CA216 Operating Systems

Assignment: The Sleeping Barber

Provided to Students: Thursday 29th March 2018

Submission date: Friday 20th April 2018 at 16:55

Objectives:

1. To introduce students to multi-threaded programming;
2. To introduce students to issues of concurrency;
3. To introduce students to testing of multi-threaded programs.

Description

This is a general description of the problem you are trying to solve. Assume That there is a barber shop with a certain number of barbers. Each barber has one chair, which s(he) uses when cutting a customer's hair. There is also a waiting room with a number of chairs in it. When the barber finishes cutting a customer's hair, the customer leaves, and then the barber goes to the waiting room to see if there are other customers waiting. If there are, the next customer comes to the chair and has their hair cut. If there are no other customers waiting, the barber returns

To his/her chair and sleeps in it.

Customers will come into the barber shop in a random manner, and haircuts can take a random amount of time to complete. When all barbers are busy, the customer waits in the waiting room. When the customer comes in to the shop, if one or more of the barbers are sleeping, the customer will wake the barber up and sit in their chair. Note that this problem is based on events. For example, an event happens when a customer enters the sho, and again when s(he) is finished having their hair cut.

You are required to write a program to simulate the above scenario. There are several different versions which you can attempt:

1. For 40% of the marks, you should consider the case of one barber, and a waiting room with an infinite number of chairs. This means you do not have to cater for the fact that the waiting room might at any time become full.
2. For 60% of the marks, you should consider the case of 1 barber, and a waiting room with 10 chairs.
3. For 100% of the marks, you should consider the case of 3 barbers (minimum) and a waiting room with 15 chairs.

   You may use either Python or Java to complete this assignment. Note that as the language used in this module is Python, I provide a template on which you may base your code in this language. No support will be offered by the lecturer or lab tutors should you choose to write your programs in Java. They will be graded, but only using the standard command-line tools. The lecturer will not use any form of IDE to grade Java-based submissions. As a comment at the top of your Python submissions, please indicate whether you wish the lecturer to use Python 2 or Python 3. Again, no IDE will be used to grade assignments.

Submission Instructions:

You should submit by email to my DCU email address: donal.fitzpatrick@dcu.ie and you should only submit from your own DCU address. Submissions will not be accepted from addresses such as Gmail, or other external domains. The email should have the subject: “2017-18 CA216 assignment”. The email should contain your name and ID number. Attached to the email should be a zip file containing your program source code and a file named readme.txt containing details of how you

tested this code, and any flaws you have discovered in your implementation. Emails must reach me by the stipulated submission deadline. A 10% penalty will be applied for every day the submission is late. Note that once the submission deadline has passed, irrespective of how soon afterwards your mail arrives, you will be determined to have missed the deadline, and thus the penalty will be applied.