Thread Synchronization II
Parking Lot Control system

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V1.0

Introduction

In this exercise you will implement a Parking Lot Control System (PLCS) which monitors a parking lot and grants access for cars to enter and exit the parking lot.

Prerequisites

Finished Exercise *Thread Synchronization I*.

Goal

To give you some routine in mapping real-world problems to multithreaded programmed solutions

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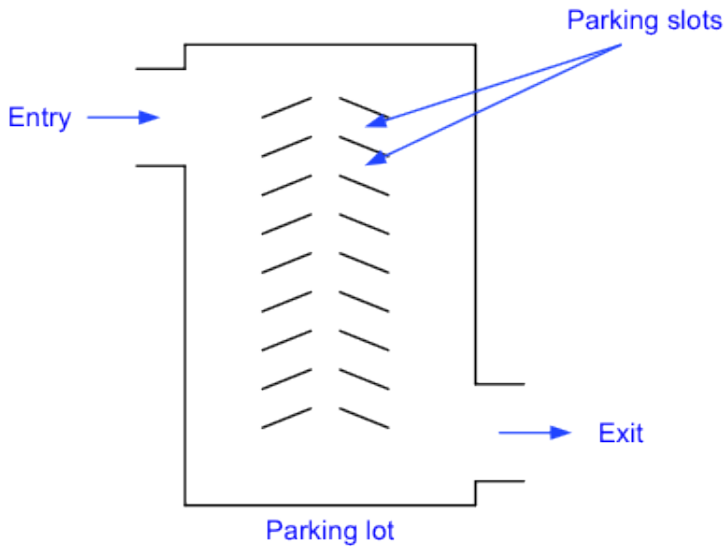
This is a sketch of the PLCS:



A simple sketch of the PLCS

These are the requirements for the PLCS:

- Cars enter the parking lot, stay there for a while, and then exit the parking lot again. Then they wait a while before they re-enter the parking lot.
- An arriving car must request permission to enter the parking lot from the *PLCS entry guard*. When permission is granted, the car may enter the parking lot.
- An exiting car must request permission to exit the parking lot from the *PLCS exit guard*. When access is granted, the car may exit the parking lot.

Use the *Park-a-Lot 2000* example of the recent lecture as an example of how a car may interact with the *PLCS entry (or exit) guard* to request access to enter (or exit) the parking lot and receive permission to do so.

These exercises *must* be implemented using `mutex/conditional` constructs.

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Exercise 1 Implement Park-a-Lot 2000

Exercise 1.1 First step

Implement the PLCS and verify that it works with a single car that enters the parking lot, waits there for some time and exits the parking lot again.

Exercise 1.2 The grandiose test

Repeat the above test this time with multiple cars, where each car is being represented by a single thread. Furthermore every car should wait a different amount of time in the parking lot before exiting.

Verify that all cars are able to enter and exit as would be expected.

Exercise 2 Extending PCLS, now with a limit on the number of cars

We now add an additional requirement to the PLCS:

- The entry guard must ensure that entry is not granted to a car if the parking lot is full. In that case cars wanting to enter must wait.

Extend your PLCS to handle this situation and verify that it actually does as you expect. Remember to test the scenario where a car leaves a full parking lot, enabling a waiting car to enter.