

16.216: ECE Application Programming

Spring 2013

Lecture 34: PE6
April 29, 2013

1. Explain the use of general data structures and pointer-based data structures in particular.
2. Describe the general design of a linked list.

3. Describe the structure used for each node in the list.

4. Explain the operation of the following function, which adds a node to the beginning of the list and returns a pointer to that node.

```
LLnode *addNode(LLnode *list, int v) {  
    LLnode *newNode;  
    // Allocate space for new node; exit if error  
    newNode = (LLnode *)malloc(sizeof(LLnode));  
    if (newNode == NULL) {  
        fprintf(stderr,  
                "Error: could not allocate new node\n");  
        exit(0);  
    }  
    newNode->value = v;    // Copy value to new node  
    newNode->next = list;  // next points to old list  
    return newNode;  
}
```

5. Write each of the following functions:

- a. Finding item in list (Function should return pointer to node if found and return NULL otherwise)

```
LLnode *findNode(LLnode *list, int v) {
```

```
}
```

b. Removing item from list

- Must deallocate space for deleted node
- Function should return pointer to start of list after it has been modified
 - No modifications should be made if value `v` is not in list
 - Hint: you can use the `findNode()` function in this function, but you may not want to!
- Note: removing first element in list is special case

```
LLnode *delNode(LLnode *list, int v) {
```

```
}
```

6. Describe how to maintain a sorted linked list.

7. Write each of the following functions:
 - a. Adding an item to a sorted linked list
 - Use **addNode()** as a starting point
 - Instead of adding node at beginning, find appropriate place in list and then add
 - Function should return pointer to start of list after it has been modified

```
LLnode *addSortedNode(LLnode *list, int v) {
```

```
}
```

b. Finding an item in a sorted linked list

- Use **findNode()** as starting point—should perform same operation, but more efficiently
- Function should return pointer to node if found
- Return NULL otherwise

```
LLnode *findSortedNode(LLnode *list, int v) {
```

```
}
```