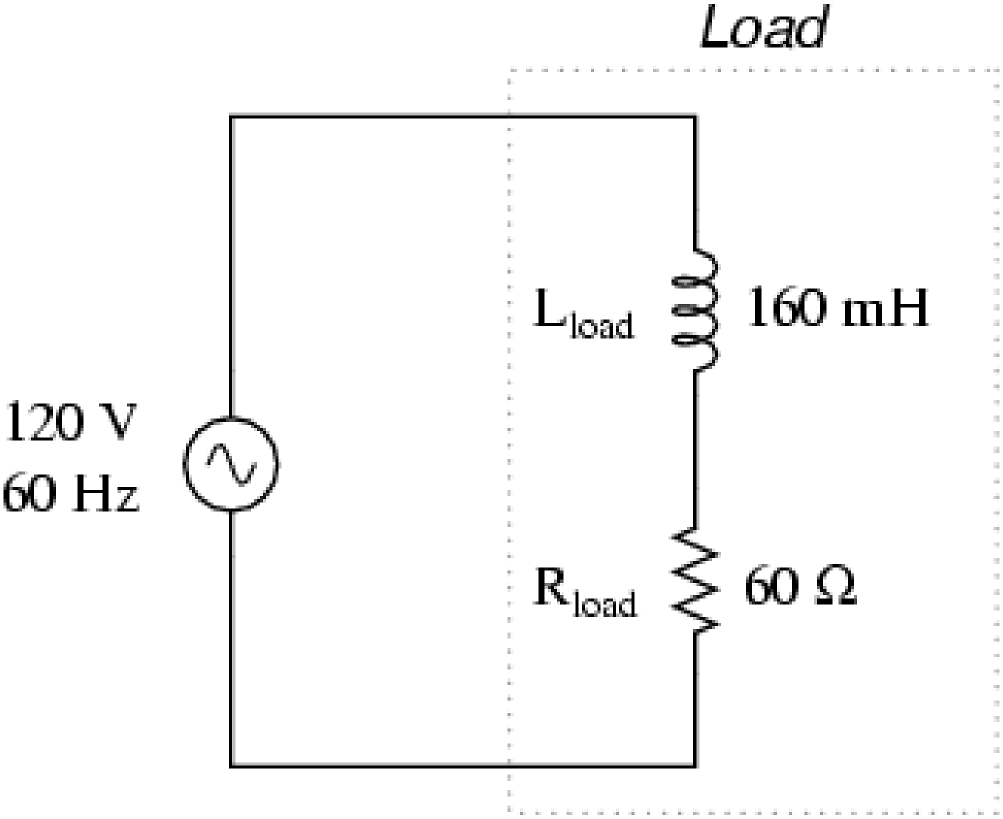
Design Document

Assignment 2-Circuit Solver



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Overall Design

In this project the input is given in the standard SPICE NETLIST format that is read by parser which checks any syntax error if they exist.Then the parser generates a context free language that stores all the parsed data in a structure named component which is used by the display function to make diagram of the circuit in svg format.

To make the resulting SVG zoom-able, we have used an external git repository ”svgpan.js” which embeds the output.svg image and displays the zoom-able image in a web browser. The files which make output.svg zoom-able are present in the thumbnailViewerfiles folder.
reference: https://github.com/ariutta/svg-pan-zoom

1 Sub components:

1.1 Class display.cpp :

This class contains functions to draw components like resistor, inductor, capacitor, ground, wire and text symbols. The class has a default constructor which creates the output.svg file and then writes the basic structure of the svg code.It also has a default destructor (display) which closes the svg tags and closes the file handle.

1.2 Header display.h :

This file is the header file for display.cpp class which contains function definitions for default constructor, destructor, and for functions like resistor,inductor, capacitor, ground, wire and text which write the respective codes in output.svg file. The header file also contains one private variable that is name of the file variable.

1.3 structure component :

This structure stores the information of all the components and all the other details like the starting and ending nodes. It also stores the information of the power source like amplitude, dcoffset and other information.

1.4 Class main.cpp:

This class is the brain of the whole project which does the appropriate calculations and calls the required functions.

The functions in main.cpp class are as follows:

1.4.1 display circuit function:

It sorts the structure using radix sort and the calls the draw function which draw the wires and other components.

1.4.2 draw function:

It draws wires taking caution that wire do not intersect with each other.

1.4.3 specialsort function:

This function is responsible to do the radix sort.

1.4.4 writecomponents function:

This function calls the display.cpp class functions which in turn draws the components in the svg file.

1.4.5 parser function:

This function populates the vector of the structure using top.cir.

1.4.6 solver.cpp class:

This part of C++ program is responsible for solving the AC circuits. It calculates the voltage difference and current flowing through all the components. Then it stores all this information of the components in a structure from which this information is written in the svg file. The voltage difference and the current is calculated using basic physics kirchoff's law. The phase difference is taken positive in clockwise direction. This assumption is used in every loop of the circuit as th phase differnece is a relative term.

2 Testing:

GDB is used to track any error during testing.

2.1 Testing of the sub components:

2.1.1 Parser:

Lex and Yacc are tested by running all the permutation and combinations, also considering the corner cases where major errors can occur.

2.1.2 display class:

The function of the display class is tested by drawing various different complex circuits like 20 parallel resistors, 15 series inductors etc.

After the completion the test cases given by the instructors are also tested thoroughly.

2.1.3 solver.cpp:

Solver.cpp is tested by drawing some pre-solved circuit and then checking the calculated answer with the original answer.

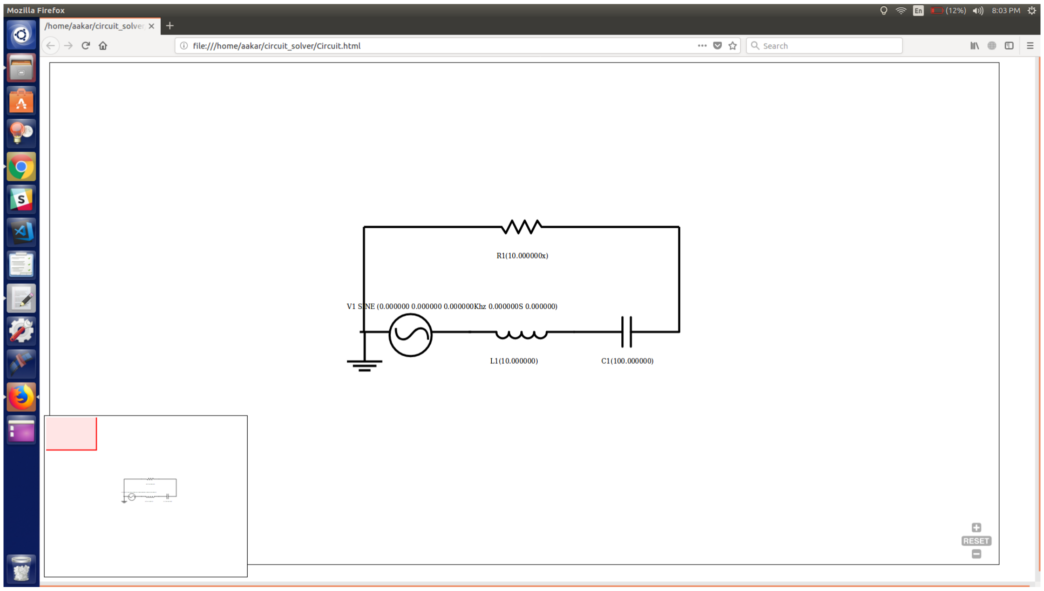
3 Sub-components Interaction:

The object of the structure is shared by various sections of the program using extern keyword. Major interaction is happening because of this structure component which components all the data of the circuit.

4 Additional Features:

There is an additional feature of zoom-able image in this project in which you can also zoom the generated svg image.The image can be moved by holding and moving the mouse, rolling the mouse wheel increase and decreses the size of the image. Also we have implemented a thumbnail features in which you can see the portion of the svg image which are you currently looking. To implement this we have used the SVG PAN library.

reference-https://github.com/ariutta/svg-pan-zoom


Mozilla Firefox
(12%)
8:03 PM
/home/aakar/circuit_solver
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Search
R1(10.000000x)
V1 SINE (0.000000 0.000000 0.000000Khz 0.000000S 0.000000)
L1(10.000000)
C1(100.000000)
RESET

This is the image of the RLC circuit drawn using our application. There is a thumbnail viewer which shows the portion of the svg you are currently looking at.