CS 225

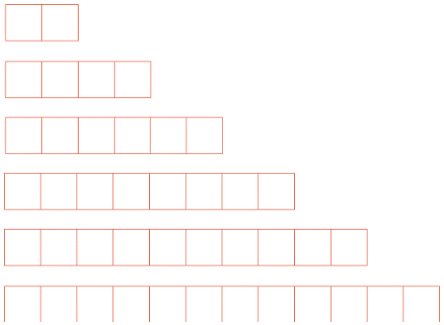
#12: Stacks, Queues, and Design

February 22, 2021 · *G Carl Evans*

Resize Details and Analysis:

➔ What is our resize strategy?

Array Resize Strategy #1:



...total copies across all resizes: _____

...total number of insert operations: _____

...average (amortized) cost of copies per insert: _____

Array Resize Strategy #2:

...total copies across all resizes: _____

...total number of insert operations: _____

...average (amortized) cost of copies per insert: _____

Running Time:

	Singly Linked List	Array
Insert/Remove at **front**		
Insert after a **given** element		
Remove after a **given** element		
Insert at **arbitrary** location		
Remove at **arbitrary** location		

A List implementation in std

- `std::vector` implements a list with dynamic growth
- `#include <vector>` to use it!
- Documentation widely available, including on CBTF exams
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Stack ADT

Function Name	Purpose

Queue ADT

Function Name	Purpose

Stack and Queue Implementations

Stack.h

```
1  #pragma once
2
3  #include <vector>
4
5  template <typename T>
6  class Stack {
7    public:
8      void push(const T & d);
9      T pop();
10     bool isEmpty();
11
12   private:
13     std::vector<T> list_;
14 };
15
16 #include "Stack.hpp"
```

Stack.hpp

```
3  template <typename T>
4  void Stack<T>::push(const T & d) {
5    list_.push_back(d);
6  }
7
8  template <typename T>
9  T Stack<T>::pop() {
10   T data = list_.back();
11   list_.pop_back();
12   return data;
13 }
```

Example 1

```
Queue<int> q;
q.enqueue(3);
q.enqueue(8);
q.enqueue(4);
q.dequeue();
q.enqueue(7);
q.dequeue();
q.dequeue();
q.enqueue(2);
q.enqueue(1);
q.enqueue(3);
q.enqueue(5);
q.dequeue();
q.enqueue(9);
```

	Queue	Stack
Operations + Data Order:		
Implementation:		
Runtime:		

Example 2

```
Queue<char> q;
q.enqueue('m');
q.enqueue('o');
q.enqueue('n');
…
q.enqueue('d');
q.enqueue('a');
q.enqueue('y');
q.enqueue('i');
q.enqueue('s');
q.dequeue();
q.enqueue('h');
q.enqueue('a');
```

Accessing Every Element in Our List / Queue / [Anything]
Suppose we want to look through every element in our data structure. What if we don't know what our data structure even looks like?

	Linked List
	Array
	Hypercube

CS 225 – Things To Be Doing:

1. mp_stickers due today
2. Daily POTDs