CS 180 - Vectors

Announcements

- HW due Saturday
- Review next Monday
- Midterm next Tuesday
- Second program is posted
Vectors (on 6.1)

like lists in python

myvector[5] = 6.1

Extendable: if array is too small, double it and copy everything

Time: O(N) time for N insertions

(not O(1) time per operation)
Code:

```cpp
template <typename Object>
class Vector {

private:

    Object * _data;  // array
    int _size;
    int _capacity;
};
```
Constructor:

`Vector() : capacity(100), size(0), data(new Object[capacity])`
Operator []:

Object operator [](int i) {
  return data[i];
}

(without error checking) will give a Seg. Fault
Destructor:

~Vector ()

delete [] _data;j
Erase

- Takes an index and deletes that element (differing from STL)

Ex: `myVec. erase(3);`

<table>
<thead>
<tr>
<th>Index</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>11</td>
</tr>
</tbody>
</table>

Size = 6

(for loop)
Code:

```c
void erase (int index) {
    if (index < 0 || index == _size)
        throw runtime_error("i is out of range");
    for (int i = index; i < _size - 1; i++)
        _data[i] = _data[i+1];
    _size--;
}
```
Insert: Examples

```cpp
int
myVector.insert(2, "c");
otherVector.insert(11, "new");
anotherVector.insert(7, -25);
```
How to insert?
What if it is full?

(see prev)
Code for insert:

```java
void insert(int index, Object e) {
    if (_size == _capacity) {
        Object * newData = new Object[2 * _capacity];
        for (int i = 0; i < index; i++)
            newData[i] = _data[i];
        newData[index] = e;
        for (int i = index; i < _size; i++)
            newData[i + 1] = _data[i];
        delete [] _data;
        _data = newData;
        _capacity *= 2;
    }
    else {
        _data[index] = e;
        _size++;
    }
}
```
else {
  \textit{Life is easy}
  \begin{verbatim}
  for (int i = size - 1; i > index - 1; i--)
    data[i+1] = data[i];

  data[index] = e;

  size ++;
  \end{verbatim}
}
Other functions

at
House keeping
erase
push back
pop back