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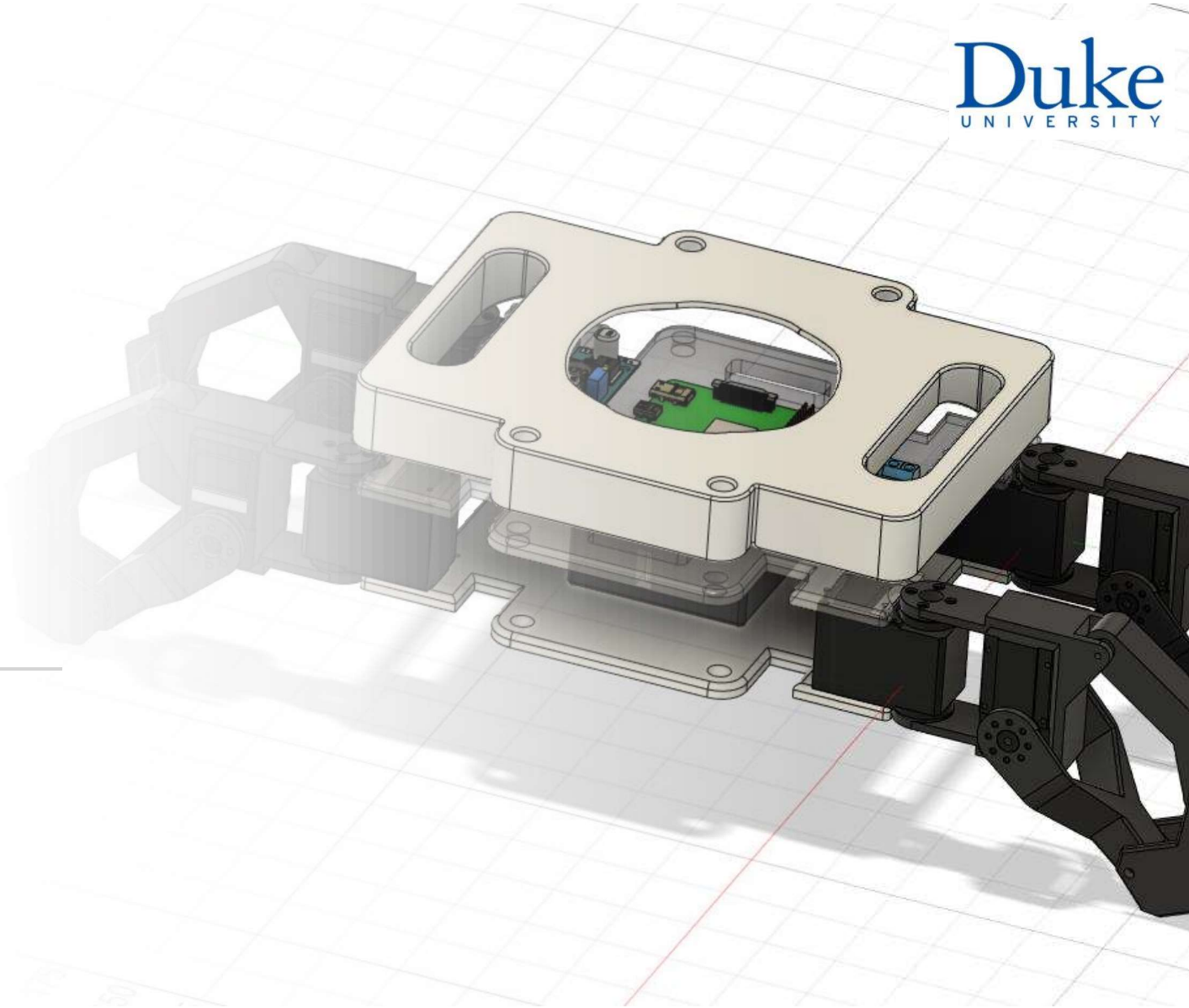
Robot studio

Conclusion table	
Semester	Spring semester
Assignment number	Assignment 4
name	Dawen Huang
Netid	dh370
Grace hours	187h-24h=163h

Working leg



Sequence of photos for moving

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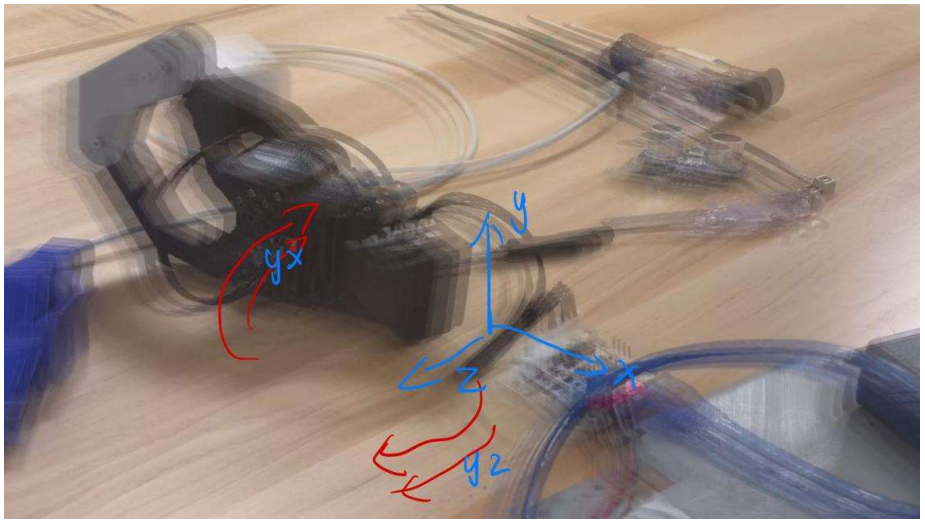
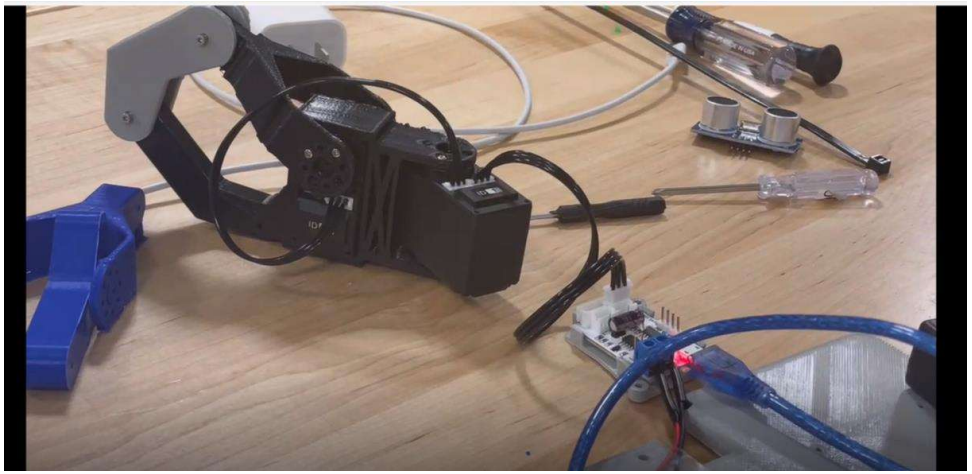
Sequence of photos for moving



Videos for moving

working_leg2.mp4



working_leg_video.mp4

Design Problem Conclusion

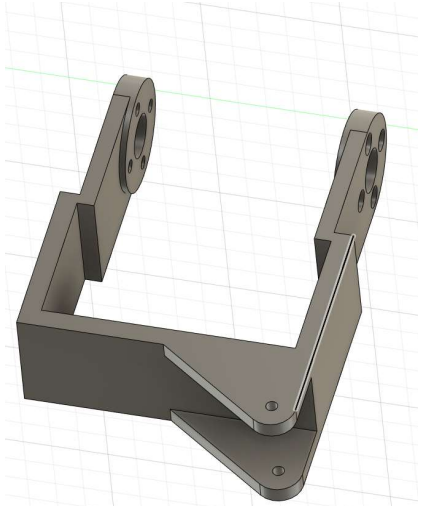
V1.0 Design Problem:

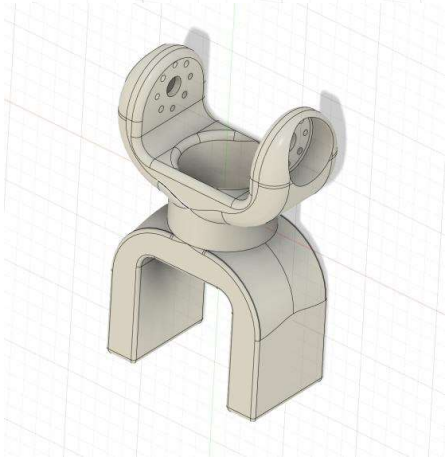
1. The valve position of the LX16A in leg A needs to be higher and wider(+1mm).
2. The step down is not deep enough.
3. The width of the connection point with a radius of 12 is less than 10mm - 8mm.
4. Remove the baffle from leg C in version V2.0 of the leg design.

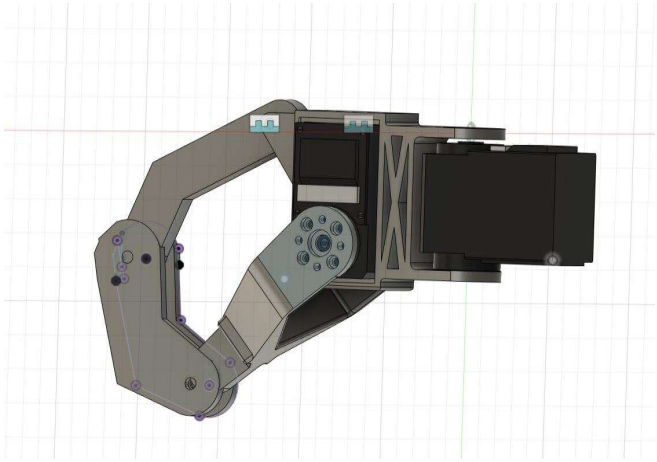
V2.0 Design Problem:

1. The thigh structure component has too much redundancy. Using Cura for slicing can achieve higher precision, and excessive redundancy is not needed; 0.5mm will suffice.
1. Servo dimensions: width 24.7mm, height 45.2mm
2. Design dimensions: 24.75mm, 45.25mm. The thigh structure component lacks strength; it needs crossbeams for reinforcement.
3. Thicken leg component 2.
4. Make the connection point of leg component 3mm thinner. For M2 12mm, the corresponding nut should be 3mm, the connection point 6mm, and the design of the nut recess on both sides should leave a wall thickness of 5mm.

Design Problem Solution







1. cad model refined and reprint the component
2. Drill the hole in order to fit the insert.

key specs listed for motor motion angle

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The motion constrain for the motors:

```
# set angle limit
    # for one leg there's two motors. upper motor(1), down motor(2)
    servo1.set_angle_limits(0, 45)
    servo2.set_angle_limits(0, 120)
```

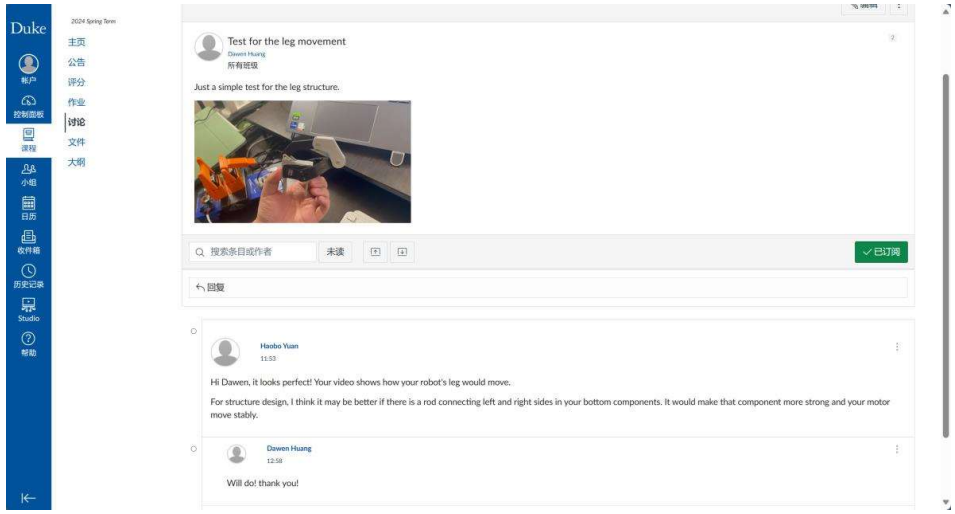
Motor1 : 45
Motor2: 120

Control code

```python
import time
import math
from pylx16a import LX16A
from serial.tools import list_ports
# Attempt to automatically find the serial port
port = None
for port in list_ports.comports():
    if 'USB' in port.description:
        port = port.device
        break
   if port is None:
    raise IOError("LX-16A Servo Controller not found")
# Initialize serial port connection
LX16A.initialize(port)
# Assign motor IDs
id1 = 1
id2 = 2
try:
    # Connect to the motors
    servo1 = LX16A(id1)
    servo2 = LX16A(id2)
    # Print motor related information: angle, temperature, voltage
    print(f"Servo {id1} Angle: {servo1.get_angle()}, Temperature: {servo1.get_temp()}, Voltage: {servo1.get_voltage()}")
    print(f"Servo {id2} Angle: {servo2.get_angle()}, Temperature: {servo2.get_temp()}, Voltage: {servo2.get_voltage()}")
    # Initialize motors to default starting position of 0°
    servo1.move(0)
    servo2.move(0)
    # Set angle limits
    servo1.set_angle_limits(0, 45)
    servo2.set_angle_limits(0, 120)
    # Use sine function for smooth control
    for t in range(0, 360):
        servo1.move(math.sin(math.radians(t)) * 60 + 60)
        servo2.move(math.cos(math.radians(t)) * 60 + 60)
        time.sleep(0.1)
except LX16A.LX16AException as e:
    # Error handling for unexpected errors (e.g., servo not responding)
    print(f"An error occurred: {str(e)}")
```

Include error handler and sin function control

Screen shot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2024 Spring Term
主页
公告
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小组
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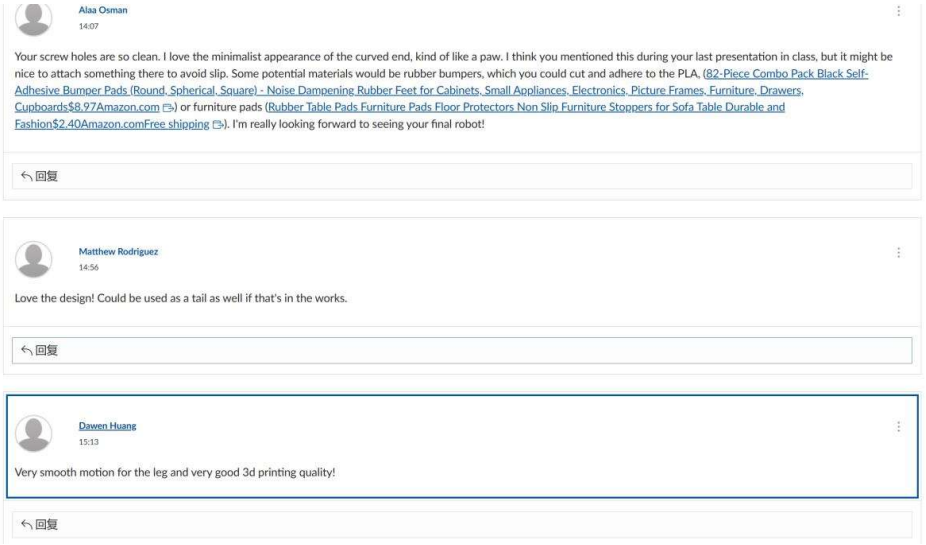
收件箱
历史记录
Studio
帮助
Test for the leg movement
Dawen Huang
所有班级
Just a simple test for the leg structure.
搜索条目或作者
未读
已订阅
回复
Haobo Yuan
11:53
Hi Dawen, it looks perfect! Your video shows how your robot's leg would move.
For structure design, I think it may be better if there is a rod connecting left and right sides in your bottom components. It would make that component more strong and your motor move stably.
Dawen Huang
12:58
Will do! thank you!


Alaa Osman
14:07
Your screw holes are so clean. I love the minimalist appearance of the curved end, kind of like a paw. I think you mentioned this during your last presentation in class, but it might be nice to attach something there to avoid slip. Some potential materials would be rubber bumpers, which you could cut and adhere to the PLA, (82-Piece Combo Pack Black Self-Adhesive Bumper Pads (Round, Spherical, Square) - Noise Dampening Rubber Feet for Cabinets, Small Appliances, Electronics, Picture Frames, Furniture, Drawers, Cupboards$8.97Amazon.com) or furniture pads (Rubber Table Pads Furniture Pads Floor Protectors Non Slip Furniture Stoppers for Sofa Table Durable and Fashion$2.40Amazon.comFree shipping). I'm really looking forward to seeing your final robot!
回复
Matthew Rodriguez
14:56
Love the design! Could be used as a tail as well if that's in the works.
回复
Dawen Huang
15:13
Very smooth motion for the leg and very good 3d printing quality!
回复


Dawen Huang
15:18
I like the gear design motion, can you show the inside of the body in order to get a better view of the placement for the motors?
回复

1. 5Points Title slide complete 5
2. 5 Points overall aesthetics, layout and formatting of the slides 5
3. 10 Points Sequence of photos showing leg in motion 10
4. 10 Points posting video of moving leg on the discussion board at least 24h in advance of deadline, and commenting constructively and positively on at least three other's postings (show screenshots) 10
5. 10 Points extreme leg positions tested and measured 10
6. 10 Points form/fit issues identified, listed and addressed (show how) 10
7. 10 Points all components properly bolted and connected (with inserts) 10
8. 10 Points 3D-print quality, support structure removed 8
9. 10 Points Different leg motion patterns explored 10
10. 10 Points Leg Modularity demonstrated 10
11. 10 Points Two or more legs tested in tandem 10
12. 10 Points Cables routed properly and securely 10
13. 10 Points Exception handling in code catches motor disconnect 10
14. 10 Points if you share your design history with us in Fusion 360 through our scripts.

Total: 100(118)