To: Fall 2006, COMP421 students
From: Prof. Jeff Wiegley
Subject: Project 3 Specifications: Mouse Motel
Date: Monday, November 27th, 2006
Due: Sunday, December 17th, 2006

1 Task

Write a C or C++ program that uses POSIX threads to simulate the asynchronous behavior of a mischief of mice[1] attempting to mate in the local mouse motel.

2 Problem Description

There exists a mouse motel where mice go to mate. Mice are either male or female. All mice are heterogenous, monogamous and mate for life.[2]

The motel has some number of room in which a male/female pair of mice may hook-up and mate, and leave to continue their happy lives together where they will buy a little home with a white picket fence, artificial lawn and raise 2.3 hundred happy, well-adjusted children.[3]

2.1 Specific Rules

1. Every time a mouse enters a room it must print
   ```
   Male Mouse XX enters Room YY.
   ```
   or
   ```
   Female Mouse XX enters Room YY.
   ```
   Mice are tagged with numbers 1 through m inclusive, where m is the number of mice total. Rooms are labeled 1 through n inclusive, where n is the total number of rooms of the motel.
2. There can never be more than two mice in a room at a time.
3. Mice must choose rooms at random to enter.
4. The number of male mice is always equal to the number of female mice.
5. The number of motel rooms is 1 or greater.
6. Every mouse must be a separate POSIX thread in the application.
7. A "mating" is considered to have occurred when a male mice enters a room already containing a female mouse.
8. If a male mouse enters a room that was empty before his entrance then that male mouse will leave the room and choose a different random room in the hopes of finding a female mate.
9. If a male mouse enters a room that already contains a female mouse then those two mice "mate", leave the room and their threads exit/terminate cleanly.
10. If a female mouse enters a room that was previously empty then she stays in that room until another mouse enters.
11. If a female mouse enters a room that already contains a female mouse then both female mice must leave the room and seek a new random room in which to wait for males.

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[1] The English language is sometimes truly weird, there is a whole concept of "collective nouns" that the reader might find entertaining.

[2] In reality mice are not always heterogenous, rarely monogamous nor mate for life. But the course happens to have hypothetical mice with very strict moral values.

[3] The daddy mouse will feel pressured to get a corner office, climb a frustrating corporate ladder and bring home more bacon to send the children to college and pay for the mommy mouse's expensive shoe habit. The mommy mouse will become lonely, accuse the daddy mouse of never being there for the children and sleeping around with his secretary. This will go on for many years. The children will wind up maladjusted from all the parental fighting and yelling. The daddy and mommy mouse, out of some sort of delusional fantasy, will still stay together "for the sake of the children." The daddy mouse will eventually go crazy and since he has agreed to mate for life and can't actually sleep with his male secretary, who he is very attracted to, will opt instead to push the mommy mouse down the stairs when she isn't looking. He will explain to the children through teary eyes that "Mommy had a small accident and won't be able to join us again... ever."

3   Execution

Your program should be named `mmotel` and the instructor will run your program during grading with:

```
$ ./mmotel -n 20 -m 30
```

Where 20 and 30 may be replaced by any valid values.

An example output for `./mmotel -n 10 -m 6` might be:

```
Male Mouse 1 enters room 4
Female Mouse 2 enters room 2
Male Mouse 3 enters room 3
Male Mouse 1 enters room 2
Female Mouse 4 enters room 1
Male Mouse 3 enters room 5
Male Mouse 5 enters room 9
Female Mouse 6 enters room 1
Female Mouse 6 enters room 6
Male Mouse 3 enters room 6
Female Mouse 4 enters room 7
Male Mouse 5 enters room 7
```

4   Deliverables

Upload your C/C++ source code files and any readmes you desire to the appropriate WebCT assignment.