CMPSC 24: Lecture 4
Implementing Linked Lists in C++

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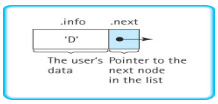
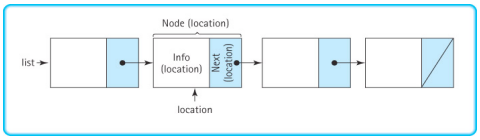
LINKED LISTS

Linked List Using Pointers




```
struct NodeType {
  int info;
  NodeType* next;
  };
NodeType* list;
NodeType* location;
```



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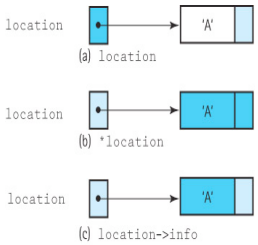
Linked List



Be sure you understand the differences among `location`, `*location`, *and* `location->info`

location ->info is the same as (*location).info

4

Linked List Operations

- Set list to empty
- Add a new node to list
- Count the number of nodes in list
- Remove the last node from list

5

Structure Definition

```
struct Node {
  int data;
  Node* next;

  Node (int item);
  Node (int item, Node* nextNode);
}

Node::Node(int item): data(item), next(0) { }

Node::Node(int item, Node* nextNode):
  data(item), next(nextNode) { }
```

Declaring the Linked List

Node* MyList;

Finding an Element in the List

```
bool find(int key)
{
   bool found=false;
   Node* p = MyList;
  // traverse the list to find the item

  // DEVELOP THE CODE IN THE CLASS

}
```

Inserting an Element at the End of the list

```
void insert(int key)
{
  Node* newNode = new Node(key);

  // lets keep things simple
  // add to the end of the list
  // traverse the list to get to the last node in
  the list
  // What about boundary conditions?

  // DEVELOP THE CODE IN THE CLASS
}
```

Deleting an Element from the list

```
void delete(int key)
{
  // traverse the list to find the node that matches
  "key"
  // we need to remove this node from the list
  // why is this more complex?
  // break down the complexity of the procedure into
  different cases
  // what are the different cases?
  // develop the implementation in class
}
```

Variation of the implementation

- Assuming that insert/append is the common case – can we make it more efficient?
- What if we need to insert an element in the middle?

LINKED LISTS C++ CLASS: PUTTING IT TOGETHER

Example linkedlist.h

```
#include <iostream>     // compiler directives
using namespace std;   // compile directives
Class linkedlist{
      private:
         struct node{
            int data;
            node *link;
         } *list;
      public:
        linkedlist();                    // Constructor
        void append( int num );  // append a node with "num"
        void delete( int num );    // delete the node containing "num"
        bool find( int num );       // TRUE if "num" exists in the list
        ~linkledist();                  // Destructor (to ensure no memory leak)
};
```

Skeleton of linkedlist.cpp

```
linkedlist::linkedlist()
{
      p=NULL;
}

void linkedlist::append(int num)
{
    // the code we developed goes in here
    .
    .
}

void linkedlist::delete(int num)
{
      // the code we developed goes in here
}
```

Skeleton of linkedlist.cpp

```
bool linkedlist::find(int num)
{
      // the code we developed goes in here
      .
      .
}

Linkedlist::~linkedlist()
{
      // ask the students what should happen here?
      .
      .
}
```

Usage of linkedlist Class

```
int main()
{
    linkedlist myList;

    myList.append(35);
    myList.append(45);
    myList.append(37);
    if myList.find(36) cout<<“36 on the list????”<endl;
    else cout<<“36 not on the list!!!”<<endl;

    // you should get the idea…
    // would it be nice to have myList.display() ??? Left as an exercise!!!
}
```