

18 I/O and Peripherals

Part 2: Peripherals

CSC 230

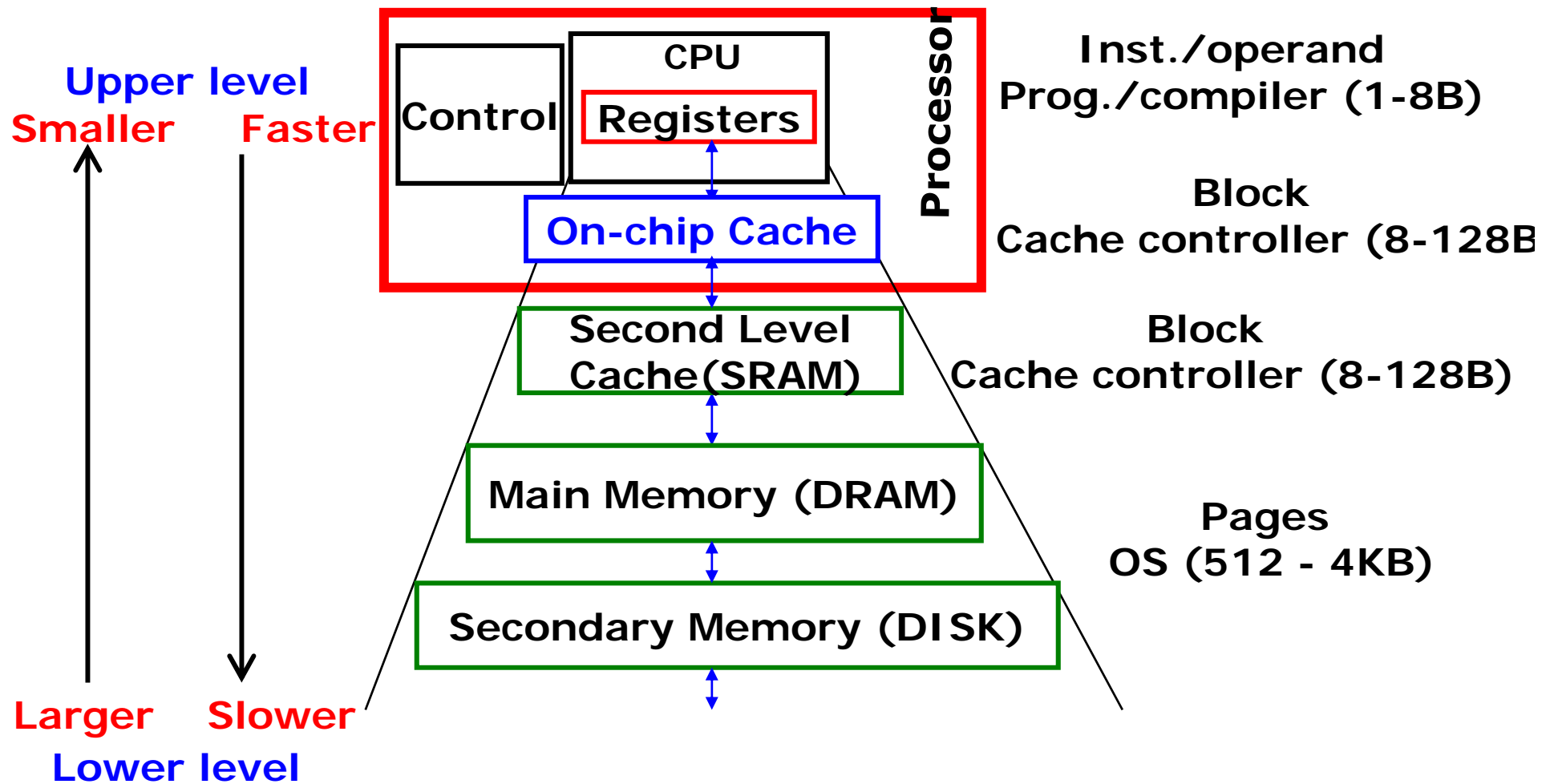
Stallings 5.1, chapter 6

M&H 7.3.4, 7.1-7.2, 8.6-8.11

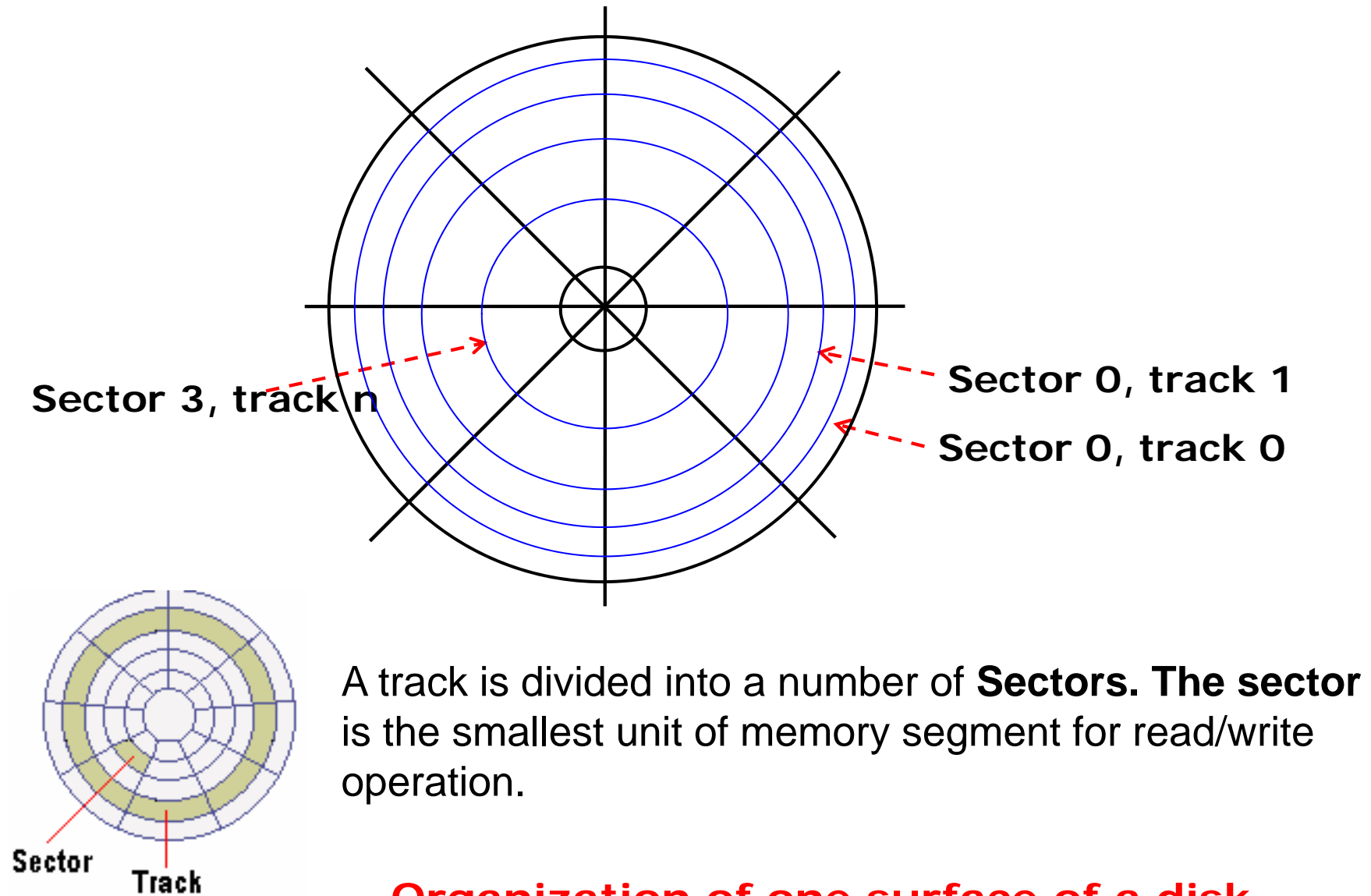
Other storage

- ❑ **ROM** Read Only Memory
 - ➔ keeps information without power on
 - ➔ write only once, read only
- ❑ **EPROM – EEPROM** reprogrammable ROM (only a few times)
- ❑ **FLASH memory**
 - keeps information when power is off
 - low power consumption
 - great density
 - low cost
 - not very fast
 - read single cell, write entire block
- ❑ **FLASH cards**
- ❑ **FLASH drives**

Speed, Size, Cost



Secondary Storage: Hard Disks



Organization of one surface of a disk.

Secondary Storage: Hard Disks

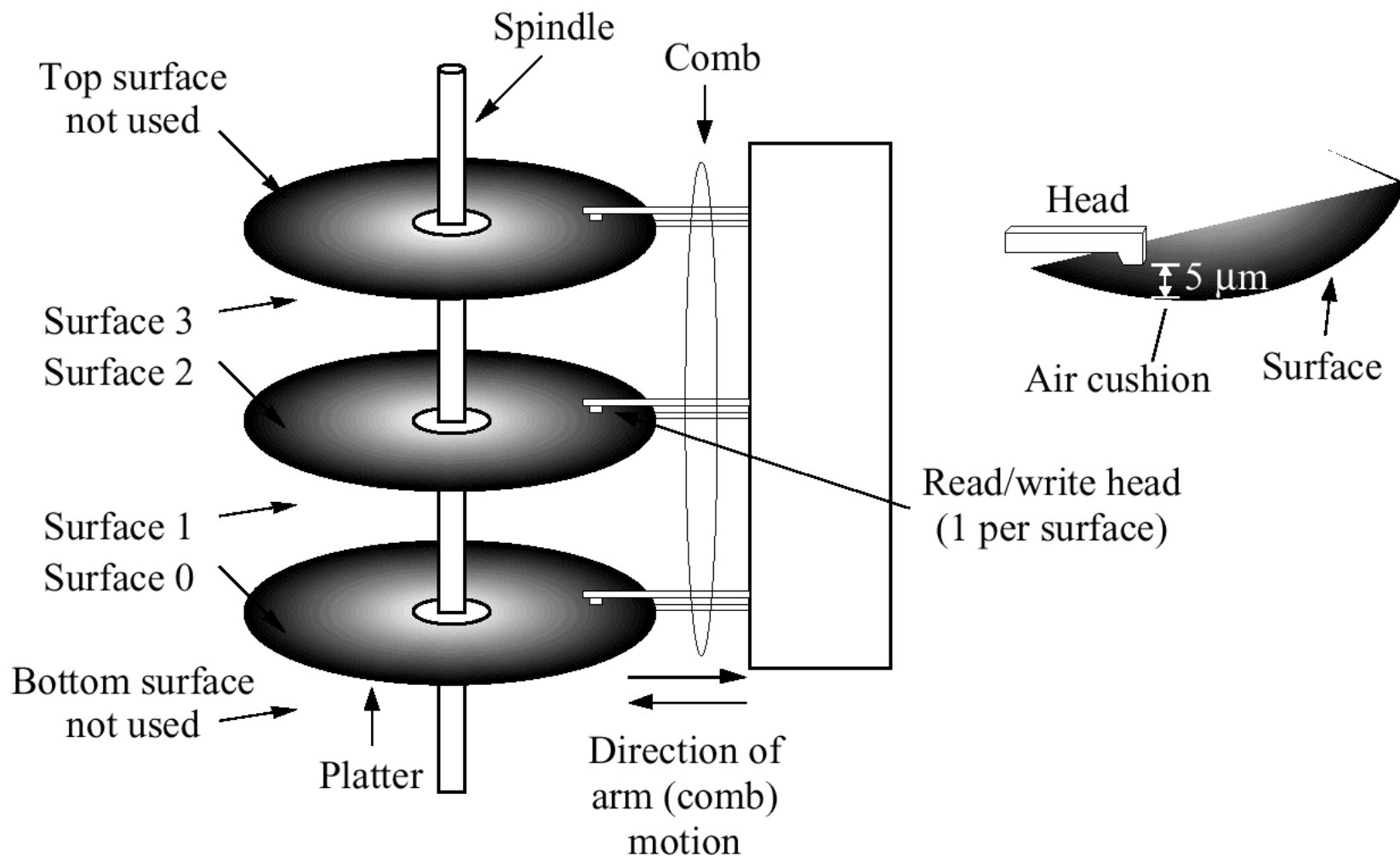
- ❑ thin magnetic film in a layer on each side
- ❑ apply current pulses to magnetizing coil
 - ➔ area underneath is magnetized positive or negative

The inside of a hard disk displaying the read/write head traveling over the top platter.

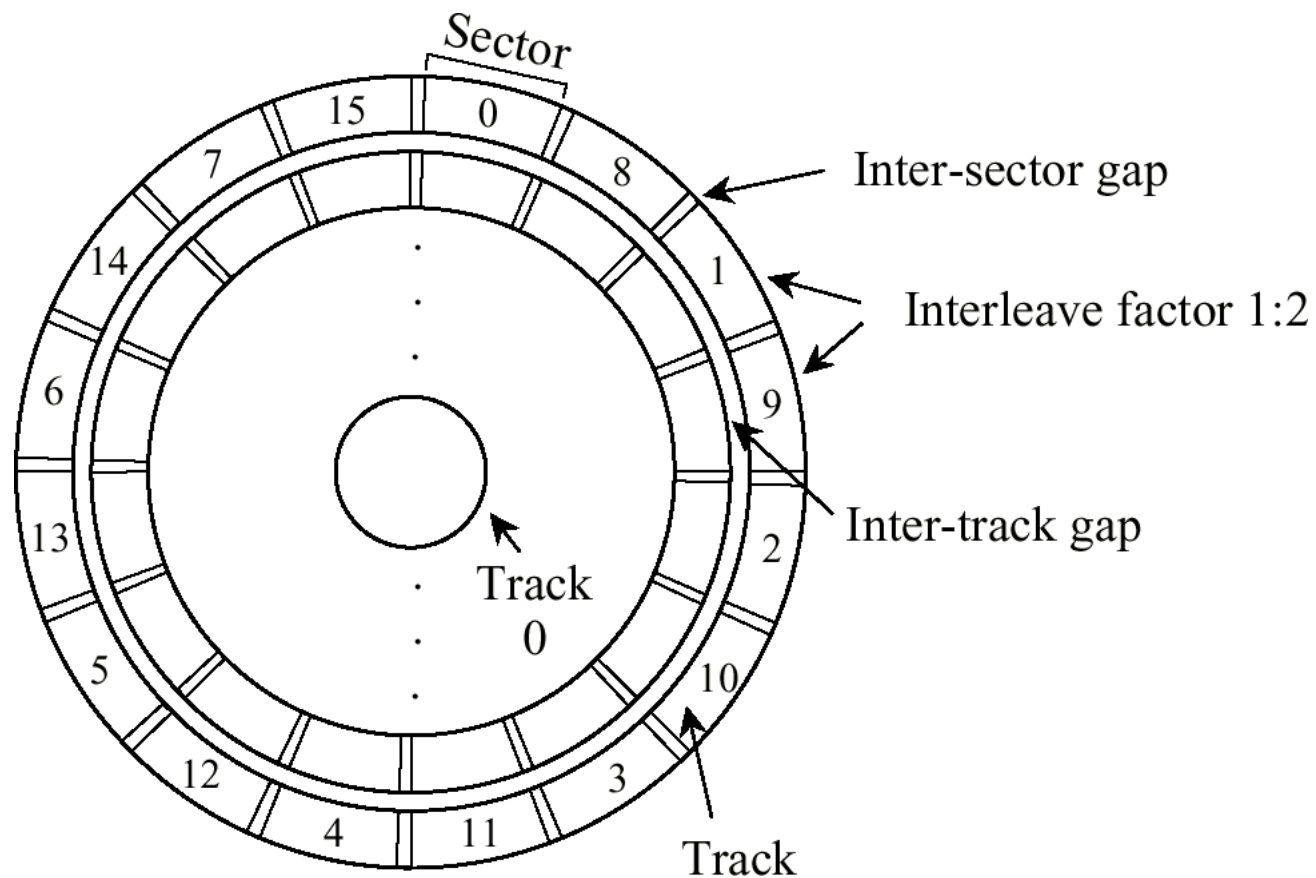
Source: Wikipedia



A Magnetic Disk with Three Platters



Organization of a Disk Platter with a 1:2 Interleave Factor



Hard Disks Timing

SEEK TIME



**time to move
R/W head to
correct track**

+ ROTATIONAL DELAY



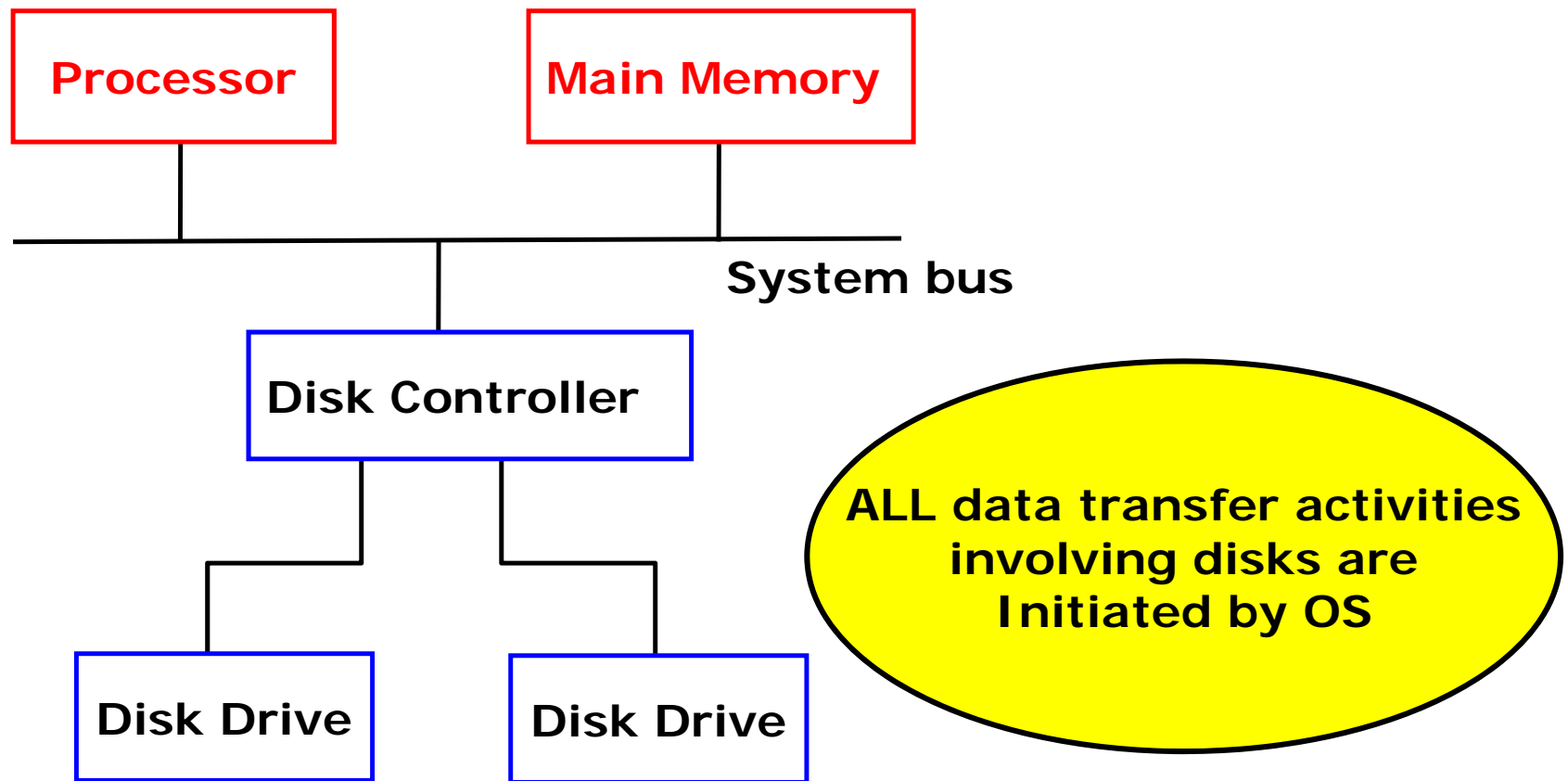
**time until correct
sector in track
arrives at R/W head**

= ACCESS TIME

Plus add the transfer medium:

SCSI bus, PCI bus, USB port

➔ need disk controller

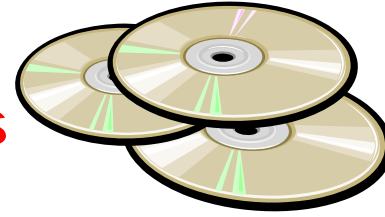


Disks connected to the system bus.

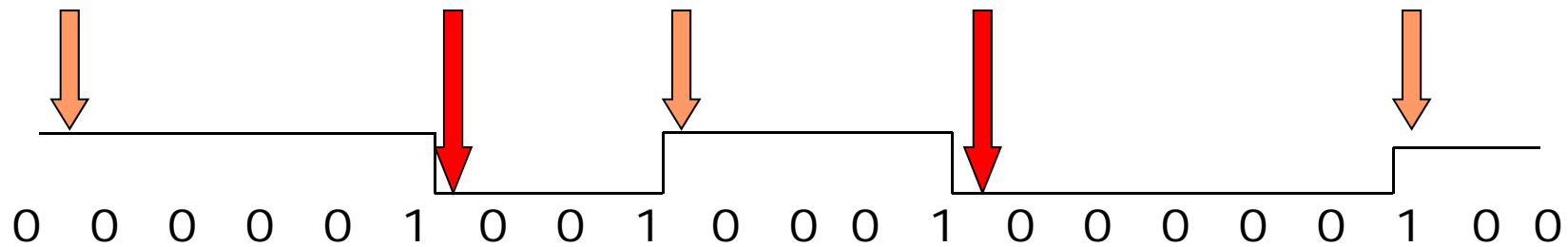
Other Storage, etc.

- ☐ Floppy disks
- ☐ Tapes
- ☐ RAID Disk Arrays (Redundant Arrays of Inexpensive Disks)
- ☐ Optical Disks
 - CD, CD-ROM, CD-RW
 - DVD, Blu-ray Disk, HDTV DVD

Compact Disks

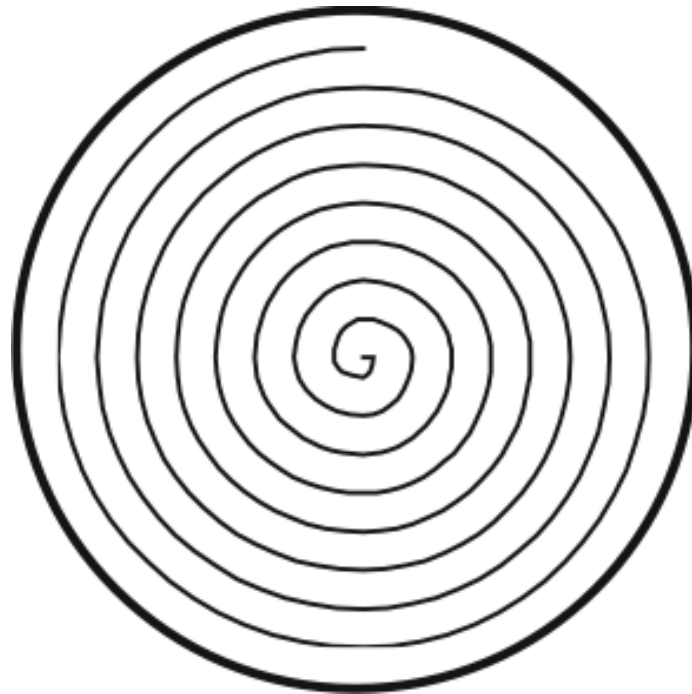


- ❑ Spiral track with pits
- ❑ A laser beam following the track detects changes in height from changes in reflected light intensity
- ❑ A change in height = a 1 bit, no change = a 0 bit



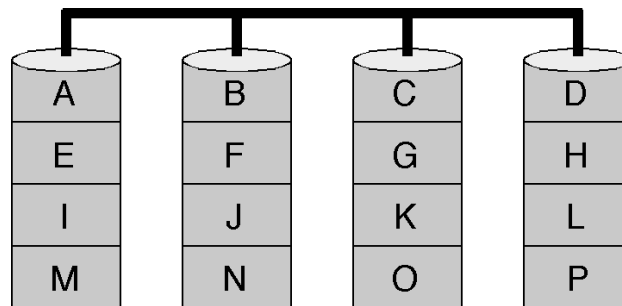
Spiral Format for Compact Disk

- Unlike a magnetic disk in which all of the sectors on concentric tracks are lined up like a sliced pie (where the disk rotation uses constant angular velocity), a CD is arranged in a spiral format (using constant linear velocity). The speed of rotation is adjusted so that the disk moves more slowly when the head is at the edge than when it is at the center.

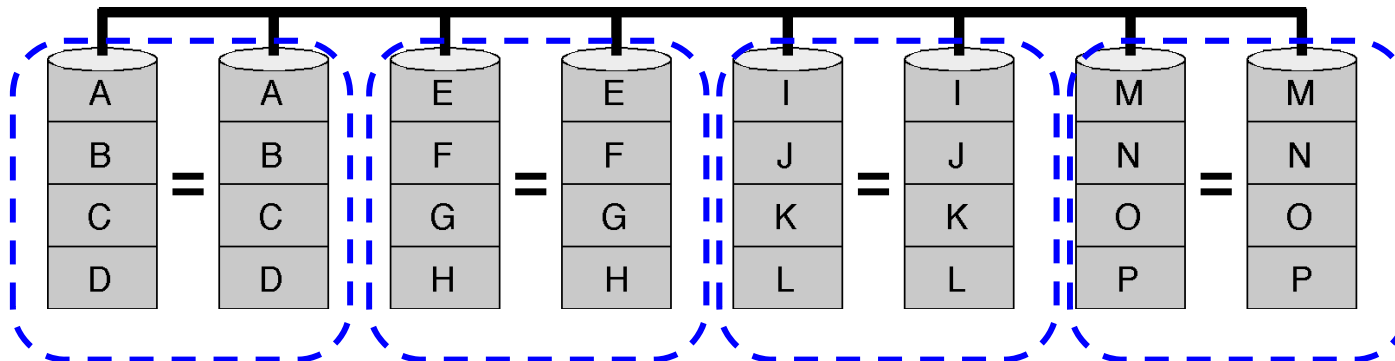


Redundant Arrays of Inexpensive Disks (RAID)

RAID level 0 – striped disk array without fault tolerance.

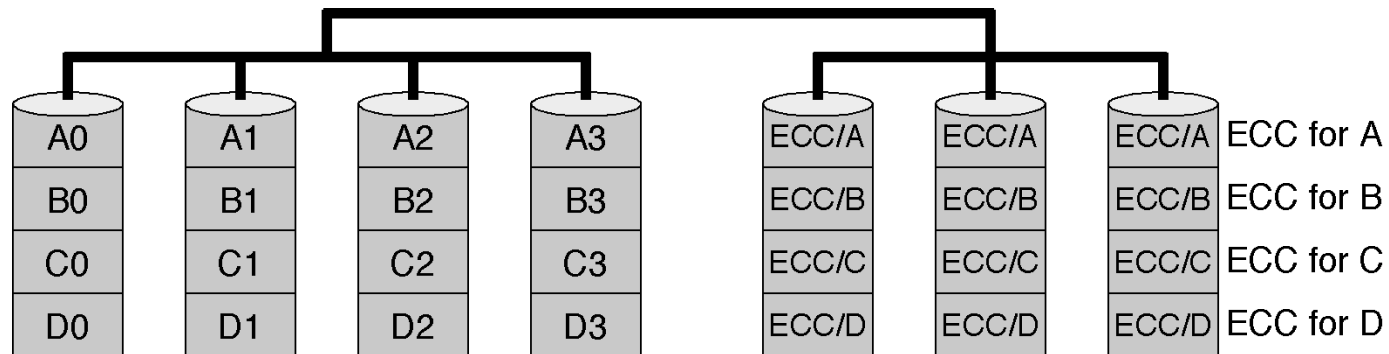


RAID level 1 – mirroring and duplexing.

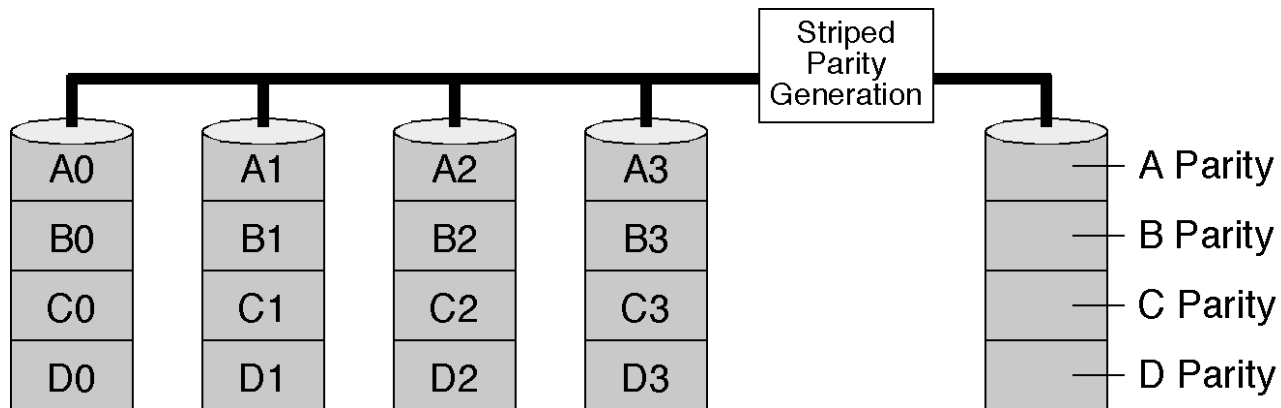


RAID (Continued)

RAID level 2 – bit-level striping with Hamming Code ECC.



RAID level 3 – parallel transfer with parity.



Touch Sensitive Pen-based Display

- Pen-based personal digital assistants (PDAs) use a passive matrix in which the pen can be anything that induces pressure on the screen.
- Two transparent conducting layers are placed on the screen, separated by spacer dots. When the user applies pressure to the top layer, as with a stylus or simply a finger, the top and bottom layers make contact. The induced voltage at the edges varies according to the position of the stylus.



Display Controller

- Display controller for a 1024*768 color monitor (adapted from [Hamacher et al., 1990]).

