE: next class (Tuesday)

- In-class lab assignment assumes you've fully read Chapter 3 and you're familiar with all the sample programs
- Pay special attention to the various ways you can use len() and range() to go through strings, especially the range() techniques to count forward, backward, and skip