CSE585/EE555: Digital Image Processing II
Spring 2020
Project #5 — Fractal Generation Using Iterated Function Systems

assigned:	Monday, 12 April 2020
due:	Friday 24 April 2020
reading assignment:	Pentland; pp. L22-9 — L22-20 of the class notes Excerpts on CANVAS from Peitgen & Saupe and Russ

You will generate a fractal image of a fern using the concept of iterated function systems. The readings from the book *The Science of Fractal Images* by H.-O. Peitgen and D. Saupe and *The Image Processing Handbook* by J.C. Russ give the necessary background:

- Subsections 5.3.2—5.4.3 of Peitgen & Saupe give background material.
- Subsection 5.4.4 of Peitgen & Saupe gives the algorithm (Algorithm RenderIFS) you are to implement for generating the fern.
- Class notes L23 also are helpful.

Generate results for Algorithm RenderIFS() for the fern. Use an image size of 512×512, or.... A 1024×1024 size could actually give you a finer detailed result. But it will be difficult to squeeze this image size into your report.... But you could generate the 1024×1024 and then shrink it to fit it into your report!.... I will leave it to you to pick the starting seed point. (Also, note that x and y can go negative - this, of course, affects the grid.)

- Page 23-11 of the class notes gives the table of necessary transformations. For these four transformations, use the probabilities 0.2, 0.35, 0.35, and 0.1.

  Give results for varying numbers of iterations as follows: num = 100, 5000, 10,000, 20,000, 100,000, 500,000, 1,000,000, 10's of millions (when you stop!). ***(This method takes a LOT of iterations!!)*** Try to run the algorithm long enough to "fill in the fern."

- Try different probabilities p_i; in particular, zero out one transform at a time (i.e., try $p_1 = 0$, $p_2 = 0$, etc.), and see what you get. Only give your FINAL result after "many" iterations for these cases (i.e., a result that clearly shows a converging structure).

Write a detailed report describing your results and implementations.