Project Overview

This software was created to simulate simple DC circuits. Given a voltage source, a resistor, and a resistive load element, the simulator can calculate the current going through the circuit and use it to find the voltage at the bus the load is connected to.

Class Diagrams

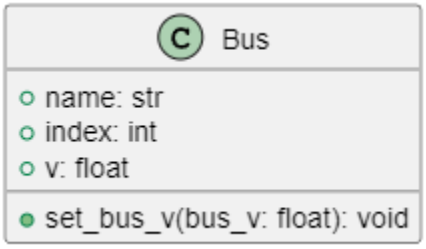

Figure 1: Bus Class

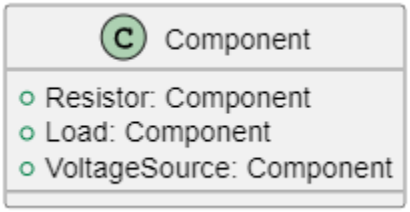

Figure 2: Component Class

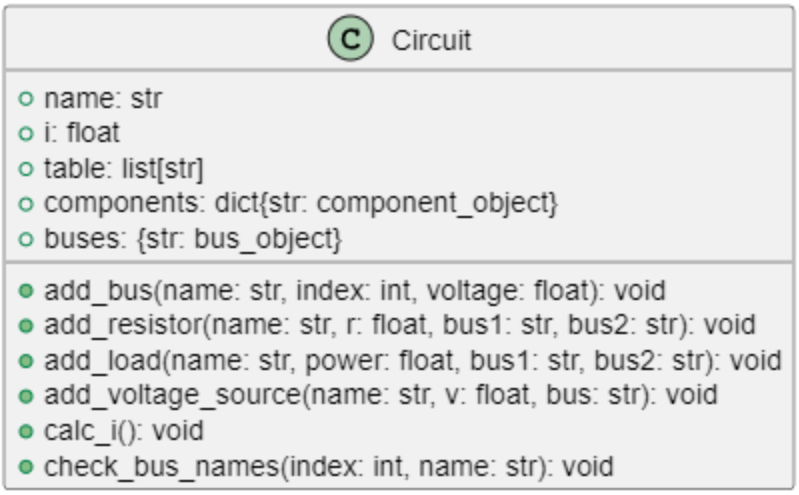

Figure 3: Circuit Class

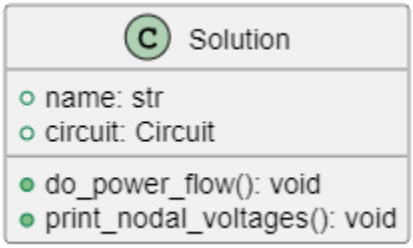

Figure 4: Solution Class

Relevant Equations

Since this simulator only solves simple linear DC circuits, the equations used are quite straightforward.

Load Resistance

For this software, we're only be using two resistors, R_1 and R_2. R_2 is found by using the following relationship,

$$R_2 = \frac{V_{Load}^{\ 2}}{P_{Load}}.$$

Current

In general, the current through any series-connected circuit is given by the following equation.

$I = \frac{V}{R_{eq}}$, where $R_{eq} = \sum_{i=1}^{n} R_i$, or in words, the sum of all the individual resistive elements in the circuit.

We're only using two resistors, so for our purposes,

$$I = \frac{V_{source}}{R_1 + R_2}.$$

Bus Voltage

After the current through the circuit is found, we can find the voltage at *Bus2* by using Ohm's law,

$$V_{bus2} = IR_1.$$

Example Case

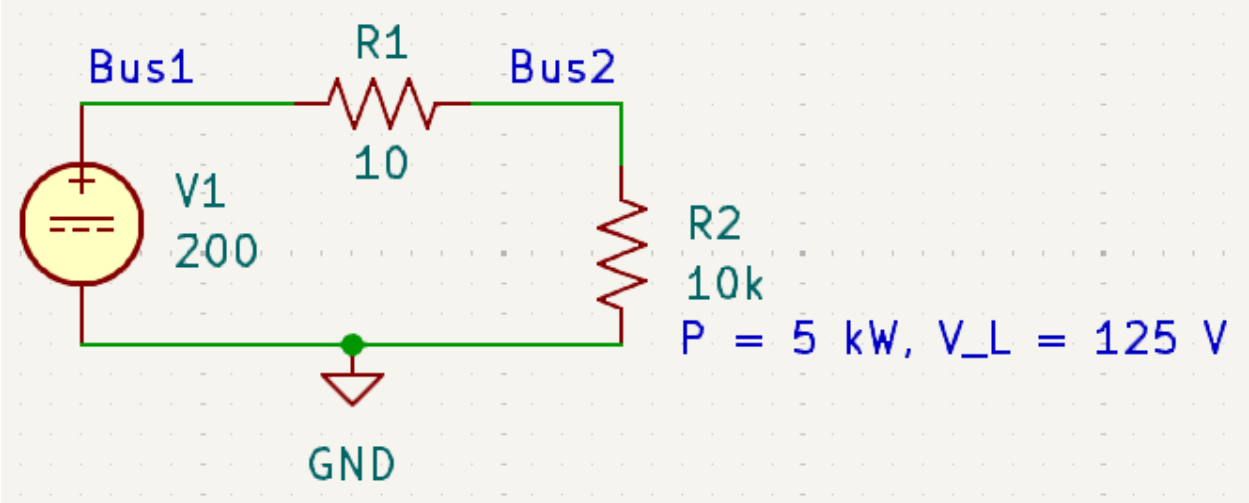

Figure 5: Example Circuit

Let's say we have the following circuit shown above. We want to find the voltage at *Bus2*. We have a resistive load, *R2*, operating at 125 V and consuming 5 kW of power. A 200 V

DC source supplies the circuit, and a 10-ohm resistance is seen between the source and load. Following **Figure 6**, enter the information for your respective circuit, and the results will be displayed as seen in **Figure 7**.

```
#  Example Case
circ2 = Circuit.Circuit("MyFirstCircuit")
circ2.add_bus("bus1", 1)
circ2.add_bus("bus2", 2)
circ2.add_voltage_source("V1", 200,"bus1")
circ2.add_resistor("R1", 10, "bus1", "bus2")
circ2.add_load("load1", 5000, 125, "bus2")
circ2.calc_i()
solution2 = Solution.Solution(circ2)
solution2.do_power_flow()
```

Figure 6: Creating Circuit

```
Equivalent series resistance = 13.125 Ω
Circuit current = 15.238095238095237 A
Bus #0, 0 V
Bus #1, 200 V
Bus #2, 152.38095238095238 V
```

Figure 7: Example Results