Understanding Computer Hardware

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CS101: Wk3 – Lec 1

Reading Assignment: Ch 3 of Text

Figure Acknowledgements: “How Computers Work” 6th Ed by Ron White
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Personal Computer Systems: An Overview

- Laptops, desktops, tower computers
- IBM PC Clones (Wintel machines),
- Macs
The Motherboard

- **PCB** (Printed Circuit Board) made of Fiberglass sheet with electrical pathways, called *traces*, etched into it
  - Buses
  - System Clock
  - Microprocessor
  - Read-Only Memory (ROM)
  - Random Access Memory (RAM)
  - Battery
  - Power Supply
  - Ports
  - Expansion Slots

Microprocessor

- Sometimes also called CPU
- Control Unit
- Arithmetic-Logic Unit
- CISC vs. RISC Processors
Memory

- Read-Only Memory
- Random Access Memory
- Cache Memory
- Virtual Memory

Harddisk
How a Fixed Disk Drive Works

1. A hard drive consists of an enclosure containing one or more magnetic platters that spin on ball bearings. The platters are coated with a magnetic material, and the head assembly, which is typically located at the bottom of the enclosure, reads and writes data on the platters.

2. The platters, which are thin discs of aluminum, spin at high speeds, typically ranging from 5,400 to 7,200 revolutions per minute. The platters are kept in place by a central hub and a outer ring, and they are supported by air bearings to reduce friction and wear.

3. The head assembly contains read/write heads that are precisely positioned above the surface of the platters. The heads are capable of accessing data on any of the platters, and they are moved by an actuator arm that can position the heads to any location on the platters.

4. The read/write heads read the magnetic data on the platters and convert it into an electrical signal that is sent to the computer. The heads can also write data to the platters by depositing magnetic patterns on the surface.

5. The platters are divided into sectors, which are further divided into cylinders. Each cylinder contains a group of sectors that are located at the same radius from the center of the platter. The heads can move between cylinders to access different sectors.

How a CD-ROM Drive Works

1. A CD-ROM drive is a device that reads data from a compact disc (CD). The CD is a disc with a layer of silver and a layer of reflective dye that contains the data to be read.

2. The drive contains a laser that reads the data from the CD. The laser emits light that is directed onto the reflective layer of the CD. The light is reflected back to the laser, and the intensity of the reflected light is used to determine the data stored on the CD.

3. The laser is focused by a lens, and the reflected light is detected by a photodetector.

4. Each point on the CD is represented by a series of pits and lands. The laser reads the data by detecting the changes in the reflective properties of the CD.

5. The CD is divided into sectors, which are further divided into tracks. Each track contains a group of sectors that are located at the same radius from the center of the CD. The laser can read data from any track by moving it to the appropriate location on the CD.

6. The CD-ROM drive uses a servo system to position the laser and the read/write heads accurately. The servo system uses feedback from sensors to adjust the position of the heads and maintain precise control over the reading and writing process.

7. The data read from the CD is converted from an analog signal to a digital signal by the drive. The digital signal is then sent to the computer, where it is used to access and manipulate the data stored on the CD.

A Different Laser

CD-ROM drives can use different lasers depending on the type of CD they are designed to read. For example, some drives use blue lasers to read DVDs, which provide higher resolution and faster data transfer speeds.
How fast is your computer?

- Depends on a lot of factors
  - Processor design
  - Clock Speed
  - Size of Cache memory
  - Bus Width
  - Math-Coprocessor
  - Graphics processor, Video Processor, Audio Processor
  - RAM Size