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STACKS AND QUEUES

When I was a kid, I used to have this curious habit of watching lines. I wondered how people decided where to stand and how they moved forward as the line got shorter. But what fascinated me more was the idea of finding other ways to form lines. Little did I know back then that these questions were connected to the world of computer science. They revolved around "abstract data types," which are essentially methods for organizing and manipulating information in a particular order. It's like having boxes with stuff inside, but there are rules about how we can put things in and take them out.

One example of a data structure is a stack ADT. It follows a simple rule: Last-In-First-Out (LIFO). This means that the last item that we put on the stack is the first one that we can take off. There are essentially two key actions we can perform with a stack: "push" and "pop." Pushing an item means putting it on top of the stack, while popping an item means taking it off. We can imagine a stack ADT as a pile of books or clothes, where we can only touch the topmost item. The item that we added to the stack most recently is the one that we remove first.

Another example of a real-world application of stack ADT is the browser history. A stack ADT is more applicable for browser history because it follows the LIFO principle. The most recent web page we've visited sits right on top of the stack, and it's the first thing that appears when we hit the back button. This way, the user can easily access the recent pages they visited instead of scrolling through the ones that are very old.

However, not everything in life works well with stacks. Imagine if we had to use a stack instead of a queue for waiting in line, such as at the bank or the cinema. The last person who arrived would be the first one to be served, while the first person who arrived would have to wait until everyone else was done. That's where another data structure, known as queues, comes into the picture, perfectly suited for these kinds of scenarios.

A queue ADT is like a line of people waiting for a movie ticket, where we can only access the front item before moving to the next. The first item we put in the queue is the first one we take out. This is called FIFO, or First-In-First-Out. To work with a queue, we can "enqueue" an item, which means adding it to the back of the line. Conversely, "dequeue" lets us remove and get the item from the front of the line.

Stacks and queues are fundamental data structures that have distinct properties and purposes. Stacks operate on the principle of LIFO (last in, first out), meaning that the most recent item added is the first one to be removed. Queues operate on the principle of FIFO (first in, first out), meaning that the oldest item added is the first one to be removed. By grasping the concepts behind stacks and queues, we can smartly decide which one to employ when it comes to sorting and accessing our data, making life simpler, whether in the digital realm or the everyday world.