*For this module’s discussion board assignment, research “MongoDB indexing” and respond to one of the following topics: What are the differences between sparse and traditional indexes? Provide at least two examples.*

Memory in a computer system is organized in a hierarchy pyramid. Example photo below.

A picture containing text, businesscard

Description automatically generated

The bottom portion of the pyramid shows reminds me of the movies that all depict a government outpost with agents wearing headphones and the reels of tape spinning on the walls around them. The tapes and disks are important in a database system. Since the amount of data is so large, storing all the data in the main memory would get very expensive in hard drives alone. So, the database system brings data from the lower level of memory into the main memory for processing when needed. The database is stored as a collection of files (also called, tables). Each file is a collection of pages (also called blocks). Each block is a collection of records. A record is a sequence of fields, (also called a document). Example photo below.

Table

Description automatically generated

Blocks move from the Disk to the Main\_Memory one at a time. This is known as the I/O Cost. A database is usually carefully optimized to minimize the I/O Cost. There are two main organization methods for records, Ordered and Unordered organization. Example photo below.

Diagram

Description automatically generated

A further example: Employees file(a.k.a.\_table) has 1,000 blocks, and user needs to search a record with the phone number(key): X(value\_variable). It would be difficult in an unordered type, and easier in an ordered type. Alternatively, (using a different query example) if searching for employee ID: Y the number of blocks accessed would be log21,000. Example given is when reading a Biology textbook and you want access to the Photosynthesis chapter, the binary equivilant is to open the book in the exact mathimatical middle and flip right or left based on the chapter number you landed in, compared to the chapter number you are quering. It would be faster, but still take a bit of time to find the chapter. With an index (bookmark[added page]) of the Photosynthesis chapter it would be a single step to find it.

There are multiple types of indexes for a database, below I have added a photo description of each to save reading.

Diagram

Description automatically generated

Now to the actual matter of this discussion post, Dense and Sparce indices.

**Dense Index** has entries for every search key and record in the database’s file. Dense index can apply to ordered and unordered databases. Example photo below.

Diagram, engineering drawing

Description automatically generated

**Sparce Index** has entries for only some of the search key and records in the database’s file. Sparce index can **only** be built on the **ordered** field of the database’s file. It is noted the first record of the block is called the Anchor Record. Example photo below.

Chart, diagram

Description automatically generated

Unrelated to Sparce and Dense indices, I have also seen examples of Primary Indexing and Cluster Indexing. Example photos below.

**Primary:**

**Diagram

Description automatically generated**

**Cluster:**

**Diagram

Description automatically generated**

Work Cited:

<https://www.analyticsvidhya.com/blog/2021/06/understand-the-concept-of-indexing-in-depth/#:~:text=Dense%20Index%3A%20It%20has%20index,fields%20of%20the%20database%20files.&text=Sparse%20Index%3A%20It%20has%20index,records%20in%20the%20database%20file>.

<http://codinginterviewquestionsans.blogspot.com/2018/01/difference-between-sparse-index-and.html>