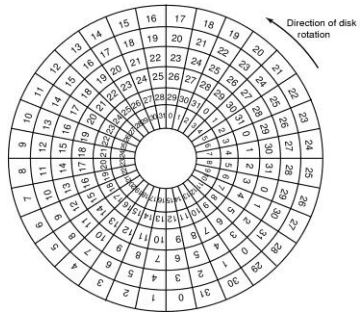
Cylinder Skew

Q1: If a 6000 rpm disk drive has 256 sectors per track and the track seek time is 780 µs, what is cylinder skew?

Cylinder skew - Offsetting the start sector of adjacent tracks to minimize the likely wait time (rotational latency) when switching tracks

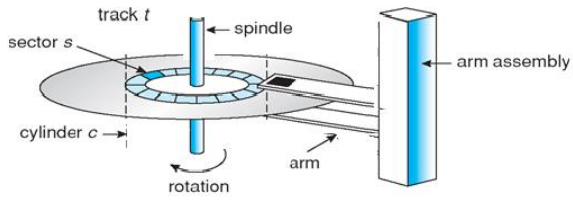
- 6000 rpm disk drive rotates in 10 ms.
  - Track has 256 sectors
  - New sector every (10/256) = 39 µs
  - If track seek time 780 µs
    - 780/39 → 20 sectors pass on seek
- Cylinder skew: 20 sectors



Disk Storage

Q2: A 4 GB hard disk that has only 1 magnetic surface for storing data has 256 cylinders and there are 128 sectors per track. If all sectors /cylinder are storing same amount of data, what is the maximum size of a file that occupies 8 sectors of a cylinder in KB ?

- # cylinders x # sectors x storage per sector= 4GB.
- $2^8 x 2^7 x k = 2^{32}$ bytes
- Hence k= 2^{17}bytes or 128KB.
- Hence a file that occupy 8 sectors will have 8 x 128 KB = 1024 KB



Disk Access Time

Q3: Consider a single platter storage disk with 98 cylinders (0, 1, , 97), and 64 sectors per track (0, 1, … , 63). At time T, three disk requests (R1, R2 & R3) of the form [request id, sector number, cylinder number] were in the scheduler queue. [R1, 30, 20], [R2, 50, 70], [R3, 10, 38]. Currently the head is positioned (at zero speed) at sector number 50 of cylinder 0. Every seek operation from one cylinder to another involves an mandatory acceleration and deceleration, and an optional coast. When the arm starts from zero speed, it covers 1 track in first 1ms and covers two tracks in next 1ms and there after it can cover 2 more additional tracks in every subsequent ms. The coast speed is 6 tracks/ms. The deceleration is also similar to the acceleration mentioned above. Data delivery time of a request is defined as sum of seek time, rotational latency and transfer time. Assume average rotational latency + transfer time is 2ms per request.

Disk Access Time

98 cylinders (0, 1, , 97), and 64 sectors per track (0, 1, … , 63).

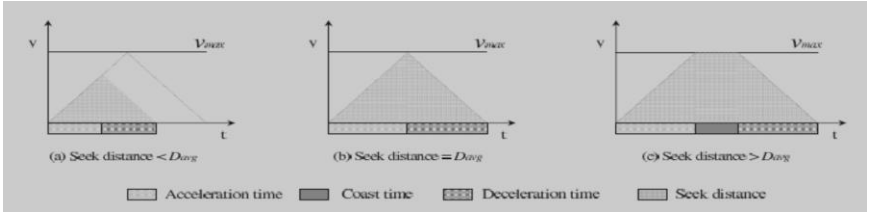
Requests→ [R1, 30, 20], [R2, 50, 70], [R3, 10, 38]. The head [H, 50, 0]

1 track/ms, 2 tracks/ms, 4 tracks/ms (acceleration)

6 tracks/ms (coast),

4 tracks/ms, 2 tracks/ms, 1 track/ms (deceleration)

Average rotational latency + transfer time is 2ms per request.



Disk Access Time

a. What is the maximum distance (in cylinders) between two disk access requests if the arm movement should not experiences a coast?

Cylinder #	0	1	3	7	11	13	14
Track /ms		1	2	4	4	2	1
Time		1	2	3	4	5	6

Disk Access Time

b. How much delivery time it will take to service R1 and then to service R2? **[R1, 30, 20], [R2, 50, 70]**

Cylinder #	0	1	3	7	13	17	19	20
Track /ms		1	2	4	6	4	2	1
Time		1	2	3	4	5	6	7

Cylinder #	20	21	23	27	33	39	45	51	57	63	67	69	70
Track /ms		1	2	4	6	6	6	6	6	6	4	2	1
Time		1	2	3	4	5	6	7	8	9	10	11	12

Disk Access Time

c. How much delivery time it will take to service R3 only? **[R3, 10, 38]**

Cylinder #	0	1	3	7	13	19	25	31	35	37	38
Track /ms		1	2	4	6	6	6	6	4	2	1
Time		1	2	3	4	5	6	7	8	9	10

Thank You