

Sleeping Barber Problem

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Introduction

- ▶ This program is a simulation of how to coordinate a barber and customers in a barber shop
- ▶ This program acts as a solution to the sleeping barber problem
- ▶ The barber will only cut hair when there is a customer in the shop
- ▶ The customer will cut their hair cut if no one else is in the shop and the barber is asleep
- ▶ Starvation and deadlock are avoided by having the barber and customer check the conditions one at a time and have them run on different threads
- ▶ The threads will sleep, notify, and wait at different times to signal different parts of the checks

Installation and setup

- ▶ Requirement: Java version 8 or higher
- ▶ In order to install this program on your own computer please copy the files from the flash drive onto wherever you wish to store them on your own system
 - ▶ Note: it is important to keep all files inside the same directory, especially the .jar and .bat files
 - ▶ Note: make sure folder that files are installed in does not have a space in the name (ex: folder named “folder 1” instead of “folder1”) for some reason if the folder name has a space in it the .bat file has trouble running the .jar file
- ▶ Once stored where you wish, double click to run the runSleepingBarberProblem.bat file. This .bat file has the commands needed to run the program from the windows cmd

Installation and setup

- ▶ If for some reason the .bat file fails to run the program, you will need to manually run the program from the windows cmd
 - ▶ Note: (java is multiplatform, these same commands should work on linux and mac as well)
- ▶ On windows, open the cmd and change to the directory that you installed the SleepingBarberProblem.jar file in
 - ▶ (EX: If installed in documents, type: cd Documents/SleepingBarberProblem.jar
 - ▶ Once in the directory, run the command: java -jar SleepingBarberProblem.jar

Barber

- ▶ Barber will check to see if there are any customers
 - ▶ If no customers barber will fall asleep
 - ▶ If there is a customer barber will cut their hair
 - ▶ If there is more than one customer the barber will cut in the order of arrival to the shop (first person to enter gets cut first)
- ▶ Once the barber is finished cutting hair barber will check for customers again and the process repeats
- ▶ This program has this process repeat in an infinite loop to simulate a constant stream of customers coming into the shop

Customer

- ▶ Customer walks into the shop and checks to see if the barber is asleep
 - ▶ If the barber is asleep the customer walks them up and they get a haircut
 - ▶ If the barber is awake and cutting another customer's hair then the customer checks to see if there are any chairs open
 - ▶ If there are chairs available the customer sits down and waits for their turn for a haircut
 - ▶ If the customer enters the shop and there are no seats available then the customer leaves

Example

- Example output of the program

```
C:\WINDOWS\system32\cmd.exe
Barber is in the barber shop
Barber sees no customers, barber goes to sleep
Customer 13 comes into the barber shop at Wed Apr 24 00:47:50 EDT 2019
Customer 13 sat in one of the chairs
There are 4 chairs remaining
Barber sees a customer
Barber is cutting Customer 13's hair
Customer 14 comes into the barber shop at Wed Apr 24 00:47:59 EDT 2019
Customer 14 sat in one of the chairs
There are 4 chairs remaining
Customer 15 comes into the barber shop at Wed Apr 24 00:48:06 EDT 2019
Customer 15 sat in one of the chairs
There are 3 chairs remaining
Customer 13's hair cut is done
hair cut took: 19 seconds
Barber sees a customer
Barber is cutting Customer 14's hair
Customer 16 comes into the barber shop at Wed Apr 24 00:48:24 EDT 2019
Customer 16 sat in one of the chairs
There are 3 chairs remaining
Customer 14's hair cut is done
hair cut took: 17 seconds
Barber sees a customer
Barber is cutting Customer 15's hair
Customer 15's hair cut is done
hair cut took: 10 seconds
Barber sees a customer
Barber is cutting Customer 16's hair
```

- Important Note: the program runs on an infinite loop to simulate a constant stream of customers coming into the shop
 - In order to stop the program once it starts running please press ctrl + c then it will ask if you want to terminate the program, enter y to exit