1 Administrivia

Announcements

Assignment

Read Chapter 6.

From Last Time

Introduction to threads.

Outline

1. Thread Synchronization

2. Lab

Coming Up

Game2D case study.
2 Thread Synchronization

1. The Producer/Consumer problem:

(a) Producer and Consumer work at different rates.

(b) Fixed amount of buffering (queuing) between them.

(c) With no synchronization, items can “disappear” or be multiply consumed.


(a) Lock and condition variables.

(b) A thread must secure the lock before executing within the monitor.

(c) Once in the monitor, a thread checks its condition variables:

   i. Producer: queue full.

      ii. Consumer: queue empty.

      If the condition is false, the thread waits — exits the monitor and sleeps. When it awakes, it **must** recheck its condition.

(d) Once a thread has modified state within the monitor, it will notify waiting threads, allowing them to recheck their conditions. (Must first re-obtain lock.)

3. Example:

```java
class Queue
{
```
private int val;
private boolean full = false;
private boolean empty = true;

public Queue()
{
    val = 0;
}

public synchronized void put(int v)
{
    while (full)
    {
        try
        {
            wait();
        }
        catch (Exception e)
        {
        }
    }
    val = v;
    full = true;
    empty = false;
    notify();
}

public synchronized int get()
{
    while (empty)
    {
        try
        {
            wait();
        }
        catch (Exception e)
        {
        }
    }
    full = false;
    empty = true;
    notify();
    return val;
}
3 Lab