Assignment 1 Design.pdf

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1 Description of my Program

The purpose of this program is to create aesthetic PDF files related to the Monte Carlo estimate of *pi*. This program is a bash script which takes the pre-built *monte_carlo.c* file and outputs a PDF of the simulations which the bash script generates. The program will generate:

1. A graph of a Quadrant of a 1 x 1 square with 1000 randomly generated points that are in a ration of 1 : *pi* according to the line.
2. Another graph of multiple lines displaying, seeding randomly per line, the error between the instance and the true value of *pi*. The error gets smaller and smaller as the iterations/sample sizes increase.

2 Files to be included in directory of "asgn1":

1. plot.sh: Bash script which uses the prebuild monte_carlo.c file and generates "-n" iterations randomly which is then stored into .dat files. It then runs gnuplot, pre-setting visual effects while also setting things like sizing, ranges, scaling, output, setting terminal to pdf, and ploting the .dat files into a pdf.
2. monte-carlo.c: C file which prints [Iterations, Estimate of *pi*, Random x, Random y, and if within the circle(0 or 1)].
3. Makefile: Sets rules, formats, cleans, and compiles files within asgn1
4. README.md: Text file in Markdown format which goes over building, and running plot.sh. Also goes over inputs, and problems while developing plot.sh
5. DESIGN.pdf: Describes design for program with pseudo code.
6. WRITEUP.pdf: Includes plots produced by the bash script and description of commands within bash script.

3 Psudocode:

Since there are two figures in which I will be generating, I will go over both of them generally then get more specific for each one:

1. In you bash, you want to start with a shebang that tells the terminal that when running plot.sh to use bash to execute it.
2. Using make files, make clean and make monte_carlo
3. Then generate 1 data set for monte_carlo (ratio in a quadrant) which takes ./monte_carlo -n [number of lines generated] and randomly generate these instances which we will then redirect into a .dat file.
4. Then for the estimation error plot, we will generate 4 plots using the same method as listed above but because this is 4 plots, we will write out 4 different .dat files.
5. Now enter gnuplot <<END to enter gnuplot Now I will go into the specifications for each plot.
6. Starting with the ratio in a quadrant, you must:
   (a) Set terminal to pdf
   (b) Set output to a .pdf in quotations
   (c) You may set the cosmetics in my case I set the shape to a square, and a few other line options and point sizings but that is up to you.
   (d) To get rid of the legend you can set the legend to nokey Plot the graph by taking the .dat file associated with the ratio in quadrant instance. Then using only the 3rd, 4th, and 5th columnns of data in your .dat file, you will plot the (x,y) coordinates then, based on whether the result of your point is in the circle you will change the color of the point accordingly.
   (e) Lastly draw the arc of the circle to identify where the ratio will be splitted.
7. Next will be the creation of the estimation error:
   (a) Since the terminal is set to pdf it isn't required again
   (b) Output to a differently named .pdf from the previous example
   (c) Set ranges starting from 1 along the x and from -1 to 1 for the y range
   (d) Scaling the scale of the x-axis to log based 2 will allow for visualization of the relatively large data set
   (e) Again for cosmetics you may do the same as before but this time you may also set grids if you want and an xlabel and a ylabel for more transparency

(f) Begin plotting the .dat of all four data sets by subtracting each y value by *pi* because doing so will give us the estimation - actual.

8. Lastly end your gnuplot on the last line.

4 Credit:

1. I went through piazza posts stumbling upon Audrey Ostrom's post about how to write a design document. Her post heavily influenced the structure and the basis of the content which my design document will be based on

2. While going to TA sections I want to credit John Yu, as he provided me will tips and also examples to go off of.

3. Due to swapping in late, I really want to thank Omar Ahmadyar, his patience, professionalism, and communication were all reasons that allowed me to finish this assignment in a timely manner. He also assisted me with problems with setting up ubuntu which I am grateful for

4. I want to credit MathAndPhysics who is a youtuber who does gnuplot tutorials as all his videos are incredibly informal and helped a lot when doing cosmetic edits to my plots.

5. Lastly, I will credit Darrel Long as I used many of his pdfs as examples for many of my writings.

5 Images:

Will be displayed in the WRITEUP.pdf