CS261 Data Structures

Dynamic Array Queue and Deque

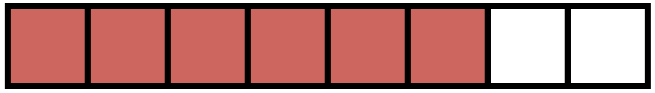
Queues

```
int       isEmpty();
void      addBack(TYPE val);   // Add value at end of queue.
TYPE        front();           // Get value at front of queue.
void removeFront();            // Remove value at front.
```

Queue Applications

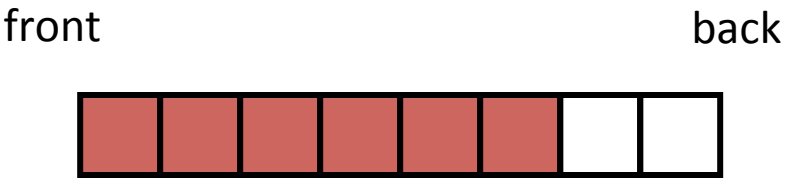
- Also good for 'remembering', just in a different order. We'll revisit this when we study graphs and search!
- Discrete event simulations
- Operating systems

Queue with Dynamic Array



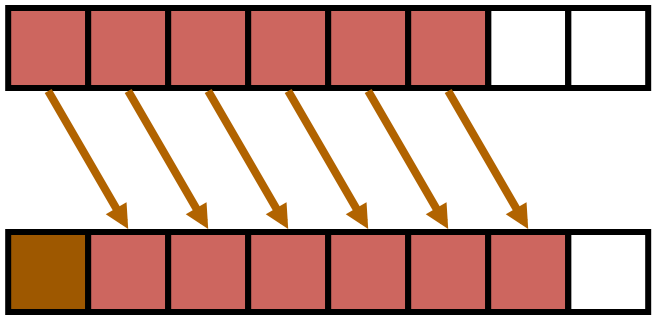
Deque (Double Ended Queue)

```
void   addFront(TYPE val);
void   removeFront();
TYPE   front();
void   addBack(TYPE val);
void   removeBack ()
TYPE   back();
```

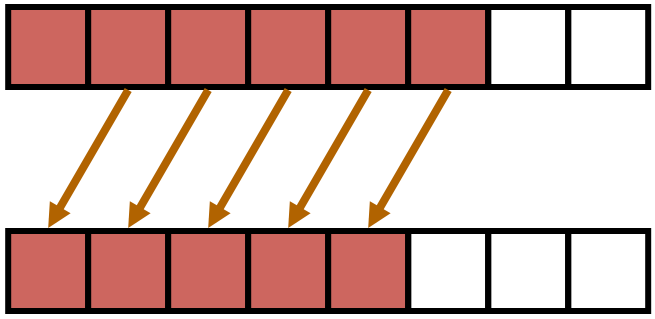


Dynamic Array Deque

Adding to Front



Removing from Front

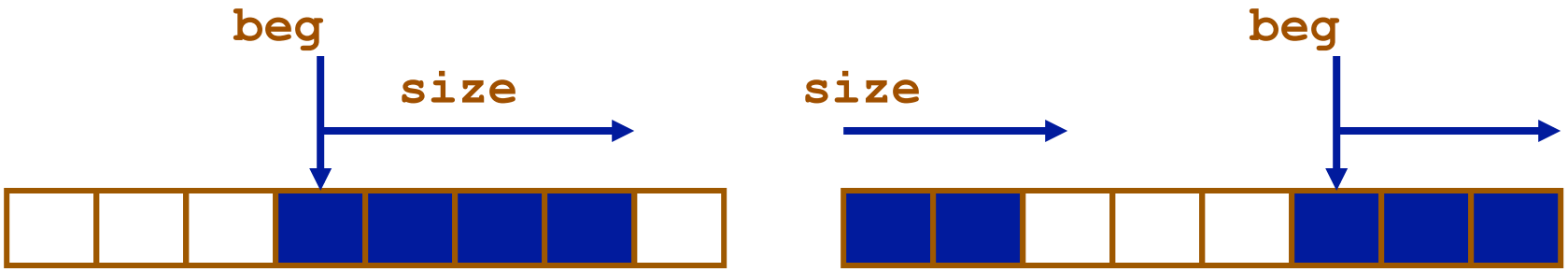


Let the partially filled block "float"

- One solution: Rather than always use index zero as our starting point, allow the starting index to "float"
- Maintain two integer values:
  - Starting or beginning index (**`beg`**)
  - Count of elements in the collection (**`size`**)
- Still need to reallocate when size equal to capacity

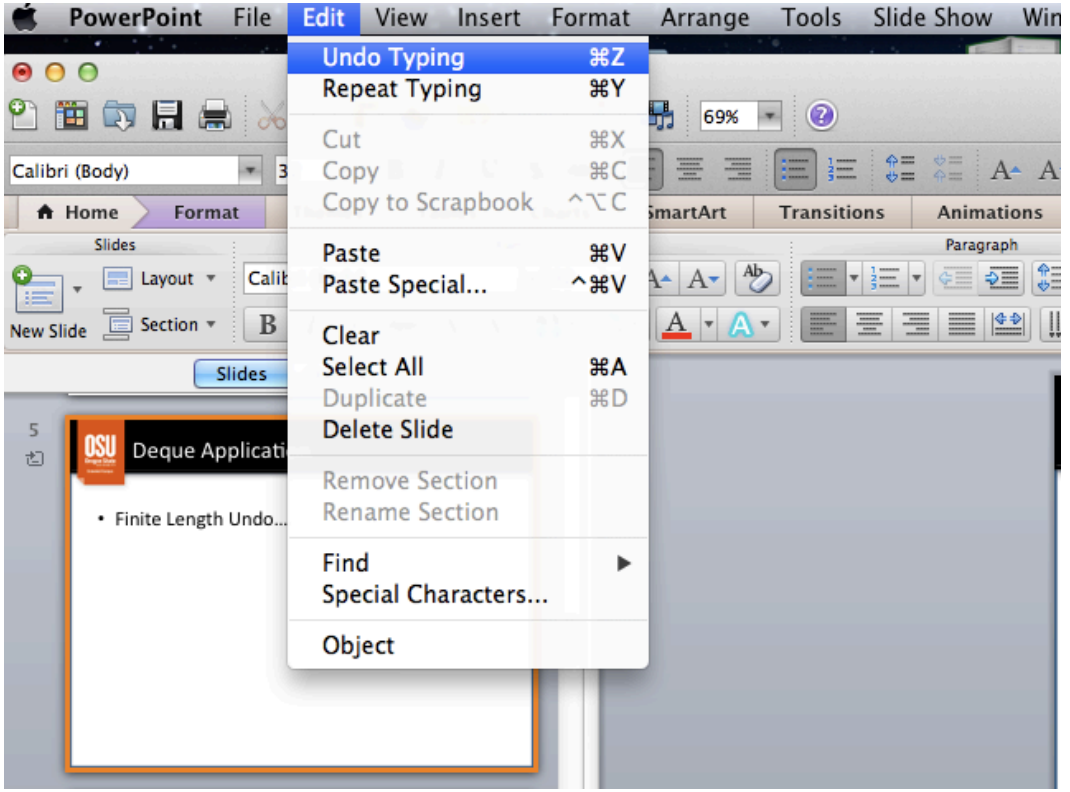
Dynamic Array Deque

- First filled element no longer always at index 0
- Filled elements may wrap around back to the front end of array
- Called **`ArrDeque`**



Deque Application

- Finite Length Undo



Your Turn

- Read Worksheet 20 Introduction