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Fundamentals of Programming and CS

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November 23rd 2015

Project Proposal

For my project, I intend to do an interactive circuit lab (no, not the same thing as hw 8!) that allows users to create a circuit with RLC circuits, AC and DC power sources, and then determine the voltage across and current through each circuit element. My project will really consist of three main parts: the actual circuit solver, the transient analysis for voltage and current vs. time, and then the image recognition of hand-drawn circuits.

First and foremost, I must be able to correctly get a circuit solver to work. This is the basis of “C” level work. For starters, I must have the program capable of determining the voltage through and the current across each element at time zero and infinity. This is obviously only true if I have DC sources. If I have even one AC source, then I can neither have a voltage nor does a current at time equal infinity. This is because an AC source alternates, meaning that there is not endpoint to the current or voltage. The program must be able to detect if there is an AC source and then not provide a voltage and current at time = infinity. If I get this aspect of the circuit project to work, I have my basic core down.

Next, I will augment my project with a transient analysis. In order to perform this transient analysis, I will have to utilize numpy and matplotlib, which are two modules relevant for plotting graphs. Basically I will have to select a circuit element and then do a transient analysis on it. The transient analysis will delineate both current vs. time and voltage vs. time graphs. In order to do this, I will need to use the “e” (voltage growth/decay) formula for each element. The difficult part of this will be to get it to work with AC (I will only use square waves). During AC, I have to monitor when there is a switch of voltage. When the voltage switches, I will have to then go reset my time value to zero and do the exponential growth/decay again.

Lastly, I will attempt an image recognition using OpenCV. This will arguably be the most difficult part of my project. In doing an image recognition, I will have to determine whether I have a current/voltage source by using Hough’s circle transformation, and then I will have to do Hough’s line transformation within the circle to determine if I have an AC/DC current source or voltage source. Then for my RLC, as well as my wires, I will have to do more wire analysis to get the program to recognize the RLC elements.

If my project goes as plan, I will have a robust circuit solver with RLC elements followed by a transient analysis and potentially image recognition using OpenCV.