

Monte Carlo Homework

Homework due Friday, October 22:

1. The fish tank simulation code from Section 3.5 of the notes can be downloaded from the webpage, as `fishtankmc2.m`.
 - (a) In this program, `days-for-delivery` is set to 5. What does this actually mean in terms of the way this program is implemented? For example, if a tank is ordered on Day 1, a Monday say, what day would it be delivered?
 - (b) Compare Strategy 1 and Strategy 2 from the notes in the case where the cost of having an overstock of tanks is smaller. Set `overstockloss = .10` instead of `.50` and repeat the comparison shown in Figure 3.2. Comment on what you observe.
 - (c) Note that there is a bug in the code in the notes. The first line on page 21 should read

```
if (mod(day, fixed_delivery) == 0)
```

It turns out this doesn't when testing Strategy 1 or Strategy 2. Why not?
 - (d) Discuss some of the shortcomings of the model used here to simulate the fish tank ordering problem. Suggest another strategy or a different sort of experiment that it would be interesting to test with a simulation. (And do so, if you wish!)
2. Recall the pharmacy problem from the introduction of S. M. Ross, *A Course in Simulation*, Macmillan Publishing Company, 1990:

From the webpage you can download a file `pharmacy.m` which makes a first pass at answering these questions. This code simulates a single day assuming that arrivals are a Poisson process and that the time required to fill each prescription is normally distributed with the given mean and standard deviation.

- (a) Study this program to understand it. Modify it to answer the **first two** questions posed by Ross, by simulating a large number of days.
- (b) Also determine what fraction of the days he will be able to leave at 5:00pm.
- (c) Present a histogram of the distribution of minutes past 5:00pm that the pharmacist will be able to leave, for the days that that this is greater than zero.

Notes:

- For this problem the `find` command in MATLAB may be useful. Here's an example:

```
>> r = rand(1,7)

r =

    0.4057    0.9355    0.9169    0.4103    0.8936    0.0579    0.3529

>> i = find(r < .5)

i =

     1     4     6     7
```

This returns the indices `i` of the array `r` for which `r(i) < .5`. We could now use `length(i)` to determine how many elements of `r` are less than 1/2.

- there will be an orientation in the MSCC lab Monday 3:30 – 4:30pm and I will hold office hours there starting at 3:00pm. There will be some office hours later in the week in the lab as well.
- MATLAB is available on other computers around campus as well (e.g. `saul`) and a Student Edition or Student Version can be purchased for \$99. (See the webpage.)
- A MATLAB tutorial is available in the lab, and several can be found on the web.
- In matlab the `help` command is useful. Type `help find` to learn about the `find` command, for example, or `help hist` to learn about making histograms.