

Robotics Studio MECE 4611

Spring 2024

Assignment II

Nicolino Primavera (ncp2136)

Submission:

Grace hours: 99:20 + 1:15 hours

Bob the Minion

General Robot Rendering

Electrical Component Specifications

Dimensions (L x W x H):

- Raspberry Pi 3A+ = 2.56 x 2.2 x 0.47 in
- Battery Pack = 1.1 x 3.35 x 5.7 in
- LX-16A Metal Servos = 1.38 x 0.97 x 1.78 in
- Small Servo Controller Board = 4.7 x 3.1 x 1.2 in
- 10A Stepdown DC to DC Buck Converter = 3.74 x 2.24 x 1.22 in
- DROK DC Converter = 3.23 x 2.05 x 1.26 in
- Raspberry Pi Camera = 0.98 x 0.90 x 0.35 in

Mass (grams):

- Raspberry Pi 3A+ = 50g
- Battery Pack = 190g
- LX-16A Metal Servos = 52g
- Small Servo Controller Board = 62.4g
- 10A Stepdown DC to DC Buck Converter = 9.072g
- DROK DC Converter = 68g
- Raspberry Pi Camera = 3.4g

3D Printed Component Specifications

Dimensions (L x W x H = Volume):

- Oval Base: 6.5 x 6.0 x 0.3 in
- Motor Harness (from Solidworks: Evaluate→Mass Properties): V=7.81 in³ , SA=39.29 in²
- Thigh Link (from Solidworks: Evaluate→Mass Properties): V=3.65in³ , SA=27.39 in²
- Foot Attachment (from Solidworks: Evaluate→Mass Properties): V=0.401in³ , SA=5.92in²
- Foot (from Solidworks: Evaluate→Mass Properties): V=1.02in³ , SA=12.03in²

Mass (grams): mass = volume (L x W x H) x density (1.24 g/cm³) x infill percentage (0.10), 1in³ = (2.54cm/1in)³

- Oval Base = 23.774g
- Motor Harness = 15.87g
- Thigh Link = 7.42g
- Foot Attachment = 0.815g
- Foot = 2.073g

GrabCAD Designs for Components - Citations

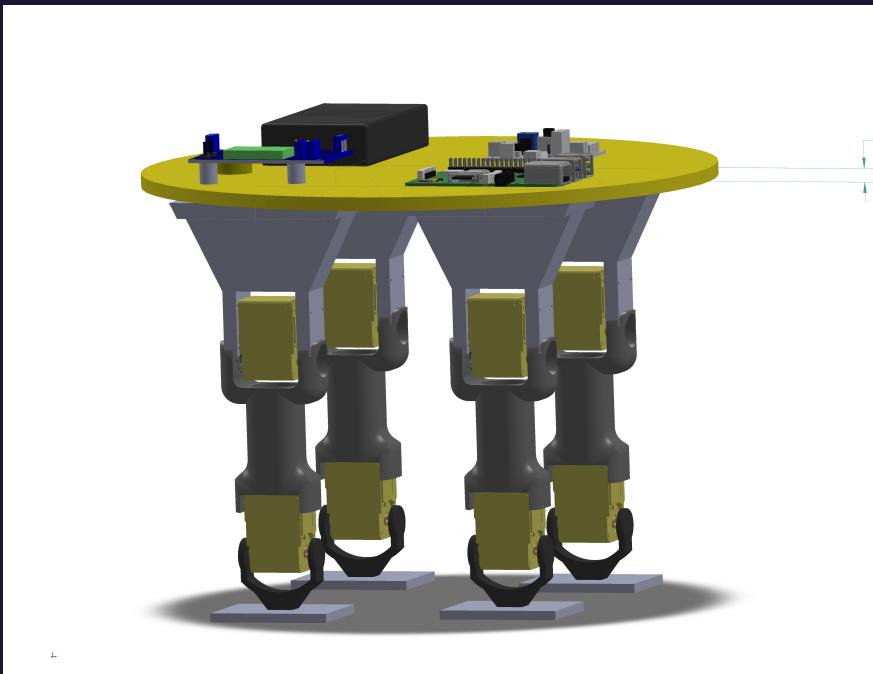
Incorporated in preliminary design

- LX-16A Metal Servos: <https://grabcad.com/library/lewansoul-lx-16a-bus-servo-1>
- Small Servo Controller Board: <https://grabcad.com/library/lewansoul-lx16a-controller-board-1>
- Battery Pack: <https://grabcad.com/library/talentcell-rechargeable-12v-3000mah-lithium-ion-battery-pack-1>
- DROK DC Converter: <https://grabcad.com/library/drok-dc-converter-5-3-32v-to-1-2-32v-1>
- Raspberry Pi 3A+: <https://grabcad.com/library/raspberry-pi-3-4>
- Motor Harness: <https://grabcad.com/library/robot-skeleton-and-modular-motor-harness-1>
- Thigh Link: <https://grabcad.com/library/leg-piece-2>
- Foot: <https://grabcad.com/library/lewansoul-lx-16a-motor-connector-1>

Did not incorporate these yet

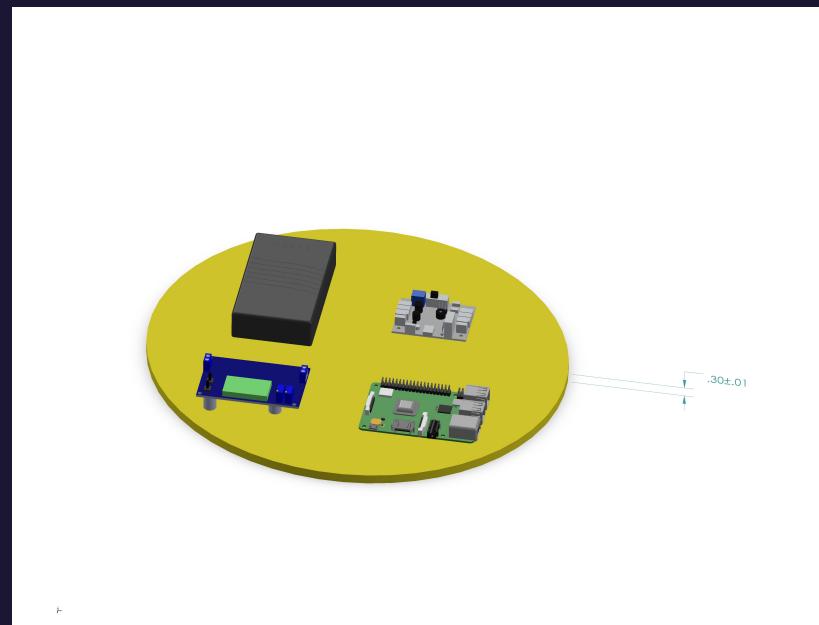
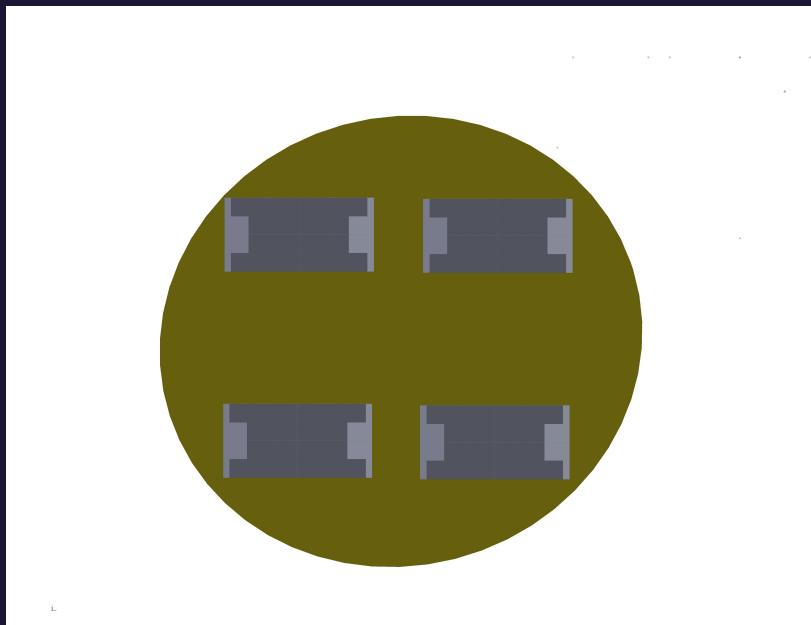
- IMU (Adafruit): <https://www.thingiverse.com/thing:4602596>
- Raspberry Pi Camera: <https://grabcad.com/library/raspberry-pi-camera-module-v2-1>
- Mini USB Microphone: <https://grabcad.com/library/raspberry-pi-camera-module-v2-1>
- Motor Wheels: <https://grabcad.com/library/motor-shaft-adapter-for-lx-16a-1>

Renderings – Full Robot

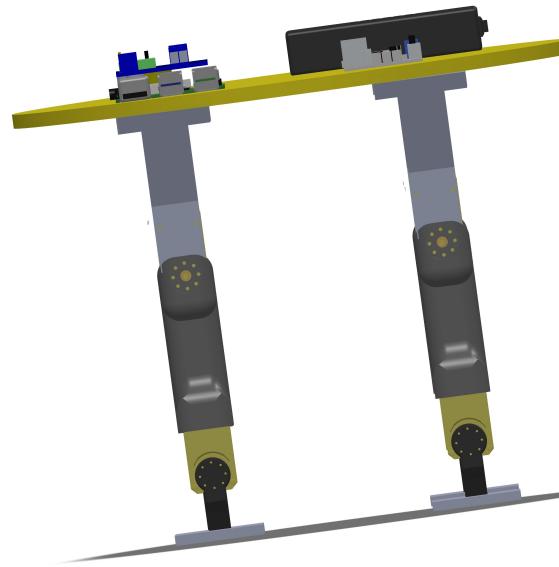
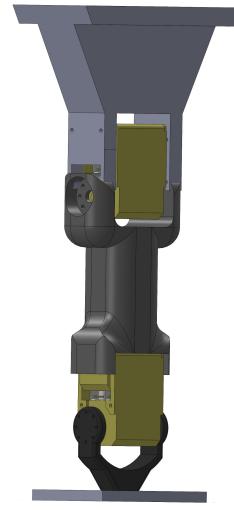


- So far, I have completed the legs and base designs of the robot
- Next step will be to incorporate the Despicable Me Minion features
- The robot legs are approximately 10 in long and the oval base is 6.5 by 6.0 in
- The electrical components will be covered in the final design
- Based off my initial calculations it will take ~1.5 seconds to walk 10 meters
- The motors are positioned to be able to walk forwards and backwards
- I opted for four legs instead of two for increased stability and so the robot can support more weight

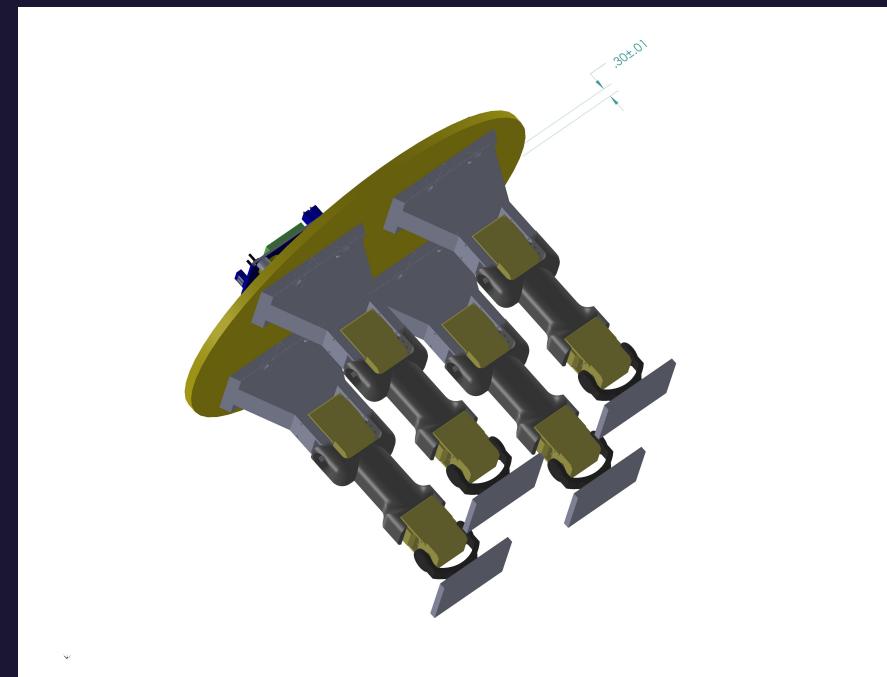
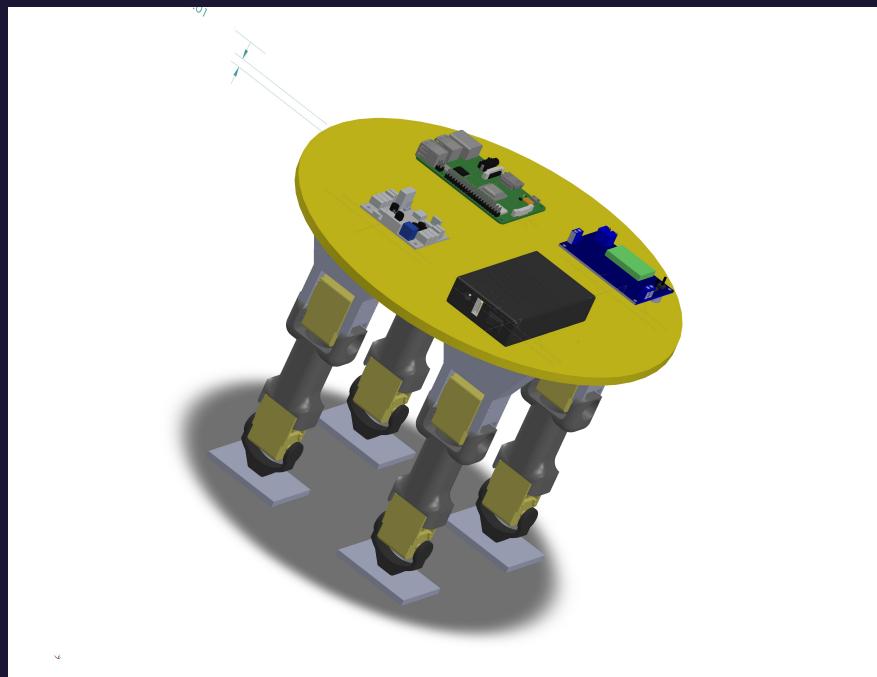
Renderings – Aerial View



Renderings - Leg Design



Renderings – Full Robot



Next Steps

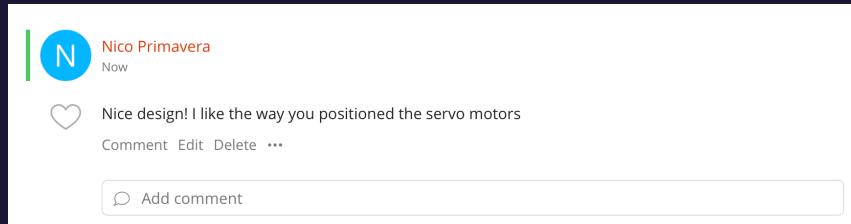
- Finalize leg design by adding fasteners, mounts, bearings, cables, through-holes, cable fasteners, surface texture, etc.
- Find the best way to incorporate the minion design found on GrabCAD
 - Extruded cut of minion design found on GrabCAD
 - Shrink-wrapping ("Monokoting")
- Find the best place for a camera
- Decide if an IMU is necessary (probably not since 4 legs will provide stability)



Rubric Checklist

- 5 Points Title slide complete (Slide 13)
- 5 Points overall aesthetics, layout and formatting of the slides (All slides)
- 10 Points posting some rendering of your robot 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) (Slide 23-24)
- 10 Points 3D Renderings in perspective (Slides 17-20)
- 10 Points Key components included (Slides 17-20)
- 10 Points organic shape (no/few straight edges) (Slides 17-20)
- 10 Points photorealistic rendering (Slides 17-20)
- 10 Points context rendering (Slides 17-20)
- 10 Points animation
- 10 Points exploded view (Slides 17-20)
- 10 Points key specs listed including speed (Slides 14-15)
- 10 Points multiple poses shown (Slides 17-20)
- 10 Points detail close-up shown (Slides 17-20)
- 10 Points side views with main dimensions (Slides 14-15, 17-20)
- 10 Points sharing a relevant CAD component on GrabCAD or Thingiverse (show screenshot)

Comment (constructively) on at least three other's postings

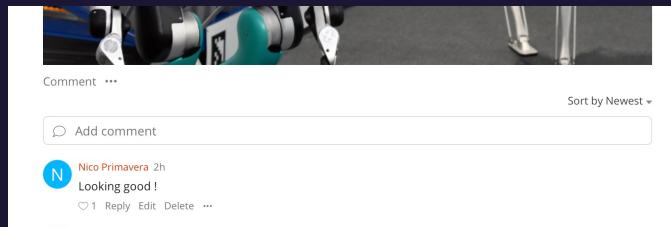


Nico Primavera
Now

 Nice design! I like the way you positioned the servo motors

Comment Edit Delete ...

 Add comment



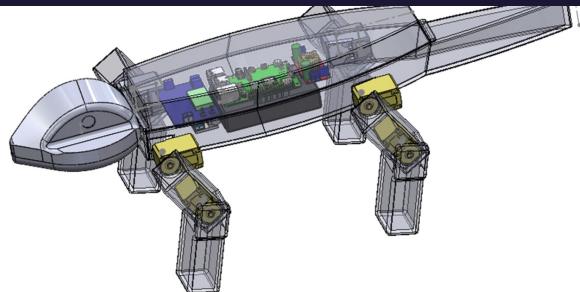
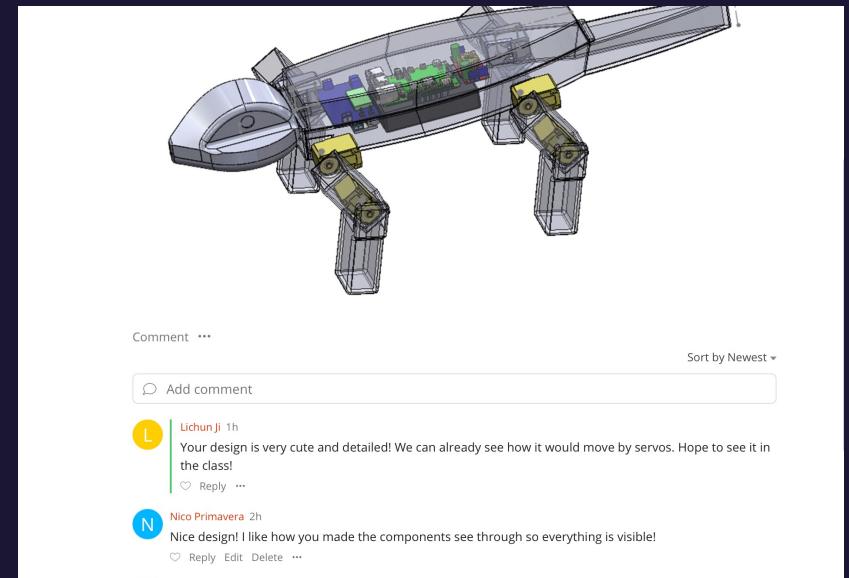
Comment ...

 Sort by Newest ▾

 Add comment

 Nico Primavera 2h
Looking good!

 1 Reply   ...



Comment ...

 Sort by Newest ▾

 Add comment

 LichunJi 1h
Your design is very cute and detailed! We can already see how it would move by servos. Hope to see it in the class!

 Reply ...

 Nico Primavera 2h
Nice design! I like how you made the components see through so everything is visible!

 Reply   ...

ED Discussion Board post

Preliminary CAD Model #57



Nico Primavera

1 minute ago in CAD design



STAR



WATCHING

3

VIEWS



Hi all,

Attached is my preliminary CAD model. I am still working on a few things but this is the general concept. My end result is a four legged minion. I have created the base so far, and I found this great minion design on GrabCAD that I am hoping to use. I am not sure of the best way to cut and scale everything from GrabCAD so if anyone has any ideas please let me know. As of right now I am planning on cutting the top half of the minion design and using it as a cover.

Minion example.pdf

Side View of the Robot.pdf

Comment Edit Delete ...

Add comment