Data Structures and Algorithms

Agenda

- ADT
- Queue
- Stack

ADT - Abstract Data Type

- Data structure
  - How data is organized in memory?
  - How operations are performed on that data?
- From user perspective, all data structures are ADTs.

(Static) Array ADT

- Operations
  - Write element on given index: arr[i] = x
  - Read element from given index: y = arr[i]
- Advanced Operations
  - Sorting
  - Searching
  - Traversing

Queue ADT

- FIFO behaviour
- Operations
  - Insert in Queue -- Push()
  - Delete from Queues -- Pop()
  - Read next Element -- Peek()
  - isEmpty() -- True/False
  - isFull() -- True/False
- isFull() operation is applicable if storage capcity is fixed.

Stack ADT

- LIFO behaviour
- Operations
  - Insert -- Push()
  - Delete -- Pop()
  - Read next -- Peek()
  - isEmpty() -- True/False
  - isFull() -- True/False
- isFull() operation is applicable if storage capcity is fixed.

Queue Applications

- Operating Systems
    - Message queue (IPC)
    - Waiting queue (IO waiting)
    - Ready queue (CPU scheduling e.g. FCFS, SJF, ...)
- Breadth First Search (Tree and Graph)

Stack Applications

- Process stack -- Function call
- Depth First Search
- Back-tracking
- Math expression solve
- Parenthesis balancing