

Lab 3.2 Solutions

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I had requested for extension/extra late days from Prof Yim due to some unforeseen circumstances. He told me to just mention in the lab report so I am attaching the proof here. Thank you for the consideration.

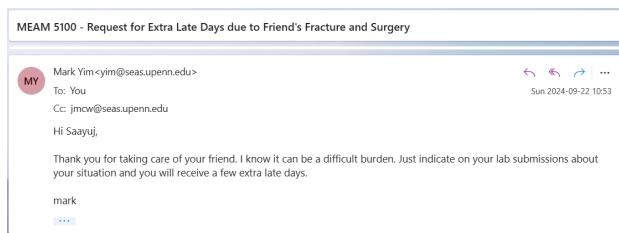


Figure 1: Proof of extra late days awarded

2 Waldo Output

3. 2. 1. 2 shows the dimensioned drawing of the Waldo dog output, which has been scaled to 2 times the input, which has been kept the same as before. I created mounts for all the three motors, and stuck the respective moving parts (paw, tail, ear) on the servo motor horn using hot glue. The dog's body parts and the mounts have all been laser cut using 1/8" MDF. The servo motors have been fastened to the mounts using 2 mm nut and bolt pairs. The three mounts for the moving parts along with the dog body itself, have been propped up and stuck on another platform to ensure stability and to enhance visibility (as opposed to when it is kept flat on the table).
2. • SG90 Servo Current Specifications: Max Torque = 1.8 kg.cm, Idle Current Draw = 100 mA, Peak Current Draw = 650 mA (full load).
For the worst case, assume that all the three servo motors are under full load. Thus, the total current drawn would be

$$I_{servo} = 3 * 0.65A = 1.95A$$

For three 10k long stem trim potentiometers, the current draw would be

$$I_{pot} = 3 * \frac{5V}{10k\Omega} = 1.5mA$$

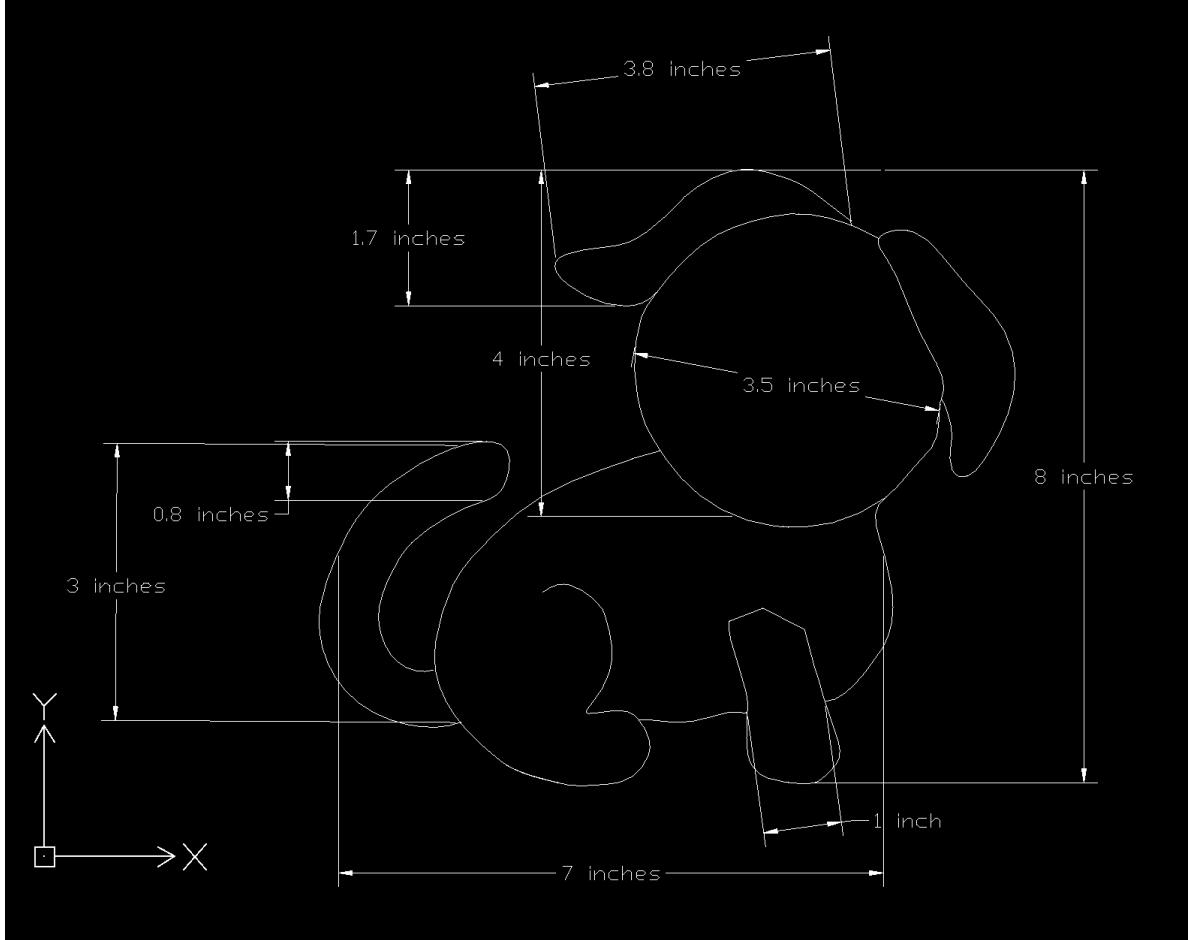


Figure 2: Dimensioned drawing of the Waldo output

The ItsyBitsy draws current between 50 mA to 100 mA. So considering the worst-case scenario

$$I_{\text{ItsyBitsy}} = 0.1A$$

Calculating the total current in the circuit

$$I_{\text{total}} = 1.95A + 1.5mA + 0.1A = 2.0515A$$

The minimum power supply needed to supply this current

$$\text{Power} = V * I = 5V * 2.0515A = 10.2575W$$

- 3 shows the circuit diagram for both the input side and output side of the Waldo. The input consists of three potentiometers mounted on a small version of the dog, while the output consists of three servo motors mounted on a larger version of the dog. The power source used here is the ItsyBitsy itself, which in turn, is powered by the laptop. The 5V and GND pins of the ItsyBitsy are used to supply power to the three motors and the three potentiometers.
3. • The commented code is submitted separately on Gradescope.

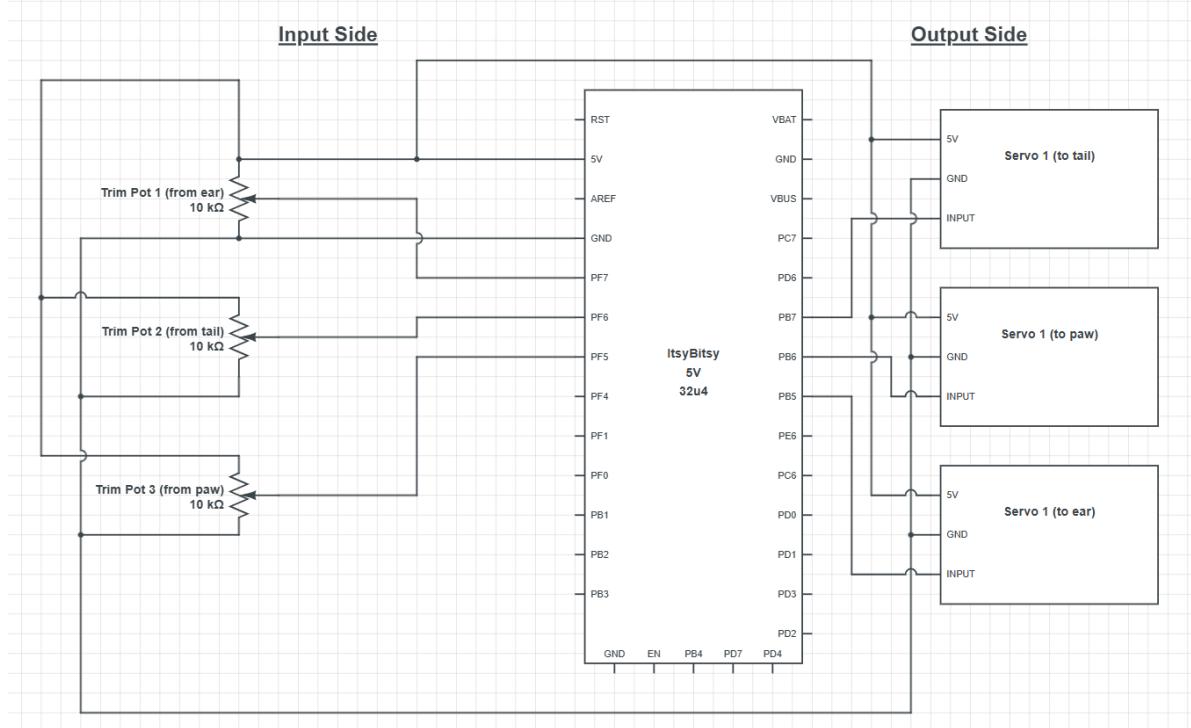


Figure 3: Circuit diagram of the entire Waldo input-output system

- Link to the YouTube video showing full range of motion of each degree of freedom: <https://youtu.be/A7K3O2LXZMQ>
- 4. Link to the YouTube video showing the robot dancing: https://youtu.be/I060CUL_fQs

3 Feedback

3. 3. 0. Time taken for each section of the lab:-
- 3.1.1 - About 2 hours
- 3.1 - About 10 hours
- 3.2 - About 8 hours

4 References

1. Latex template from the course CIS 5190 taught this fall.
2. MEAM 5100 Fall 2024 Lecture Slides.
3. Previous year lab videos posted on Canvas.
4. Took dog photo outline from url: <https://tinyurl.com/meam510dog>

5. Stack Overflow for writing in C.
6. Worked with peer Gia D'Costa in the lab, but we have submitted our own report, code, etc.