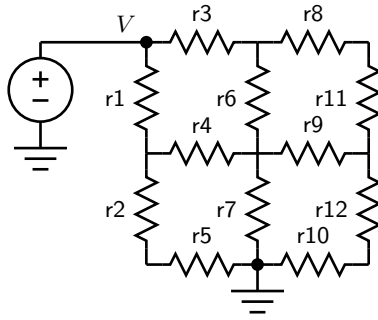


Numerical Analysis

Homework 12. Nonlinear Resistor Networks

Due: June 2, 2015

In this home work, we revisit the resistor network but this time the network consists of nonlinear resistors. The network of interest is shown below.



1. Assuming all resistors have the following resistance.

$$R_i = R_0 + \alpha V_i, \quad (12.1)$$

where $R_0 = 1\Omega$, $\alpha = 0.1$, and V_i is the voltage across the resistor.

- 1.1. Please find the total current supplied by the voltage source as a function of V , $V = 0, 0.1, \dots, 5$ volts.
- 1.2. For each value of V , find the current through resistors r_2 , r_7 , and r_{12} .

2. Assuming all resistors have temperature dependent resistance as

$$R_i = R_0 + \kappa T_i, \quad (12.2)$$

$$T_i = \frac{\beta V_i^2}{R_i}. \quad (12.3)$$

where $R_0 = 1\Omega$, $\kappa = 1$, $\beta = 1$, T_i is the temperature increase for R_i and V_i is the voltage across R_i .

- 2.1. Please find the total current supplied by the voltage source as a function of V , $V = 0, 0.1, \dots, 5$ volts.
- 2.2. For each value of V , find the temperature increase for resistors r_2 , r_7 , and r_{12} .

Notes.

1. For this homework you need to turn in a set of C++ source codes. That includes `hw12.cpp`, which solves question 2 above, `MAT.h`, `MAT.cpp`, `VEC.h` and `VEC.cpp` files.
2. A pdf file is also needed. Please name this file `hw12a.pdf`.

3. Submit your files on EE workstations. Please use the following command to submit your homework 12.

```
$ ~ee407002/bin/submit hw12 hw12a.pdf hw12.cpp MAT.h MAT.cpp VEC.h VEC.cpp
```

where **hw12** indicates homework 12.

4. Your report should be clearly written such that I can understand it. The writing, including English grammar, is part of the grading criteria.