Data Structures

CSCI 2270

Sorting

Sprint 5

....

Ready

....

GO!

Sorting

- BubbleSort
- InsertionSort
- QuickSort

Sorting:BubbleSort

- Bubble up
- Slow
- Does the job

Sorting:BubbleSort

Pre-conditions

A is an array.

Post-conditions

A is in ascending order.

Algorithm

```
bubbleSort(A){
1.    for i = 0 to A.end - 1
2.       for j = 0 to A.end - i - 1
3.          if (A[j] > A[j+1])
4.             swap = A[j]
5.             A[j] = A[j+1]
6.             A[j+1] = swap
```

Sorting: InsertionSort

- Pivot down
- More efficient than bubble
- More coding

Sorting: InsertionSort

Pre-conditions

A is an array.

Post-conditions

The array A is in ascending order.

Algorithm

```
insertionSort(A)
1.    for i = 1 to A.end
2.        index = A[i]
3.        j = i
4.        while(j > 0 and A[j - 1] > index)
5.            A[j] = A[j - 1]
6.            j = j - 1
7.        A[j] = index
```

Sorting: QuickSort

- Divide and conquer
- More efficient than others on average
- Complex coding/ recursion

Sorting: QuickSort

Pre-conditions

A is an array.

left and *right* are valid integers that index array *A*.

Post-conditions

The array A is sorted in ascending order

Algorithm

```
quickSort(A, left, right)
1.      i = left
2.     j = right
3.     pivot = A[(left + right) / 2]
4.      while(i <= j)
5.          while(A[i] < pivot)
6.              i = i + 1
7.          while(A[j] > pivot)
8.              j = j - 1
9.          if(i <= j)
10.             tmp = A[i]
11.             A[i] = A[j]
12.             A[j] = tmp
13.             i = i + 1
14.             j = j - 1
15.     if (left < j)
16.         quickSort(A, left, j)
17.     if (i < right)
18.         quickSort(A, i, right)
```

Linked List

- Nodes
- Pointers
- Head and Tail nodes

Linked List: Linked list vs Array

- Linked Lists have:
  - Nodes, nodes have:
    - Pointers
    - Data
- Arrays List have:
  - Data

Linked List: Linked list vs Array

- Linked List → access value by:

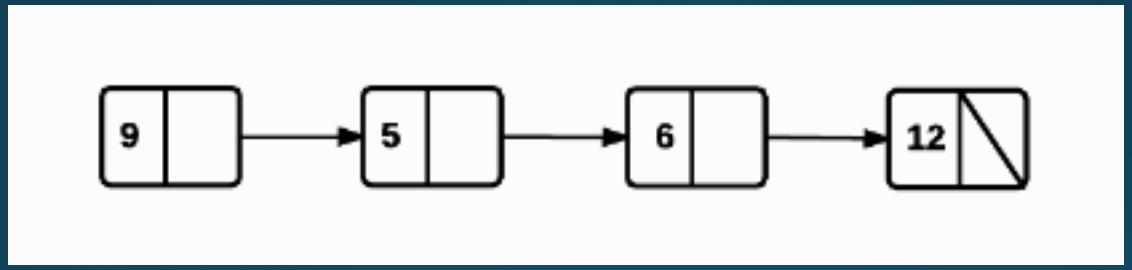
  traversing the list

- Array → access value by:

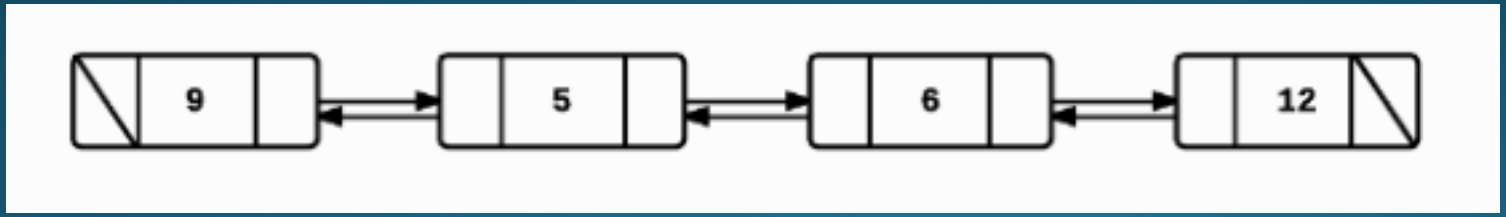
  indexing

Linked List

- Single linked list



- Doubly linked list



Linked List: How?

- Abstract the data
  - Struct → limited to attributes usually
  - Class → lots of stuff: private, methods, etc…

Linked List: What can we do?

- Insert
- Search
- Delete

- * can use recursion!!

Lecture Quiz

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