

INF4140 Fall term 2012. Week exercises 5 (Concurrent programming in Java)

Exercise 1

Implement a one-slot buffer in Java with two methods put and get.

Hint:

```
public class OneBuf {
    Object slot = null;

    public synchronized void put(Object o)
    throws InterruptedException {
        ...}

    public synchronized Object get ()
    throws InterruptedException {
        ...}
}
```

Exercise 2

Replace the condition synchronization in your implementation of the one-slot buffer by using the following semaphore class:

```
// up() is the V operation
// down() is the P operation

public class Semaphore {
    private int value;

    public Semaphore (int initial) {
        value = initial;
    }

    synchronized public void up() {
        ++value;
        notifyAll();}

    synchronized public void down()
    throws InterruptedException {
        while (value==0) wait();
        --value;}
}
```

Exercise 3

A museum allows visitors to enter through the east entrance and leave through the west exit. Arrivals and departures are signaled to the museum controller by the turnstiles at the entrance and exit. At opening time, the museum director signals the controller that the museum is open and then the controller permits both arrivals and departures. At closing time, the director signal that the museum is closed, at which point only departures are permitted by the controller. In this exercise there are four processes/monitor: EAST, WEST, CONTROL and DIRECTOR. Identify which of these should be threads and which one a monitor. Provide the implementation of the monitor in Java.

Exercise 4

Implement a monitor called Barrier in Java, which has a sync method that ensure that a number N of threads must call sync before any of them can proceed.

Exercise 5

The savings account problem: A savings account is share by several people, each person might deposit or withdraw funds from the account subject to the constraint that the balance of the account must never become negative. Give a java implementation for the savings account.