

CS 180 - Vectors

Note Title

10/9/2009

Announcements

- Program 3 out - due next Thursday (no checkpoint for this one)
- Midsemester grades Friday in class email if you won't be here

Vectors

like lists in python

→ myvector[5] = 6;

Extendable: if array is too small
double it ~~or~~ copy everything

Time: $O(N)$ time for N insertions

(not $O(1)$ time per operation)

Code:

```
template <typename ItemType>
class Vector {
private:
    int currentCapacity;
    int numItems;
    ItemType * data;
};
```

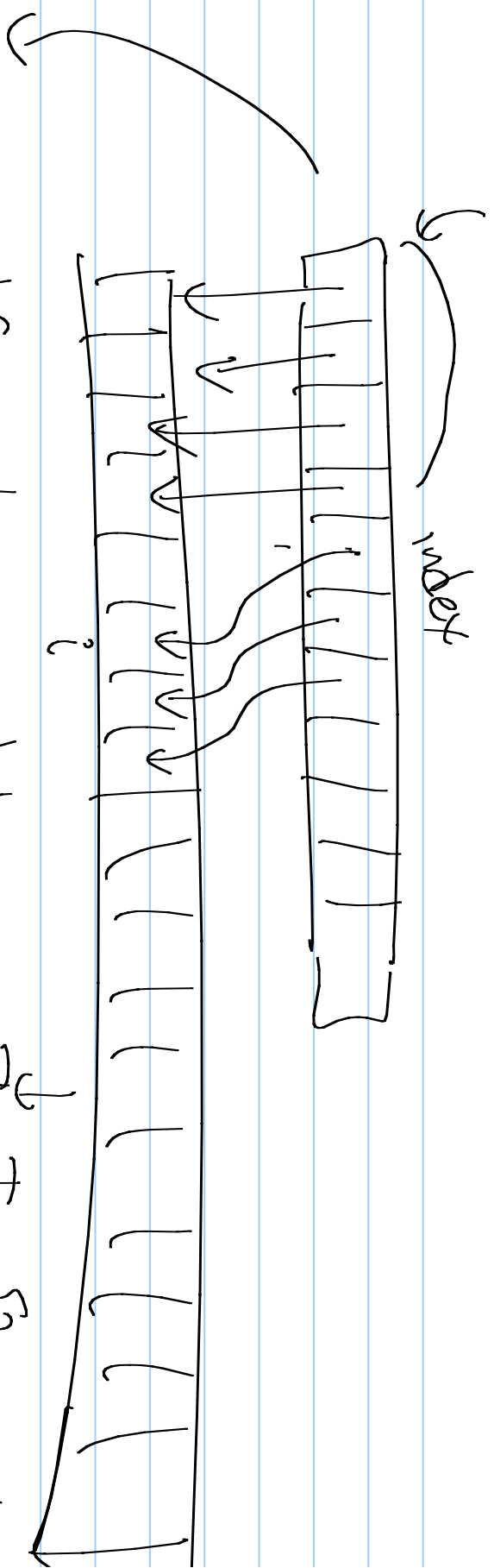
public:

```
Vector < ItemType > ( ) :  
    currentCapacity ( INITIAL_CAPACITY ),  
    numItems ( 0 )  
    data ( new ItemType [ INITIAL_CAPACITY ] )  
    { }
```

```
~ Vector ( ) {  
    delete [ ] data;  
}
```

```
ItemType & operator [ ] ( int index ) {  
    return data [ index ];  
}
```

old Data

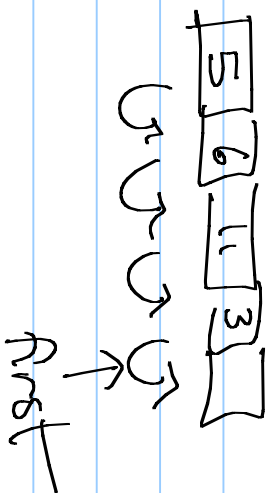
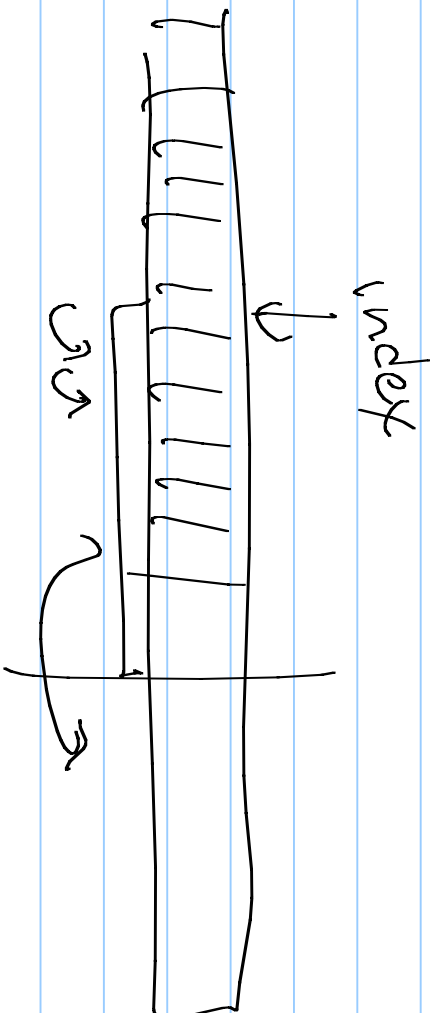


Current Capacity
num Items

data = new ItemType[2 * Current Capacity]

data

delete data;



$\langle 5, 6, 11, 13, 2 \rangle$
 $\text{insert}(2, 12)$

```

/* Function to insert an element into the vector */
void insert (int index, const ItemType & value) {
    if (index > numItems)
        throw out_of_range ("Index out of range");
    if (currentCapacity == numItems) {
        int oldSize = currentCapacity;
        currentCapacity = currentCapacity * 2;
        ItemType * oldData = data;
        data = new ItemType [currentCapacity];
        for (int i = 0; i < index; i++)
            data [i] = oldData [i];
        for (int i = index; i < numItems; i++)
            data [i] = oldData [i-1];
        delete [] oldData;
    }
}

```

```
else {  
    for (int i = numItems; i > index; i--)  
        data[i] = data[i-1];  
    data[index] = value;  
    numItems++;  
}
```



```

/assignment operator */
Vector < ItemType > operator = (const Vector < ItemType >
                                &other) {
    if (this != &other) {
        delete [] data;
        numItems = other.numItems;
        currentCapacity = other.currentCapacity;
        data = new ItemType[currentCapacity];
        for (int i = 0; i < numItems; i++)
            data[i] = other.data[i];
        return *this;
    }
}

```