CS 12: Assignment 1

Handed out: January 12, 1996

Due: January 21, 1996

Topics covered

This programming assignment covers covers the use of classes in writing a program that reinforces the use of loops and conditionals. The assignment should give you practice in writing and compiling programs that span several files, and the use of Makefile.

Before you begin writing your part of the program, you will need to get some files from my directory which will be necessary to run the program. You should have already done something similar in lab. To do this:

1. Create a directory called `walk` by typing `mkdir walk` and make it your active directory by typing `cd walk`
2. Type "`cp ~deganit/cs12/code/dice/* .`" which should copy the following files into your directory:
   - *Makefile*
   - *dice.h*
   - *dice.cc*
   - *roll.cc*

As you have seen in lab, `roll.cc` is a file containing a short program that uses the dice class. If you erase everything inside main(), you can use this as the skeleton for your program, or you can use another file with a name of your choice.

Program 1 - Random Walk

A random walk is a concept from mathematics and physics that is used to explain how molecules move in an enclosed space. The idea is that at any time step, motion can occur in any direction. The model can be used to predict how far from its point of origin a molecule will end up after a certain time period, what is the farthest point it will reach within the time period, and how many times it will "visit" a particular point.

In this program, we will examine a simple form of random walk – in one dimension along a line. Imagine a frog that lives in a long, narrow pond covered by lilly pads lined up in a row. The frog decides which way to hop by flipping a coin. If it comes up heads, the frog hops left, tails it hops right. This process repeats a specific number of steps and then stops. In more precise terms, you can imagine the frog on a number line, starting at zero. Based on the result of the coin flip, the frog will add or subtract one from its current position.

Write a program to simulate random walk in one dimension. The walk itself should be in a function which can then be called from the main(). Your function should provide the user with the option of veiwing each step of the walk or just the final position. The function should also keep track of the farthest point from the origin that the frog reaches. For extra credit you can also keep track of the number of times the frog lands on its original position.

Once the function is written, write the main program, which should prompt the user for the length of time the frog should hop, and the printing preference (all or just the final position), and print out the final position of the frog and the farthest point it reached from the origin during its random hops.

Makefile

For this assignment, you should turn in a Makefile with your program. You can write your own makefile or modify the one in `~deganit/cs12/code/dice`. The only requirements are that

(1) the label for the compile command will be `run`, so that you can compile the program by typing `make run`, and

(2) that the executable should be called `hop`.

Turning in your program

You are to turn in both a paper copy and an electronic version of your program. The paper copy should be handed to me at classtime, or placed in the box under the desk in the CS office (A242 Bourns). Please do not slide hardcopies under my door. To print a copy of your program, type `lpr` *filename* (type the name of the file you want to print instead of *filename*), or `a2ps` *filename* to print two pages side by side, with borders and line numbers. `lpr -Phw` *filename* forces the printout to the `hw` printer which is the printer in the Pentium lab.

Electronic turnin procedure:

1. When you are ready to submit your program, get out of the directory `walk` by typing `cd ..`
2. Submit the directory by typing `turnin grad12 walk`

Grading

Programs are due at midnight at the end of the duedate (in this case, the midnight between Sunday the 21st and Monday the 22nd. You lose 5% of the total for each day late, up to one week. Lateness is measured from the time of electronic submission. Assignments are not accepted more than a week late.

Extra credit (+25%)

Random walk where the frog moves on a grid (only four directions).