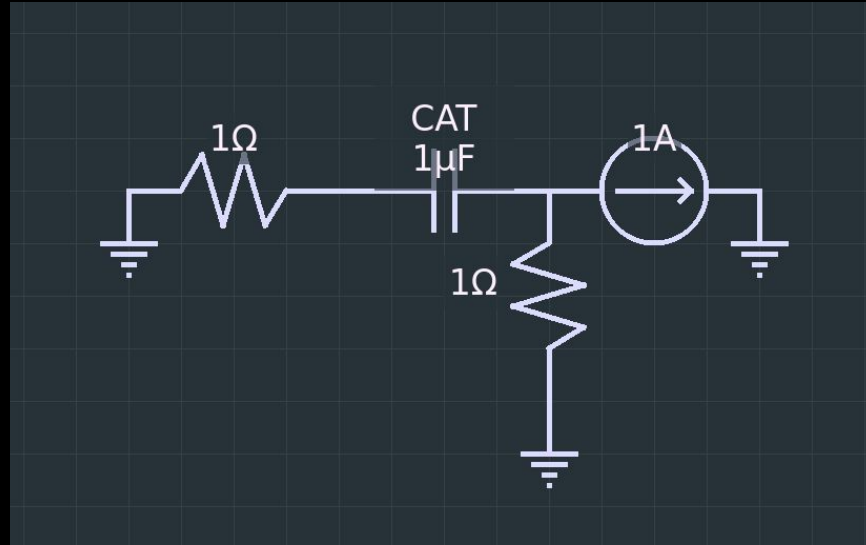


Circuit Analysis Tool

Martin Duffy



What is the Circuit Analysis Tool?

(it's a placeholder project name...)

- The goal of this project is to provide a platform for circuit analysis
- Unlike SPICE and its derivatives, this project aims to provide algebraic and symbolic analysis rather than accurate simulation
 - This will allow for variable components and mathematical representation of outputs over the time or frequency domains
 - ***There is currently no graphical toolkit that has this kind of circuit solving functionality! It's a one of a kind, and extremely useful!***

Technical Information

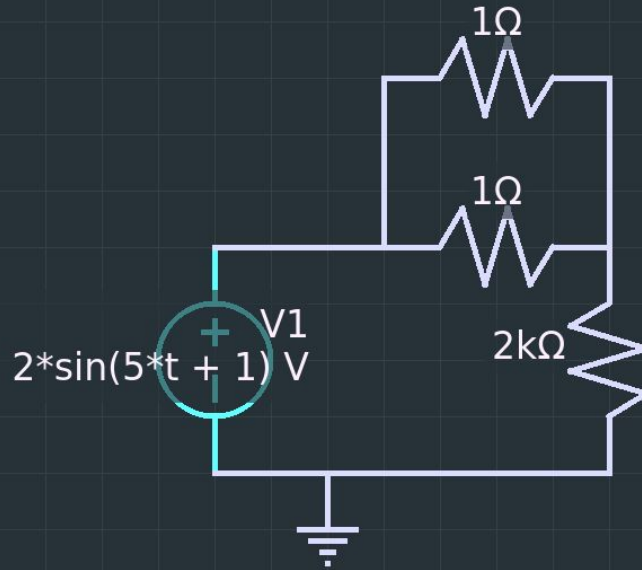
- Language: Python
- Libraries:
 - *PyQt5*: cross platform gui
 - *Scipy*: equation manipulation and display
 - *Lcapy*: linear circuit analysis
 - *Matplotlib*: graphing

Progress this Semester...

- Started from scratch!
 - 2,557++ 276-- lines of code later...
 - Basic graphical interface created
 - Solve variable dependent and time dependent circuits!
 - Supported components
 - Voltage Source, Current Source, Resistor, Capacitor, Inductor
 - Supported domains
 - Time (t), Frequency (s)
 - Save, and Load Circuits!
 - Easy color scheme and controls configuration!

Let's see some screenshots!

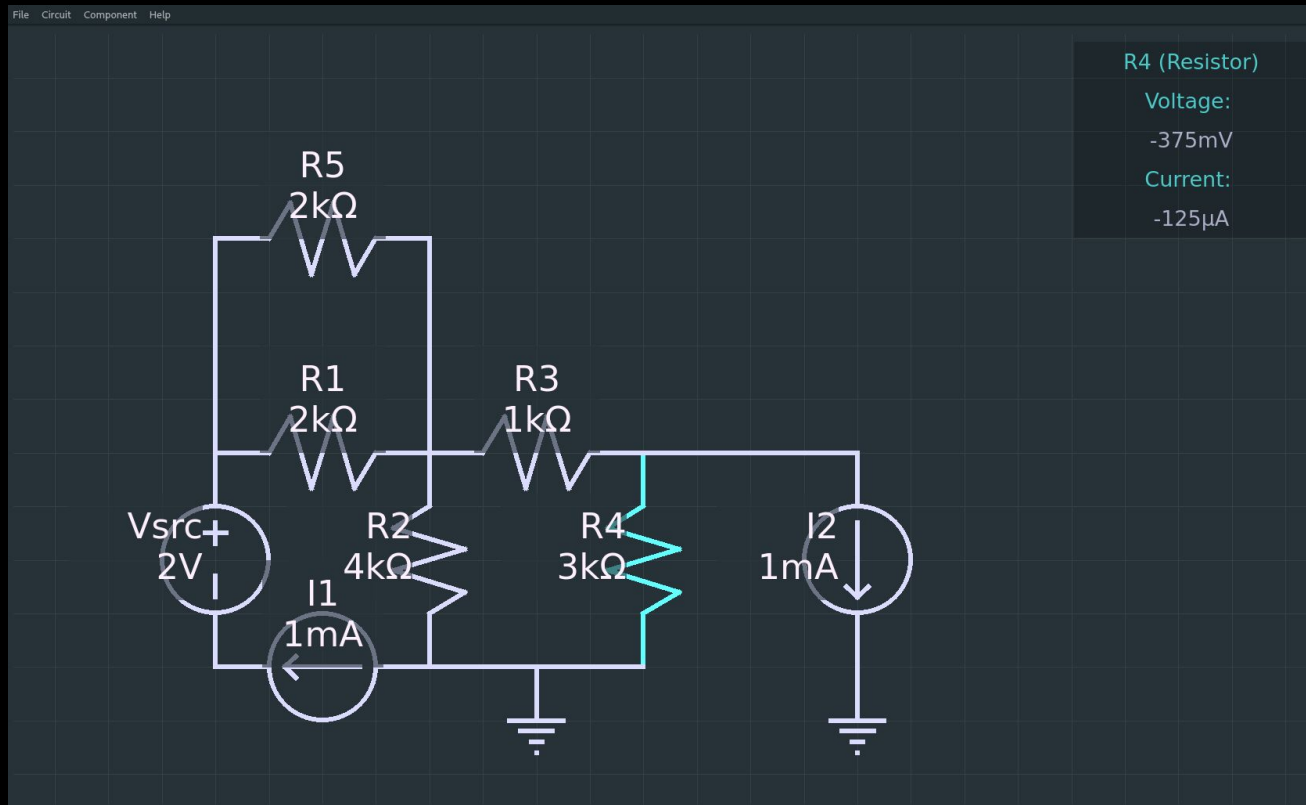
Edit Component Values!



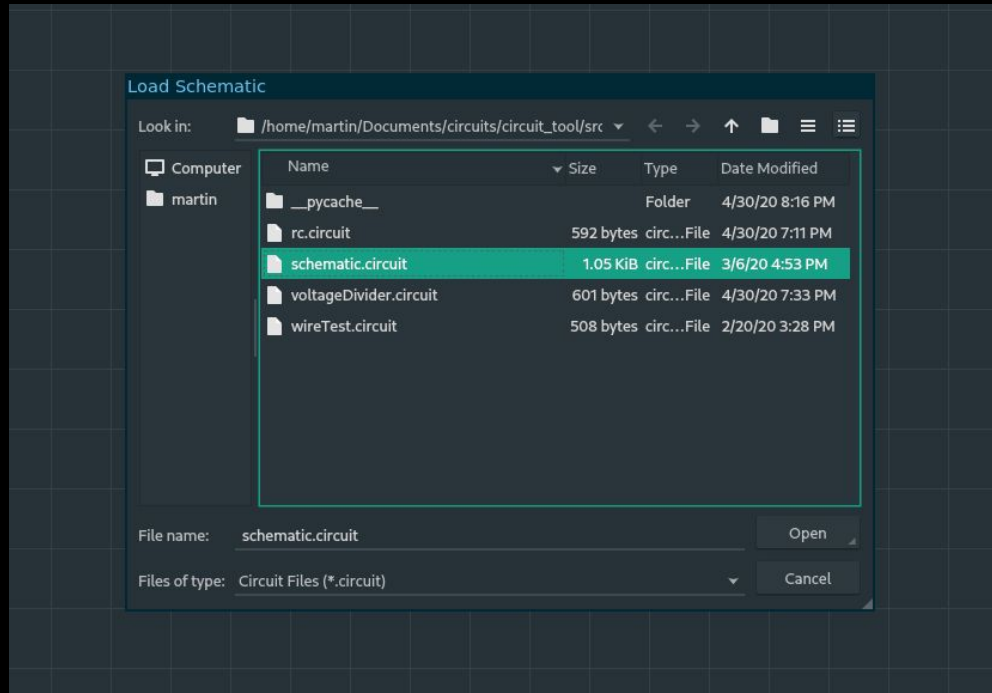
Edit Voltage Source

Name	V1	<input checked="" type="checkbox"/> show
Voltage	$2*\sin(5*t + 1)$	
Unit	V	
<input type="radio"/> Number <input checked="" type="radio"/> Expression		
ok		delete

Solving Resistive Circuits!



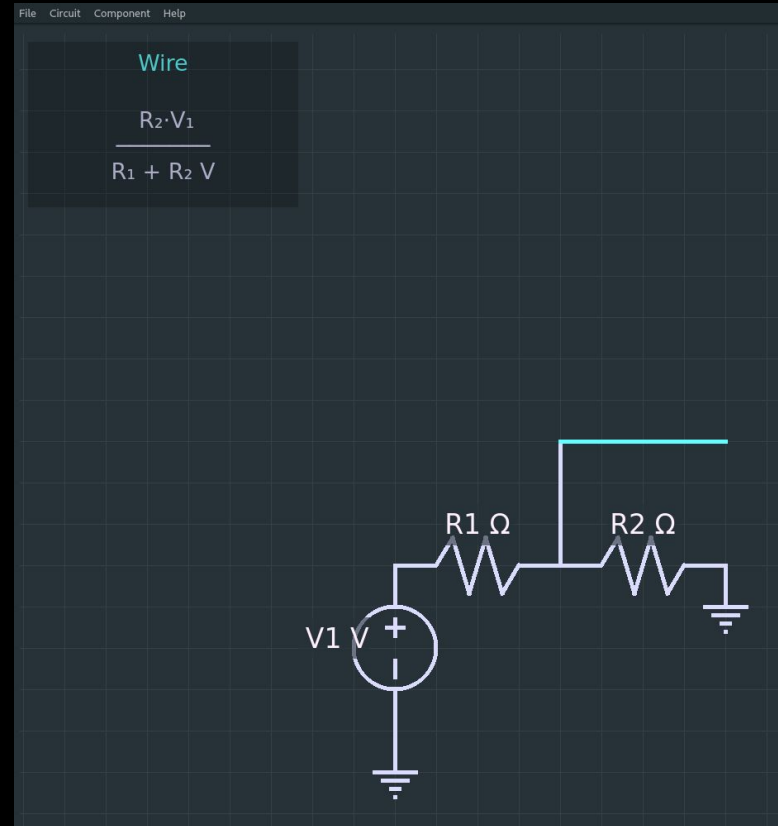
Save and Load Circuits!



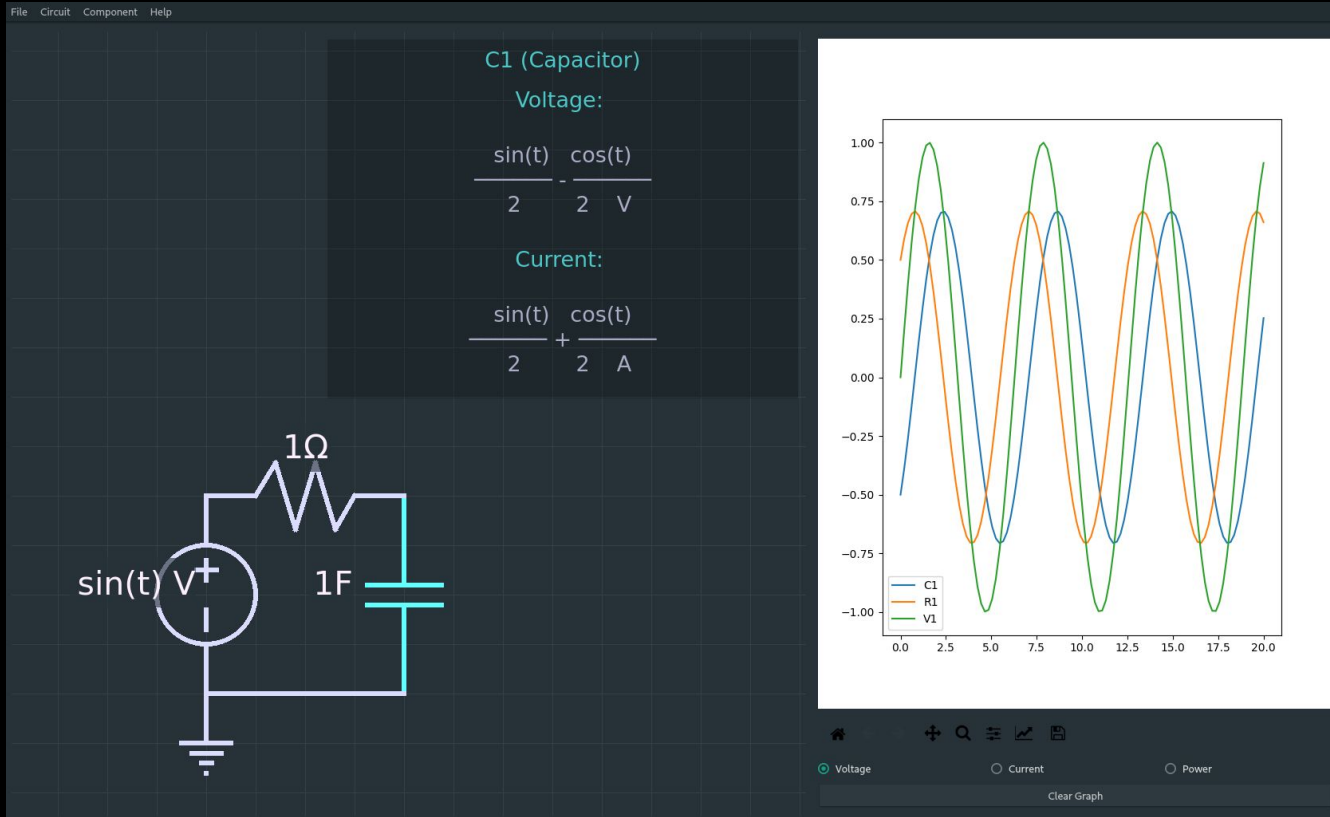
Voltage Divider!

Uses variable values for components!

Get an equation for a measure in terms of the components!



Graphing!

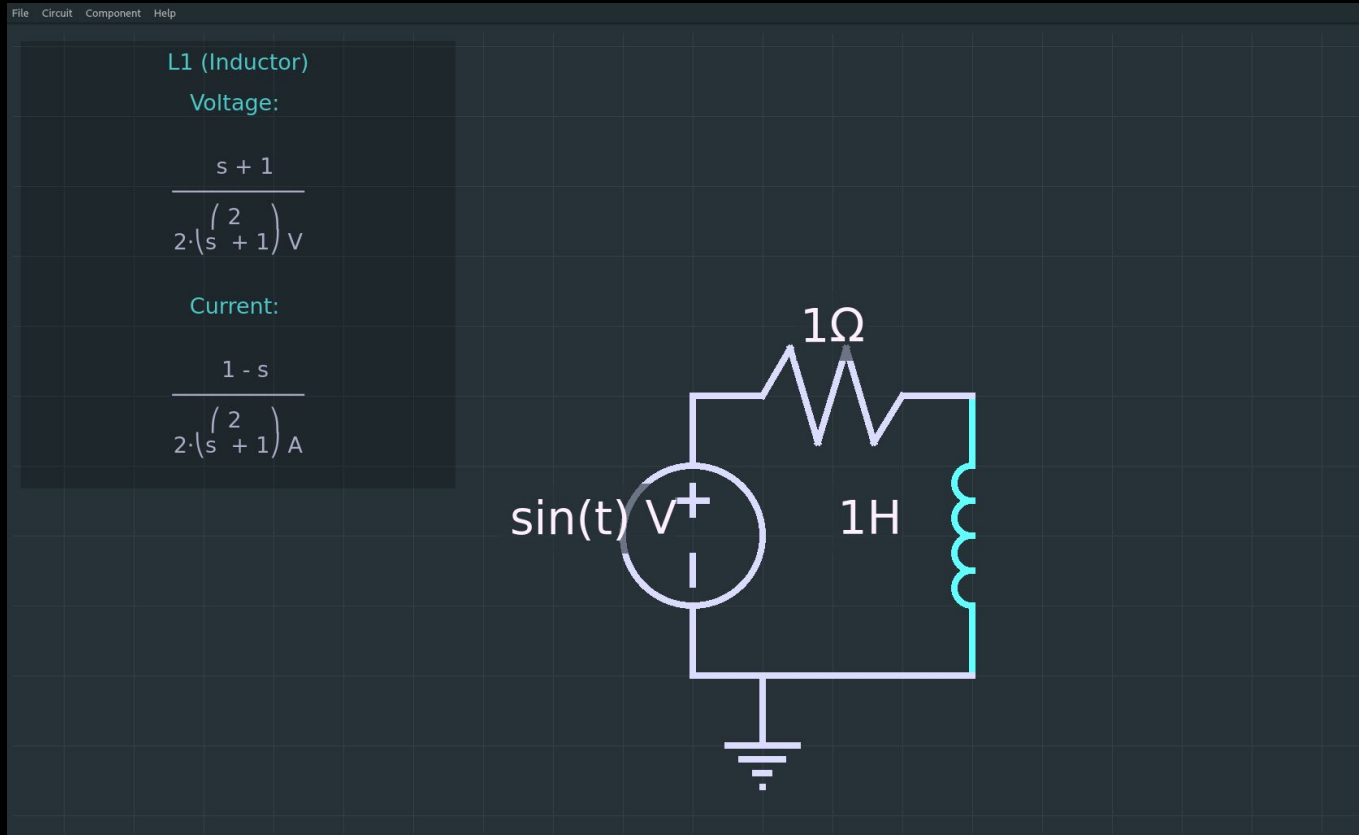


Thanks Matplotlib!

Compare Different
Components!

Change Graph
Measure! (Voltage,
Current, Power)

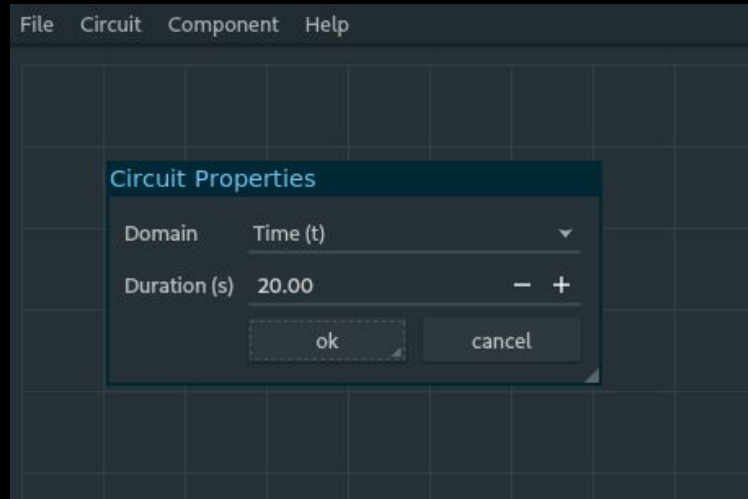
Solving in the Frequency Domain!



Thanks scipy for text representation of complex formulas!

Now need to find a font that supports it better, so we don't have broken parenthesis...

Configure Circuit Solving!



What's Next?

- Support for Op Amps
- Improve display of complex formulas
- Support initial conditions for capacitors and inductors
- Improved user interface
- Dependent voltage and current sources
- Interactive Mode!
 - Switches, lights, and real time analysis!
- Better handling of edge cases
 - Certain unsolvable circuits currently crash the program!