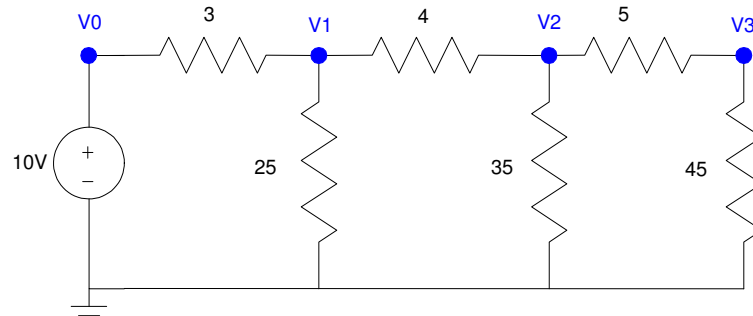


ECE 476/676 - Homework #6

Math, Random, and Matrix Routines - Due Monday, October 13th

Matrix Functions

1) Determine the voltages $\{V_0, V_1, V_2, V_3\}$ using matrix functions with Python



a) Write the voltage node equations for this circuit

b) Express these equations in matrix form

c) Solve using matrix operations in Python

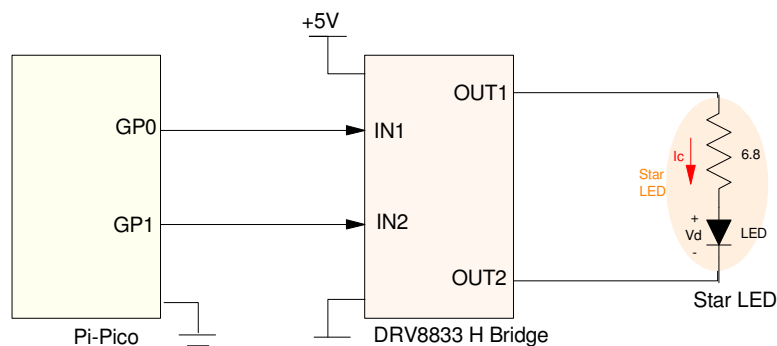
2) Check your answers using CircuitLab (or Matlab)

Candle Flicker (Hardware)

3) Set up a circuit so your Pico can turn a white LED on and off

- H-bridge works (overkill, but works)
- 6144 Transistor works

Verify you can turn the LED on and off with the Pico



4) Flicker (take 1): Make the LED flicker using PWM

- Let X be the brightness of the LED
 - X has a uniform distribution from 0% to 100%
- Let Y be the sampling rate (how often X is updated)
 - Y is 100ms (fixed)

Give you opinion for how much this looks like a candle flickering

- kind of subjective

5) Flicker (take 2): Repeat, only

- Let X be the brightness of the LED
 - X has a uniform distribution from 0% to 100%
- Let Y be the sampling rate (how often X is updated)
 - Y has an exponential distribution with a mean of 100ms

Give you opinion for how much this looks like a candle flickering

- kind of subjective

6) Flicker (take 3): Repeat, only

- Let X be the brightness of the LED
 - X has a normal distribution with a mean of 50% and standard deviation of 20%
- Let Y be the sampling rate (how often X is updated)
 - Y is 100ms (fixed)

Give you opinion for how much this looks like a candle flickering

- kind of subjective

Demonstration

7) Demonstrate what you think is the best flickering candle

Bonus! Use the touch screen to select the distribution of the flicker:

- Uniform (problem 4)
- Exponential (problem 5)
- Normal (problem 6)

By using the touch-screen, you can change the flicker distribution on the fly.