Queues

Another form of list: First in, First out (FIFO)

push(x)/insert/append/enque – add x to the end of the list.

pop/delete/serve/deque – remove the first element in the list.

front/get/retrieve – return the first element in the list.

empty – return True if the list is empty.

size – return the number of elements in the list.

Queue Specification

Description A FIFO list.
State $\mathbf{q}$: A sequence of type $\mathbf{T}$.
Operations
- $queue()$
  Constructor.
  Post: $\mathbf{q} = \_$ $\mathbf{q}$ is the empty sequence.
- $\tilde{queue}()$ Destructor.
- $push(\mathbf{T}\ x)$
  Mutator. Adds x to the back of the queue.
  Post: $\mathbf{q}' = \mathbf{q}x$ x is appended to $\mathbf{q}$
- $pop()$
  Mutator. Removes the front element.
  Pre: $|\mathbf{q}| > 0$ The queue is not empty.
  Post: $\mathbf{q}' = \mathbf{q}_{\{1,\dots|q|-1\}}$ The first element of $\mathbf{q}$ is removed.

- $\mathbf{T}\ front()$
  Accessor. Returns the front element of the queue.
  Pre: $|\mathbf{q}| > 0$ The queue is not empty.
  Post: $Result = q_0 \wedge \mathbf{q}' = \mathbf{q}$ The first element of $\mathbf{q}$ is returned and $\mathbf{q}$ is unchanged.
- $\mathbf{Bool}\ empty()$
  Accessor. Returns True if the queue is empty, false otherwise.
  Post: $Result = (|\mathbf{q}| = 0)$ Returns true if the length of $\mathbf{q}$ is 0, false otherwise.
- $\mathbf{int}\ size()$
  Accessor. Returns the length of the queue.
  Post: $Result = |\mathbf{q}|$ Returns the length of $\mathbf{q}$.