Data Structures and Algorithms

Agenda

- Linked List Applications
- Hashing

Linked List Applications

Applications examples

- Browser -- previous/next buttons are implemented as doubly linked list.
- Image Viewer -- previous/next images are shown using doubly linked list.
- Music player -- play queue is implemented as singly linked (with head & tail).

System Applications

- CPU scheduling -- In Round Robin scheduling, each node is given a CPU time share in circular fashion. Easily implemented using singly circular linked list.
- FAT filesystem internally use linked list to keep track of file data blocks and also the free/unused blocks on disk.
- Dynamic memory allocation internally use linked list to keep track of allocated and free blocks in memory.

Applications

- Implement stack/queue (dynamically growing).
- Implement stack/queue using singly circular list with only tail pointer (efficient -- O(1) time).
- Implementing advanced data structures like Graph (Adjacency List), HashTable (Chaining).
- Polynomial representation and calculation -- List of coeficients.
    - 4x^3 + 7x^2 + 3x - 5
    - head --> -5 --> 3 --> 7 --> 4 -->
    - You can write a program to solve the Polynomial i.e. f(x), if value of "x" is given.

Hash Table

- Searching Algorithms
    - Linear search: time = O(n)
    - Binary search: time = O(log n)
    - Hash Table: time = O(1) -- ideal -- fastest searching