

CSC 262 Operating Systems Course
Assignment #3
Due Date: Oct 14, Friday

Sleeping Barbers Problem

The classical definition of problem from Wikipedia is as below:

“The analogy is based upon a hypothetical barber shop with one barber. The barber has one barber chair and a waiting room with a number of chairs in it. When the barber finishes cutting a customer's hair, he dismisses the customer and then goes to the waiting room to see if there are other customers waiting. If there are, he brings one of them back to the chair and cuts his hair. If there are no other customers waiting, he returns to his chair and sleeps in it.

Each customer, when he arrives, looks to see what the barber is doing. If the barber is sleeping, then the customer wakes him up and sits in the chair. If the barber is cutting hair, then the customer goes to the waiting room. If there is a free chair in the waiting room, the customer sits in it and waits his turn. If there is no free chair, then the customer leaves.

Based on a naïve analysis, the above description should ensure that the shop functions correctly, with the barber cutting the hair of anyone who arrives until there are no more customers, and then sleeping until the next customer arrives. In practice, there are a number of problems that can occur that are illustrative of general scheduling problems.

The problems are all related to the fact that the actions by both the barber and the customer (checking the waiting room, entering the shop, taking a waiting room chair, etc.) all take an unknown amount of time. For example, a customer may arrive and observe that the barber is cutting hair, so he goes to the waiting room. While he is on his way, the barber finishes the haircut he is doing and goes to check the waiting room. Since there is no one there (the customer not having arrived yet), he goes back to his chair and sleeps. The barber is now waiting for a customer and the customer is waiting for the barber. In another example, two customers may arrive at the same time when there happens to be a single seat in the waiting room. They observe that the barber is cutting hair, go to the waiting room, and both attempt to occupy the single chair.”

- 1) State the race conditions and give scenarios to show the problem in the analogy.
- 2) Implement the solution with thread (in Java or C with PThreads library).
Return your solution with at least a barber, a customer and a main function.
- 3) Write all your assumptions during the solution.

Please submit the code file(s) and your report, which is addressing the synchronization problems and your assumptions.