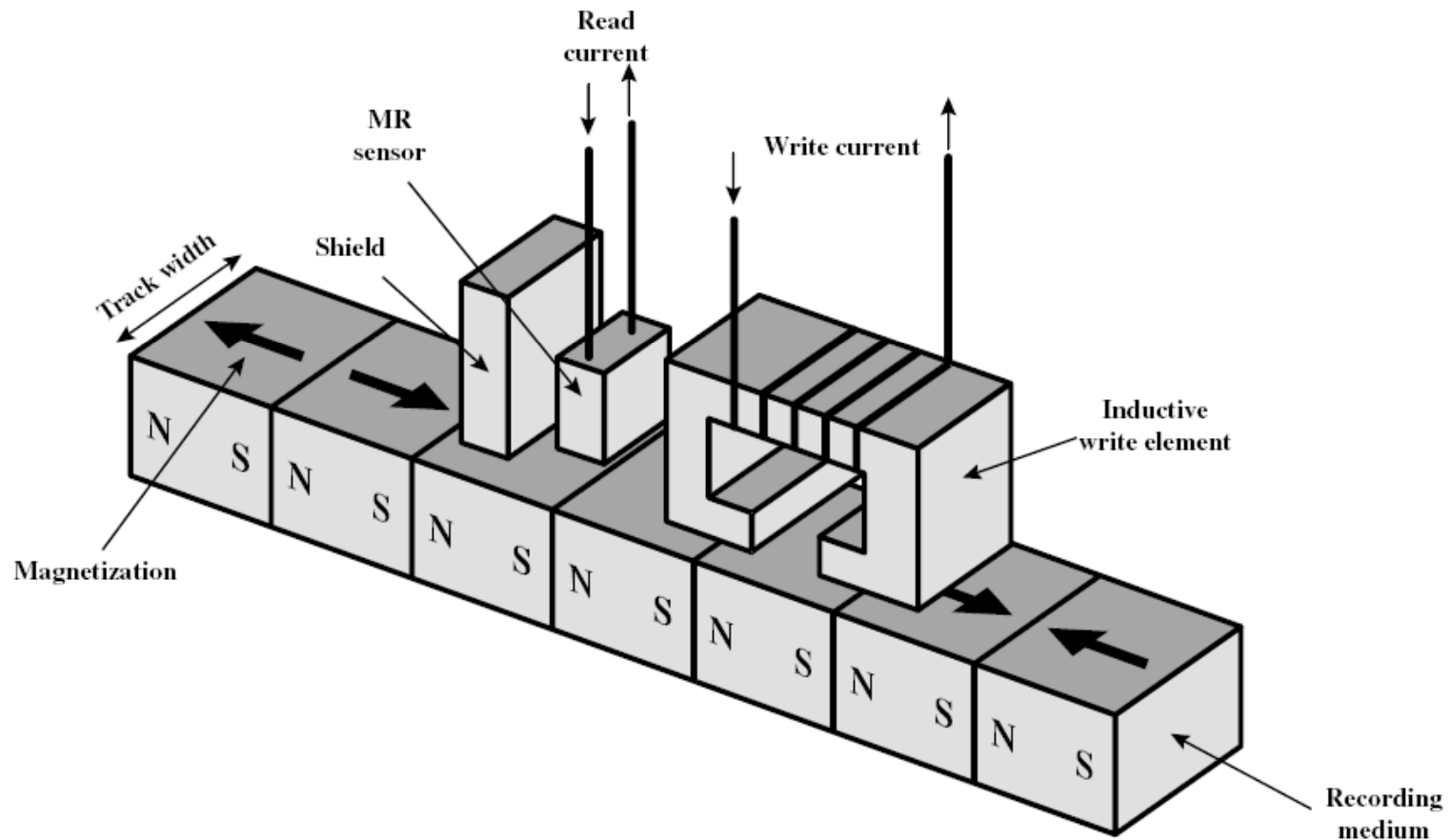

DATA STORAGE TECHNOLOGIES & NETWORKS

(CS C446, CS F446 & IS C446)

LECTURE 11– STORAGE

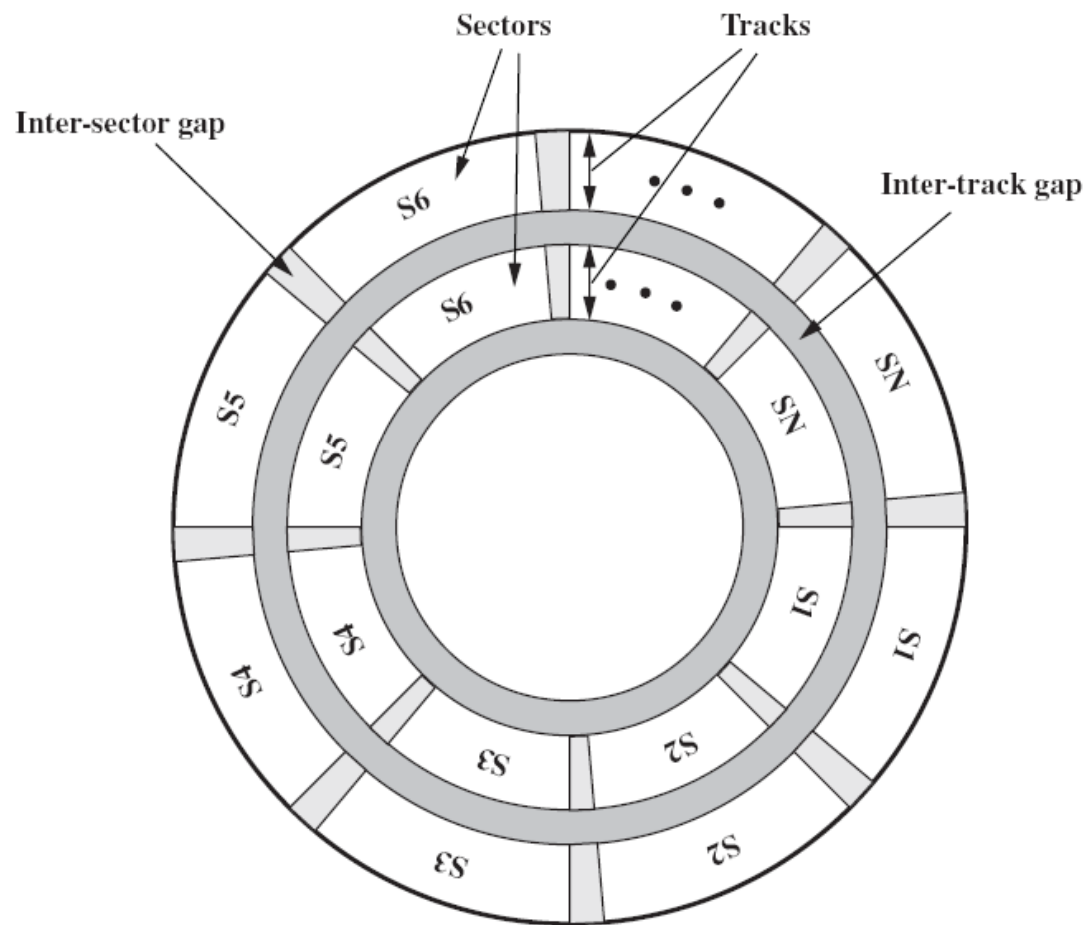
Read and Write in Hard disks



Read / Write Head Mechanism

- Smaller heads allow for higher densities, but force head to be closer to the disk
- The closer the head, the greater risk of “crashes”
- Distance of head from magnetic media
 - Contact (Floppy)
 - Fixed gap
 - Flying (Winchester)
 - Head rests on platter at rest
 - When platter spins, air pressure lifts head from platter

Data Organization and Formatting



Disk structure

- Recorded on tracks
 - ❑ Tracks are concentric rings on the platter around the spindle
 - ❑ Track is same width as head
 - ❑ Tracks are numbered from 0 [outer edge of the platter]
 - ❑ Thousands of tracks per platter surface
 - ❑ Inter track gaps – Gaps between tracks protect data integrity
 - ❑ Reduce inter track gap
 - increase capacity
 - possibly increase errors due to misalignment of head or interference from other tracks

Disk structure

- Track density = # of tracks per inch [TPI]
 - Measures how tightly tracks are packed on a platter
- Each track is divided into sectors
 - Smallest individual addressable unit
- Minimum block size is one sector although may have more than one sector per block
- Typically hundreds of sectors per track
- May be fixed or variable in length
- Contemporary systems are fixed-length with 512 bytes being common
- Sectors also have gaps called intra track or inter sector gaps

Disk structure

- Constant angular velocity – Same number of bits per track (variable packing density)
 - ❑ Regardless of head position, sectors pass beneath it at the same (constant) speed
 - ❑ Capacity limited by density on inside track
 - ❑ Outer tracks waste with lower data density
- Constant Linear Velocity [in CDs]
- While formatting track and sector structure is written on the platter
- Cylinder – set of identical tracks in both surfaces of each drive platter

Hard Disks - Geometry

- Capacity depends on
 - Recording density (bits/inch)
 - Track Density (tracks/inch)
- Aerial Density is
 - Product of recording density and track density
- Total capacity is
 - $(\# \text{ bytes / sector}) * (\# \text{ sectors / track}) * (\# \text{ tracks / surface}) * (\# \text{ surfaces / platter}) * (\# \text{ platters / disk})$

Hard Disks - Geometry

- Early days:
 - Fixed number of sectors / track – sectors were spaced apart in outer tracks
- Modern disks:
 - Appear to their interface as a contiguous set of logical blocks
 - Gross capacity = # of blocks * size of the block.
 - This information is available from the manufacturers specification or
 - From the drive itself through use of special utilities invoking low level commands

Hard Disks - Geometry

■ Modern disks

- ❑ High aerial densities – inter-sector gaps would be a huge wastage.
- ❑ Multiple zones
 - Each zone is a contiguous collection of tracks
 - each zone has fixed #sectors / track (determined by the innermost track in the zone)
- ❑ Capacity equation
 - Replace (#sectors/track) with (average # sectors / track)
 - OR
 - Compute per zone and add