

CMPT-101/104, Fall 1999, Assignment 3

Introduction

In this assignment, you will write a C++ program that will draw a *fractal* called a Sierpinski gasket. You will get practice using the textbook's graphics library, along with random numbers, functions, and simple loops.

The Sierpinski Gasket

Here is a step by step algorithm for drawing a Sierpinski gasket (or triangle):

- Step 1** Using the mouse, let the user choose three corners points of a large triangle; call these points A, B, C
- Step 2** Plot A, B, C on the screen
- Step 3** Plot the midpoint M of A and B
- Step 4** Randomly choose one of A, B, C; call the chosen point X
- Step 5** Plot the midpoint of X and M; call this new midpoint M
- Step 6** Go to step 4 (or stop if you've plotted enough points to see clearly what is drawn on the screen)

On the right is an example of what your output should look like.

The interior triangles are all similar to the big outer triangle, no matter where the end points of the big triangle are placed. Of course, it is possible that the user will click on three points that don't form a triangle. It's unlikely that they'll do that, but you can add this as your "special feature" for this assignment (see below).

Your program must include, at least, a function that calculates the mid-point of any two points. The function should take two `Point` objects as input, and return a `Point` object that is the mid-point of the two input points. To calculate the mid-point, use this formula: the mid-point of (a,b) and (x,y) is $((a+x)/2, (b+y)/2)$.



What to Hand In

As usual, follow the hand-in instructions available on the course web page. For this assignment, 10% of the mark will be for some extra feature you have added to this program. You must document this extra feature in the Features, Bugs, and Limitations section of your assignment to get these marks. For example, you could add error-checking so the gasket won't be plotted until the user has entered three points that form a triangle. It is up to you to figure out how to do this, e.g. you could look in an algebra or geometry book to find the relevant formulas.

Hand in two different screen-shots showing triangles that look different (e.g. try a big fat one, and a small skinny one). You can make a screen-shot by first clicking on the output window, and then, while holding down the ALT key, press the <print screen> key. This will save a graphical copy of the window, which you can then insert into, for instance, an MS-Word document using the "paste" command.