1.Circular queues are used quite a bit in operating systems and high performance systems, especially when performance matters. Do a little outside research, and answer this question specifically: Why is a ring buffer useful and/or when should it be used?

A ring buffer, also known as circular queue, cyclic buffer, is a data structure that uses a single, fixed-size buffer as if it were connected end-to-end, overwrites the oldest data with new data and allows efficient memory utilization[2].

Ring buffer are widely used when input and output to a data stream occur at different rates, for example buffering data streams, CPU scheduling, memory Controlled trafficking signal systems. The advantage of using ring buffer is it assigns fixed size memory for the system to allocate, so that it does not use dynamic memory and there are no memory leaks, it can be implemented easily, no need to copy data around, and all operations occur in constant time [1].

In a regular array, when deleting the first element, you need to delete and copy the rest of elements to move open step forward. In a queue implementation as an array(ring buffer), you can do it by changing the position of the front and back pointer to achieve the same effect, there is no need to copy the rest of elements.

2.We are going to talk about stacks quite a lot in this course, so it will be important to understand them. Do a little outside research, and edit this section of the readme answering specifically: Why is a stack useful and/or when should it be used?

Stack is an abstract data type that serves a collection of elements with two main operations, push and pop, and it follows “First In First Out” principle [3]. This meanes that the last element added to stack will be the first one to be removed.

Stack can be used for expression evaluation and syntax parsing, backtracking, compile-time memory management, and many algorithms use stack as principal data structure to organize their information[3]. Stack can keep track of a series of functional calls and operations, and The time complexity of push and pop operation is both constant time, O(1).

An example of stack usage is that in a web browser, the browser maintains a stack and allows the user to go back to the most recent previous page by using the back button.

Reference:

[1] B. Ward, “Circular queue or ring buffer,” *Medium*, 01-May-2020. [Online]. Available: https://towardsdatascience.com/circular-queue-or-ring-buffer-92c7b0193326. [Accessed: 28-Jan-2023].

[2] “Circular buffer,” *Wikipedia*, 22-Jan-2023. [Online]. Available: https://en.wikipedia.org/wiki/Circular_buffer. [Accessed: 28-Jan-2023].

[3]“Stack (abstract data type),” *Wikipedia*, 10-Dec-2022. [Online]. Available: https://en.wikipedia.org/wiki/Stack_(abstract_data_type). [Accessed: 28-Jan-2023].