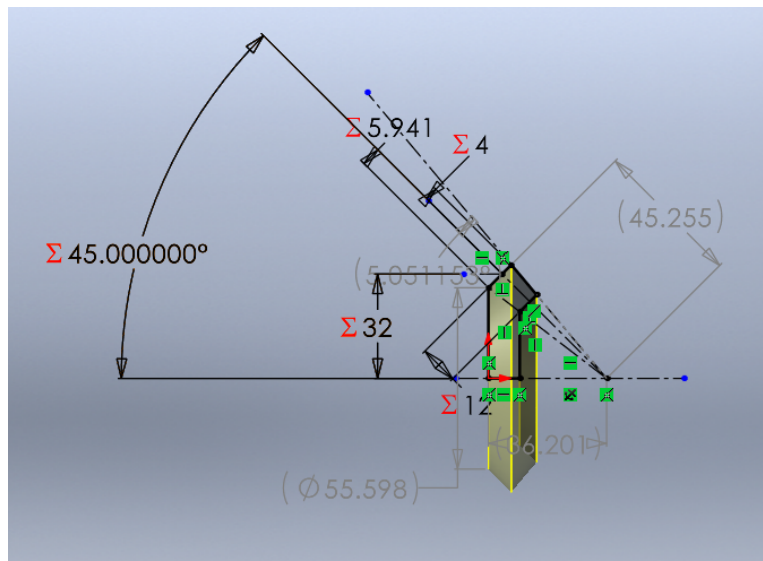


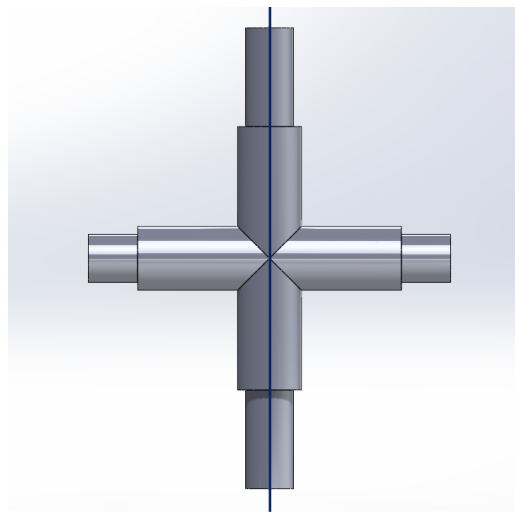
Name: Saurav Agrawal
Subject: Design of Mechatronic Systems (MEAM 5100)
17 October 2023

3.1.1 Finalize your design for the output side of your waldo. Include dimensioned drawings of the final version of your mechanical design (they may be the same or different from what you submit in 3.1. If it is different, you should submit the drawing of the new input side too). Include a short description of your mechanical design, the design choices you made, and its intended movement and functionality (exceptional mechanical design and/or creativity will be rewarded).

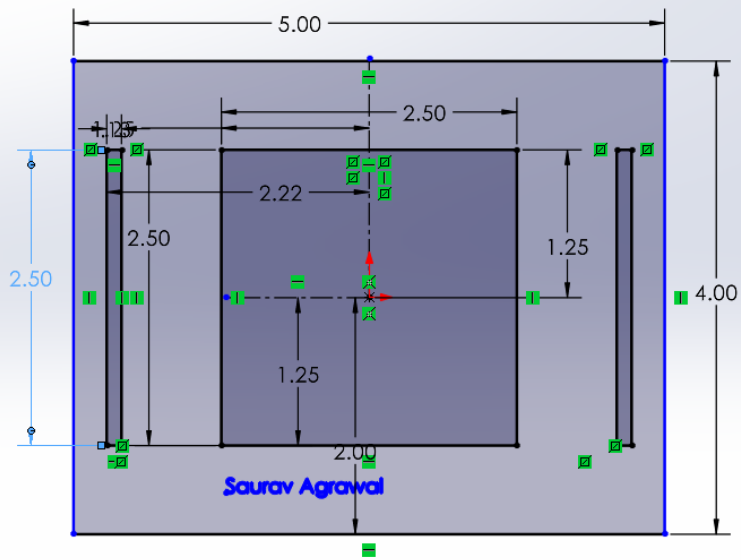
Answer:



(Gear dimensions)



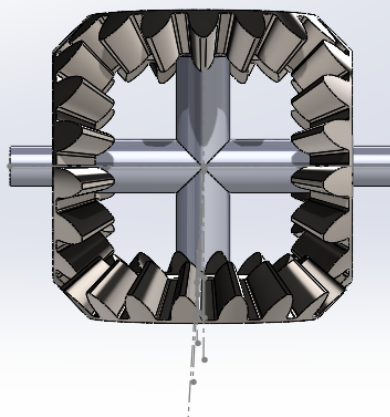
(support of gears)



(base support)



Jerry running on top



(inner assembly)

With the help of two motors I can move the 2 bevel gears of the opposite end and produce 2 degrees of motion with the help of the gear attached to motors moving in clockwise and anticlockwise direction.

3.2.2. Make the output side of your waldo. Use the supplied SG90 RC servos, or you may optionally purchase your own servos. Note that the supplied servos are weak. Do an analysis of the potential current usage by your circuit, including the current sourcing capabilities of your power supply. You may need to search online for more precise SG90 servo current specifications. Submit a document that includes your analysis of the total current draw of your circuit in the worst case (ItsyBitsy, potentiometers, servos etc.) as well as the current sourcing capability of your power supply(s). If you use something other than the SG90 servos, include a spec sheet for the servo you used. Include a schematic circuit diagram of both the input and output sides of your waldo that includes the power source(s).

Answer: The servos draw 10mA current in idle situation and 100mA to 250mA under operation. The source is 5V supply. The worst-case total current drawn by the entire circuit when both the servo motors were under load/moving was 560 mA. I have taken a 20k ohm potentiometer and Itsy Bitsy current drawn is 10-20mA. Thus, the current drawn under worst case is :

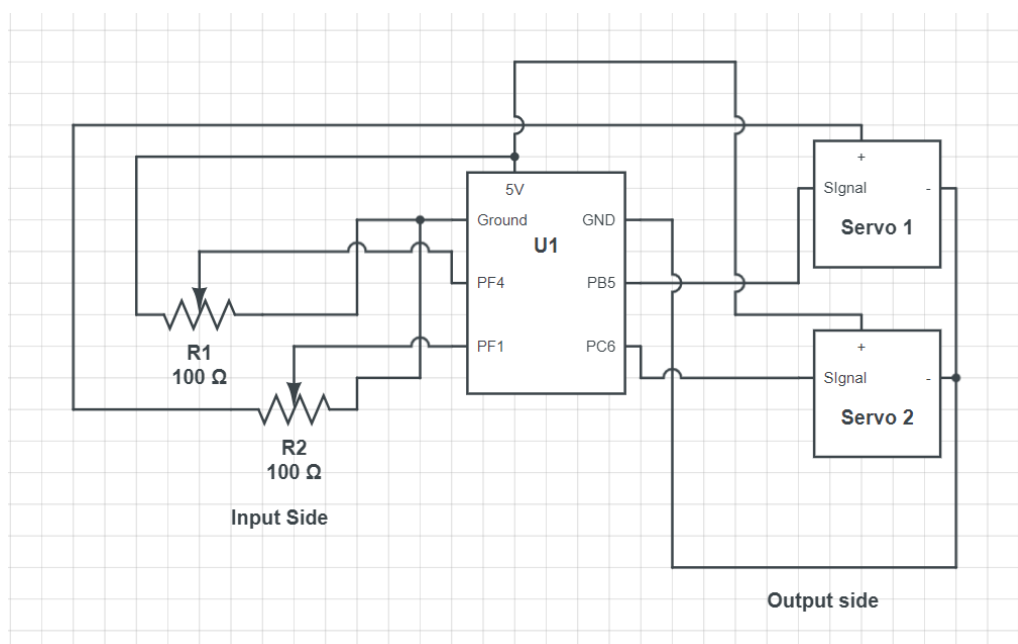
$I = V/R$ (ohm's law)

$i = 5/20000 = 0.00025$ amps i.e. 0.25mA.

Total current drawn (using 2 servos) = total current - current by ItsyBitsy - current in potentiometer
= 560 - 20 - 0.5 = 539.75 mA

Since it is for 2 servos, current per servo is 269.75 which is close to the specified current in the link and also very less than the stall current of 360 mA.

Link to the the servo datasheet: <https://protosupplies.com/product/servo-motor-micro-sg90/>



(Circuit diagram)

3.2.3. Write code that integrates everything to make a complete waldo input/output system. You may use the events and services model. Once completed, your output should accurately mimic the input with minimal delay. Look at the example videos provided for reference of expectations. Submit well commented code. Submit a link to a video showing the full range of motion of each degree of freedom and also that the input and output match at least 2 intermediate points. (Do not send more than 10 seconds of video)

Answer : I have submitted the code separately on the gradescope. I have written code for 3 motors.

10 second video link <https://youtube.com/shorts/aO28WdK4YVM>

3.2.4 Do a dance!

Show us what your waldo can do! Submit a video of your robot dancing to a 10 second portion of music choreographed to the selected music (announced in class). We will have a competition at the end of the class where the TA's will vote on the best projects. Each winning project will receive 1 extra late day and a fabulous prize.

Answer : Video link : <https://youtube.com/shorts/lktTxbs8E34?feature=share>