CCC2113 Data Structures

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Project: Supermarket Queue Simulation

Project Description:

In this project you will simulate the queue in the cash counters of a large supermarket using Java. The requirements are as follows:

Basic Requirements:

1. User should be able to input the number of cash counters and the number of customers
2. For the sake of simplicity, each customer takes the same constant time (for example 2 minutes) at the counter. The user should be able to input this time at the beginning of the simulation.
3. Customers will come to the cash counters at a constant rate (for example, 1 customer every minute). The user should be able to input this rate at the beginning of the simulation.
4. The program assign customers to the cash counters in either of the following ways:
    a) Customers will queue up randomly in any counter
    b) Customers will queue up at the shortest queue
5. The program should display the detail status (how many customers waiting, how many customers are being served, etc) in real time during the runtime of the simulation
6. At the end of the simulation, the program should output the following:
    a) Total number of customers processed by each counter displayed separately
    b) Average waiting time of customers for each counter displayed separately
7. You can choose command line or GUI based implementation
8. All user inputs must be interactive, not hard coded
9. Test your code thoroughly

Project Report:

- **Introduction**: Describe the problem you are trying to solve, why it is important or useful, and summarize any important pieces of prior work that you are building upon.
- **Framework**: Draw a diagram sketching how your program works.
- **Alternative**:
    - Discuss what data structure you could use other than Queue (at least 1 alternative).
    - Draw a diagram sketching how your program would be different if you have used the other data structure
- **Additional Features**: List any additional features you added to your simulation apart from the basic requirements of the project
- **Testing**: Describe the test cases and their results for your program
- **Conclusion / Future work**: What did you learn in doing this project? What are the shortcomings or failure cases of your work? If you had more time or resources, how would you continue or expand upon the work you have already done?

Rules:

1. **Your score will depend on your implementation, creativity and reporting.**
2. You have to submit your project report and a present slide for your work. Prepare a
3. Timeline:
    a. Project Report and Presentation Slides: 8 February, 2024
4. Each day of delay will have a penalty