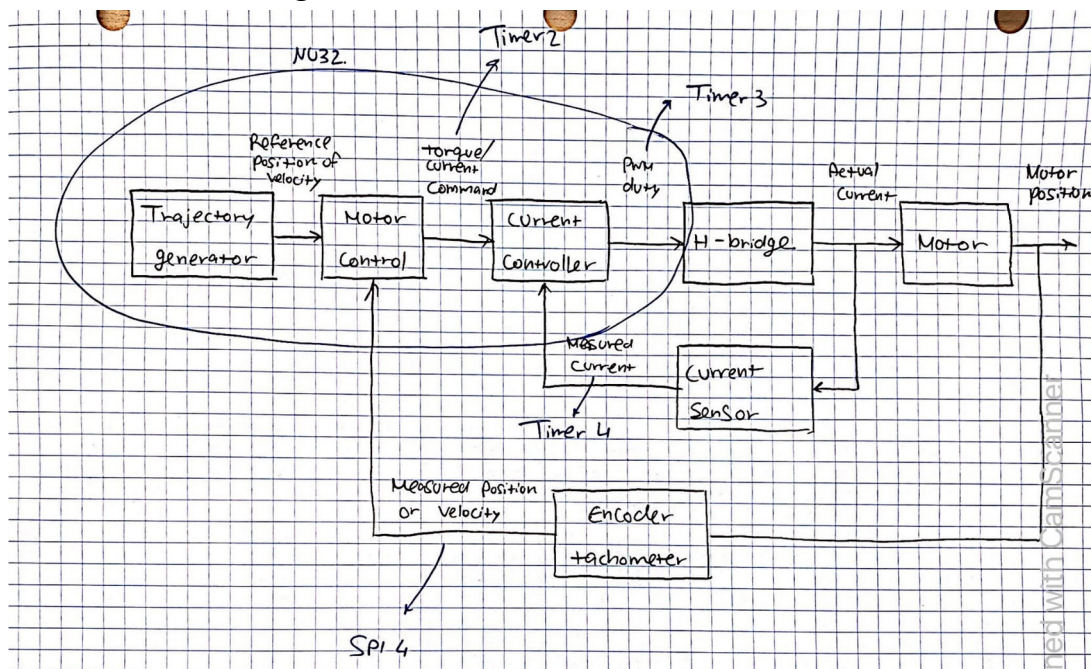


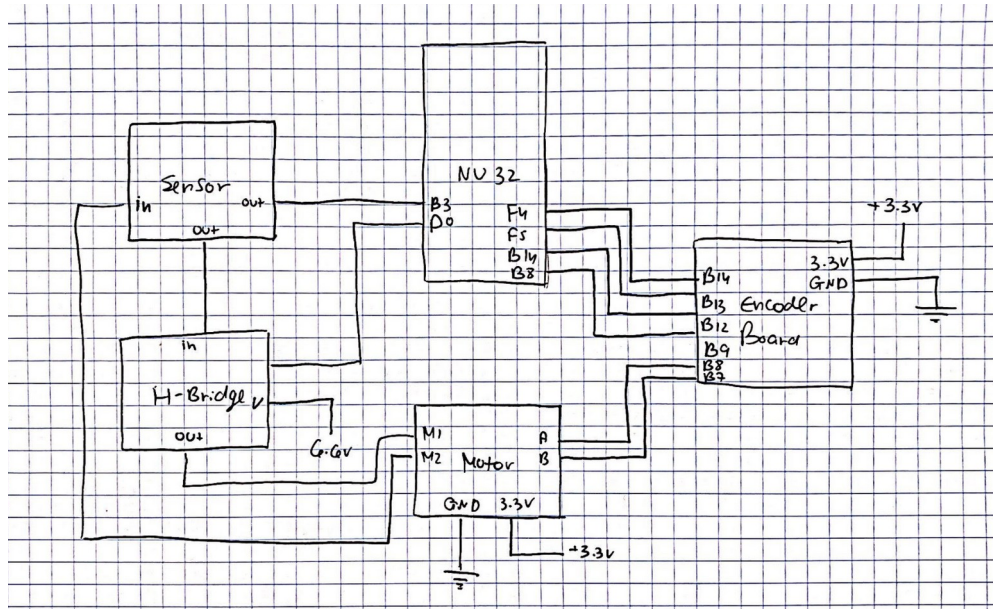
## ME333 – Final Project – Yael Ben Shalom

### Chapter 28.4.1:

1. For the encoder counter communication, I used SPI channel 4. It uses NU32 pins B14, F4, and F5.
2. For the MAX9918 current sensor reading, I used ADC input AN3 (NU32 pin B3).
3. For the DRV8835 H-bridge control, I used PWM OC1RS and Timer3 (NU32 pins RD0 and RD11).
4. To implement the 200Hz position control ISR I used Timer2 (priority 5), and to implement the 5kHz position control ISR I used Timer4 (priority 4).
5. The annotated block diagram:



6. Sketch of the proposed layout of the circuit boards relative to the NU32:



#### Chapter 28.4.7:

1. I chose  $R_3$  to be  $330 \Omega$ .

2.  $V = 6V$

$$R_{\text{motor}} = 3.2 \Omega$$

$$I_{\text{max}} = 2V / R_{\text{motor}} \rightarrow I_{\text{max}} = 3.75 \text{ A}$$

3.  $I = I_{\text{max}} = 3.75 \text{ A}$

$$R = 15 \text{ m}\Omega$$

$$V = IR \rightarrow V_{\text{max}} = 0.056 \text{ V}$$

4.  $1.65V = G \times V_{\text{max}} \rightarrow G = 1.65V / 0.056V = 29.46$

$$G = 1 + (R_2 / R_1)$$

$$29.46 = R_2 / R_1 \rightarrow R_1, R_2 = 10,000 \Omega, 300,000 \Omega$$

5.  $f_c = 200 \text{ Hz}$

$$f_c = 1 / (2\pi RC)$$

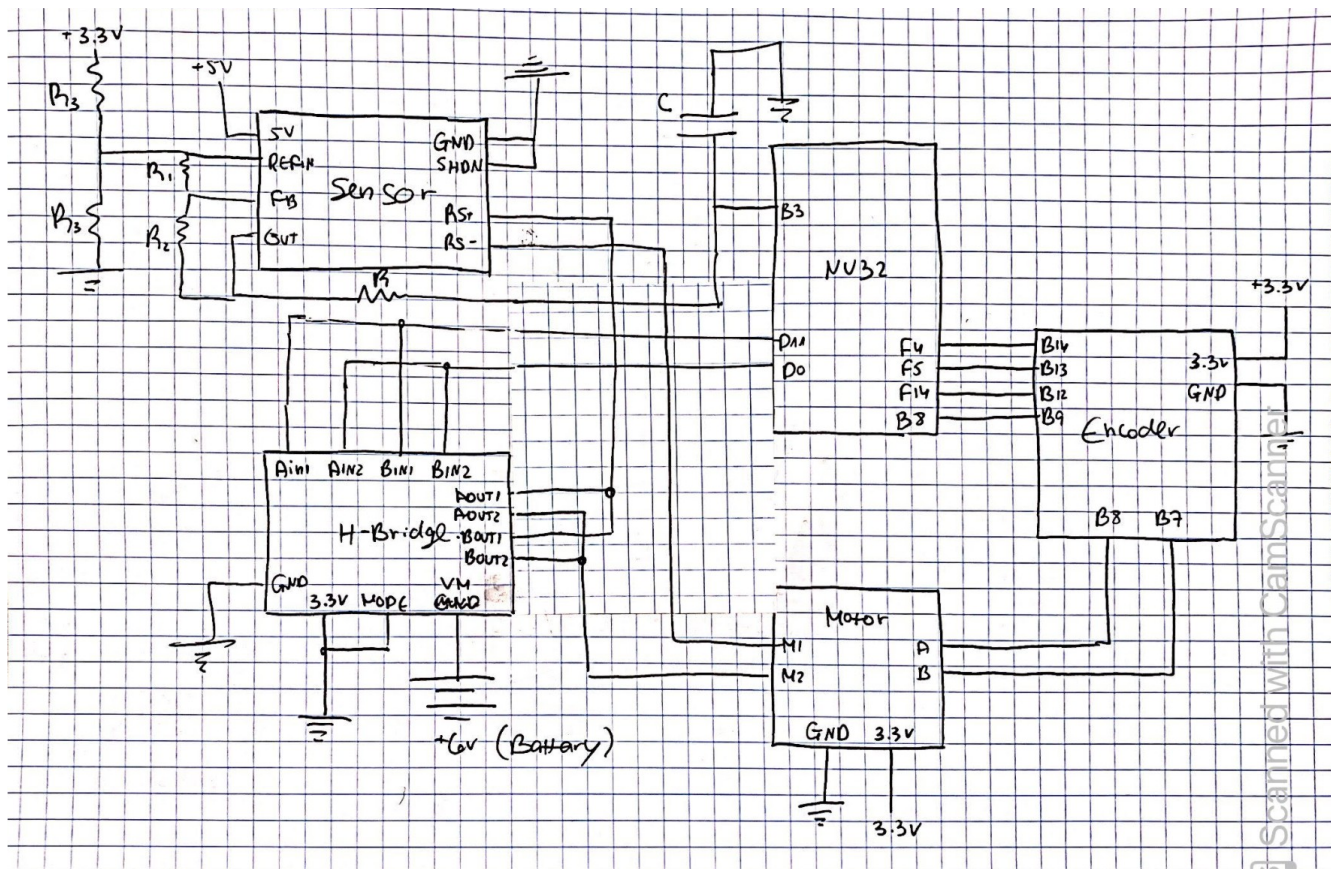
$$RC = 0.000796 \rightarrow C = 1 \mu\text{F}, R = 830 \Omega$$

6. A table for My particular resistances and battery:

R0 ( $\Omega$ )	Expected Current (mA)	Measure Current (mA)	Sensor (V)	ADC Counts (Count)
10 (RS+)	600	520	1.89	654
20 (RS+)	300	290	1.77	610
40 (RS+)	150	150	1.71	587
Open Circuit	0	0	1.64	560
40 (RS-)	-150	-150	1.56	535
20 (RS-)	-300	-290	1.49	511
10 (RS-)	-600	-520	1.37	470

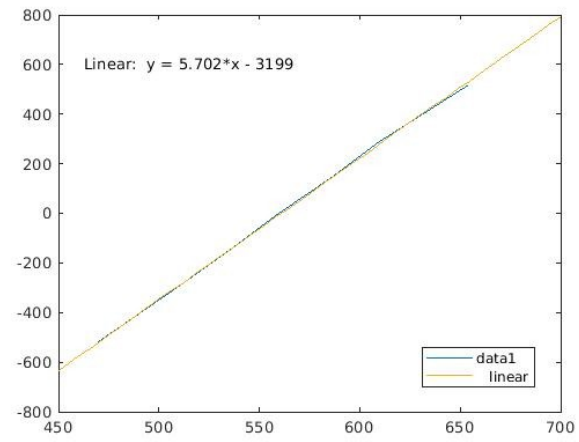
#### Chapter 28.4.9:

My circuit diagram showing all connections of the H-bridge to the NU32, motor, and current sensor PCB:

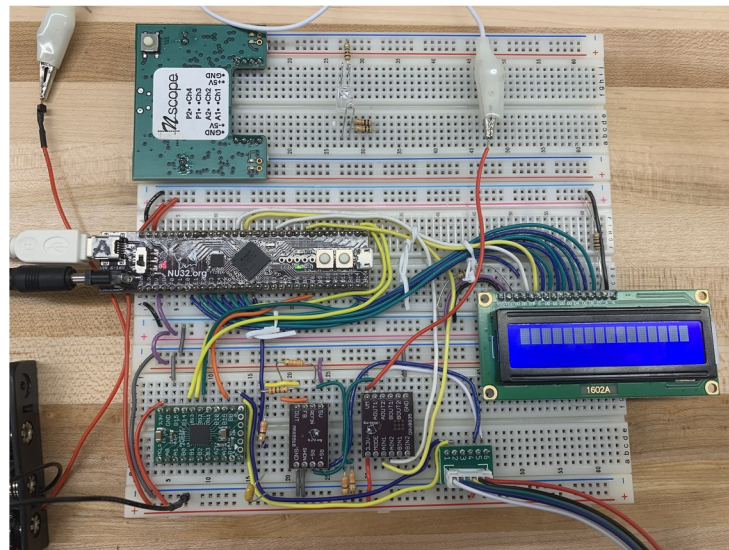




The conversion between count to current:



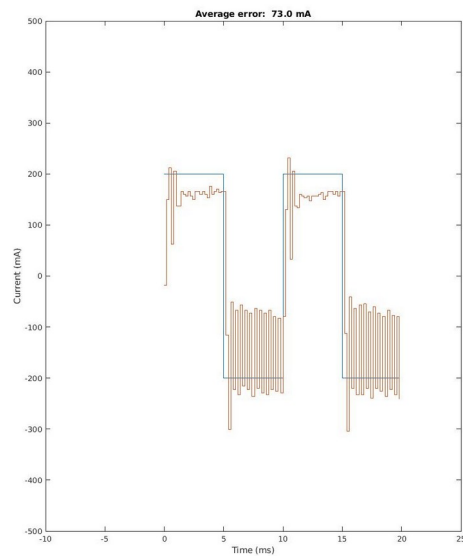
An Image om my board:



#### Chapter 28.4.10:

My best ITEST plot:

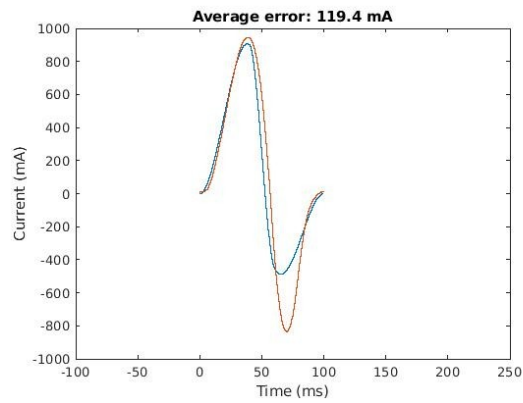
With the plastic blade –  $K_p = 0.2A$ ,  $K_i = 0.022A$ :



#### Chapter 28.4.12:

My best plots of following the step and cubic trajectories in Figure 28.5 with the load attached:

Cubic trajectory:



Step trajectory:

