

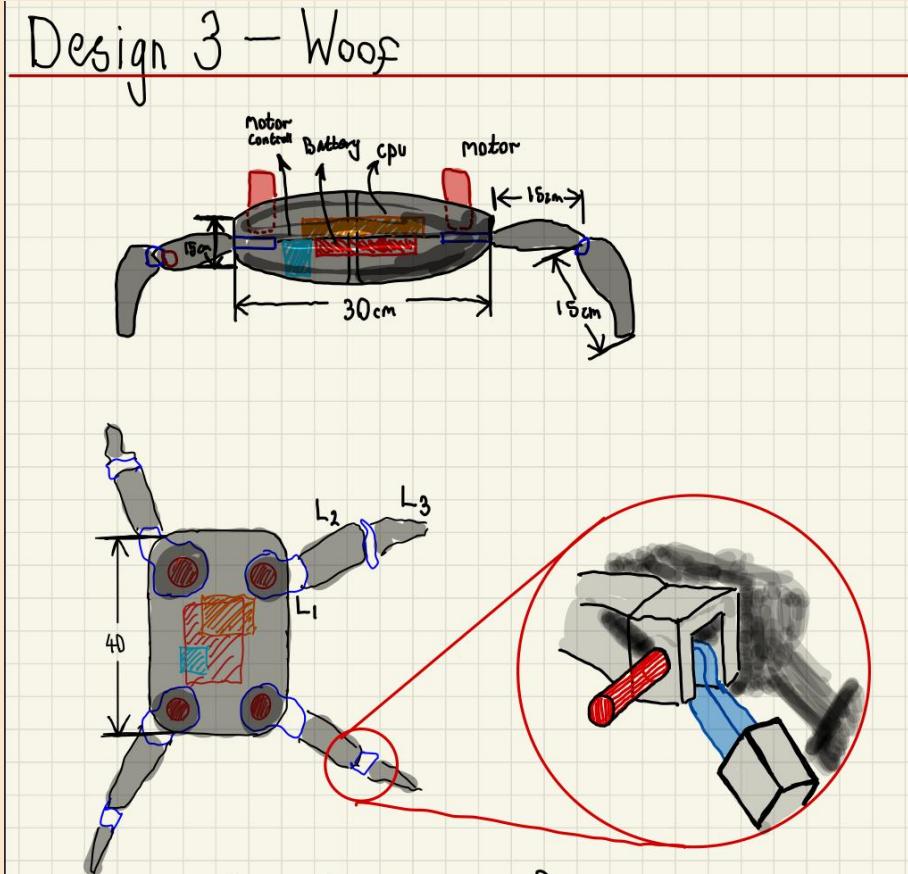
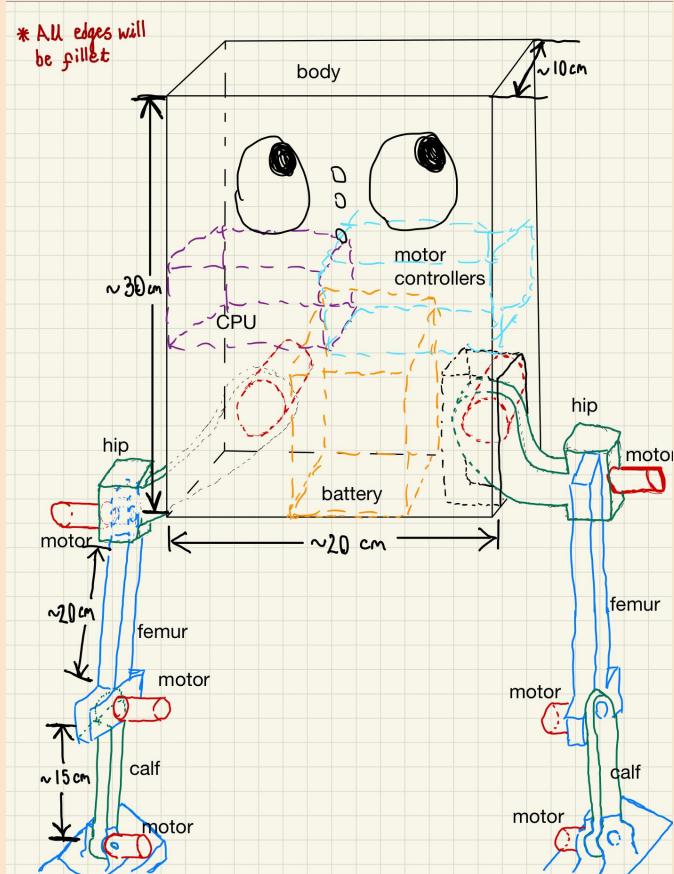
# Bucko: The Dancing and Walking Robot

Alejandro Assael (aa604) and Dadmehr Ghasemfar (ddg16)

Robotics Studio ME555

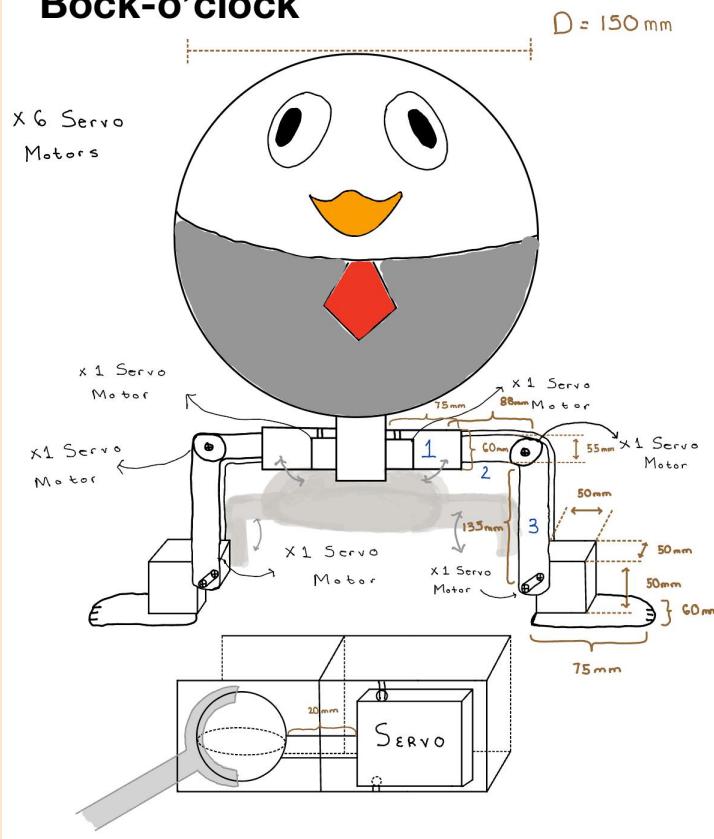
Spring 2023

# Preliminary Sketches/Ideas

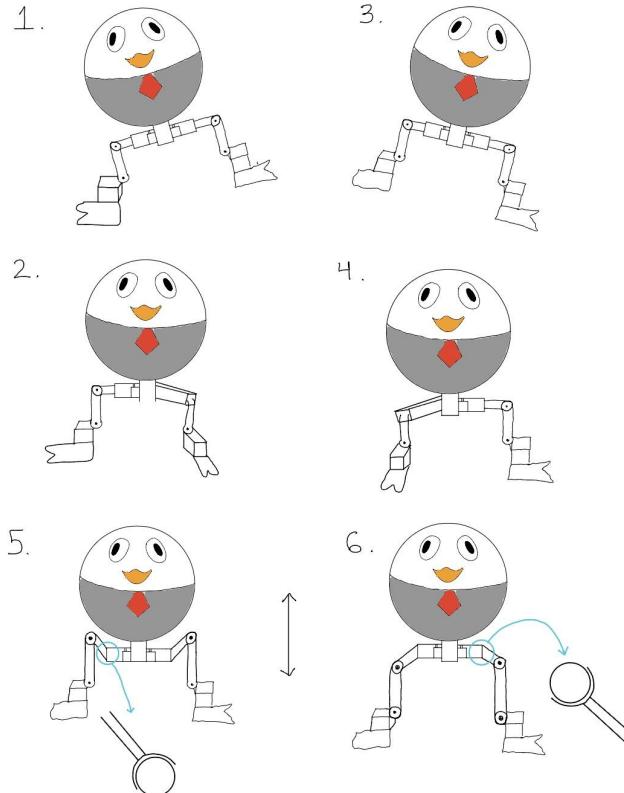


# Preliminary Sketches/Ideas

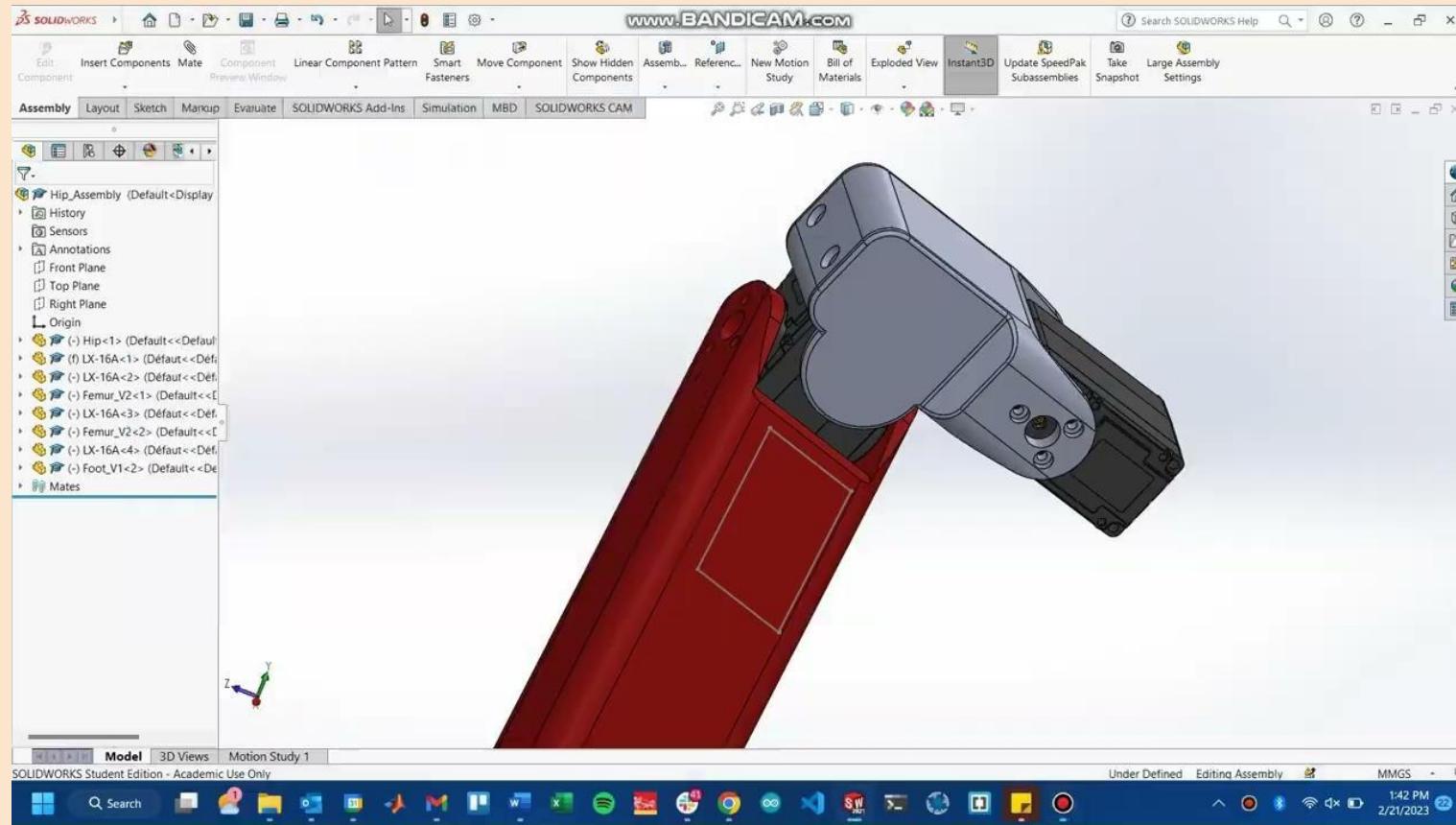
## Bock-o'clock



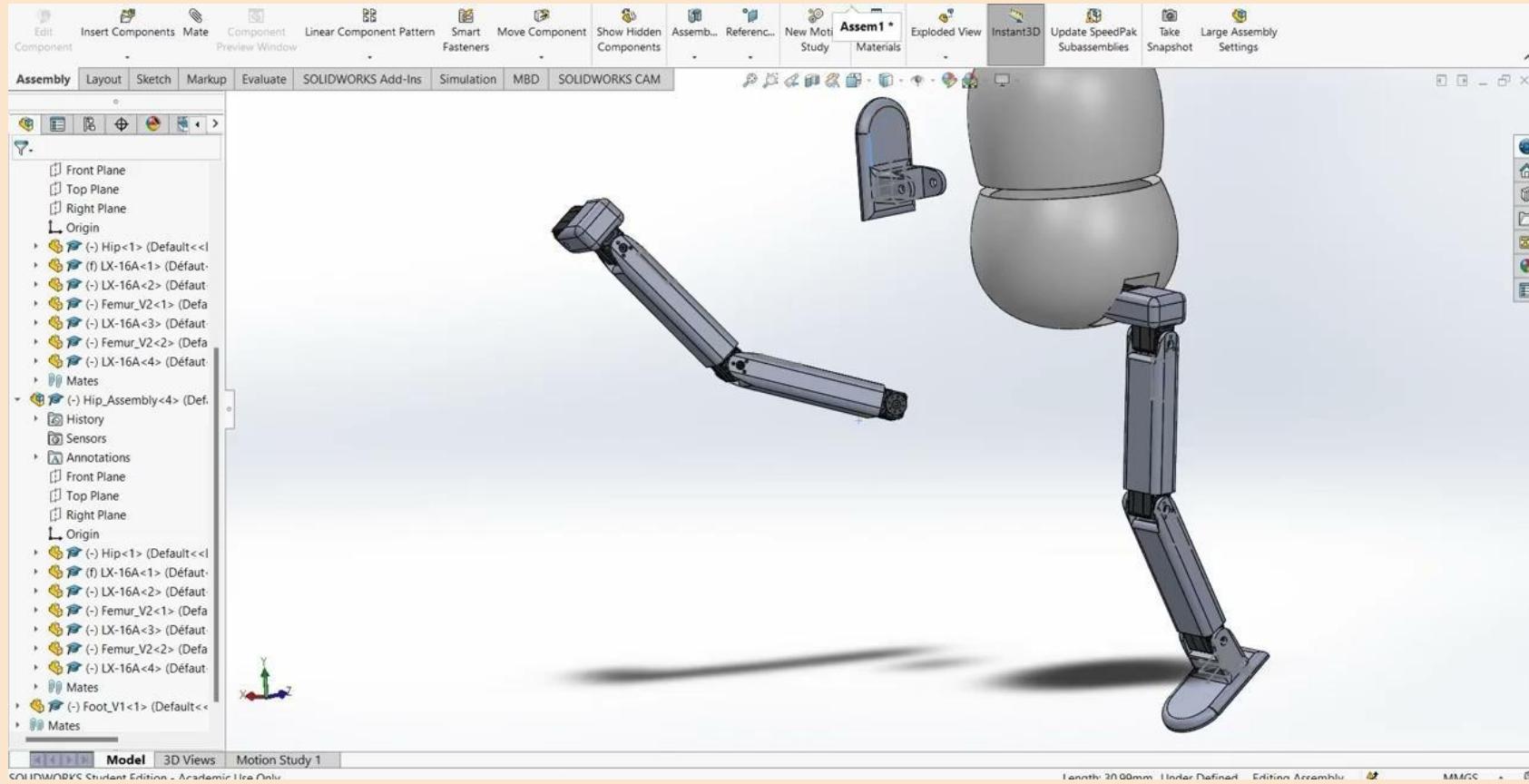
## Poses and close-ups



# CAD, CAD, and more CAD



# CAD, CAD, and more CAD



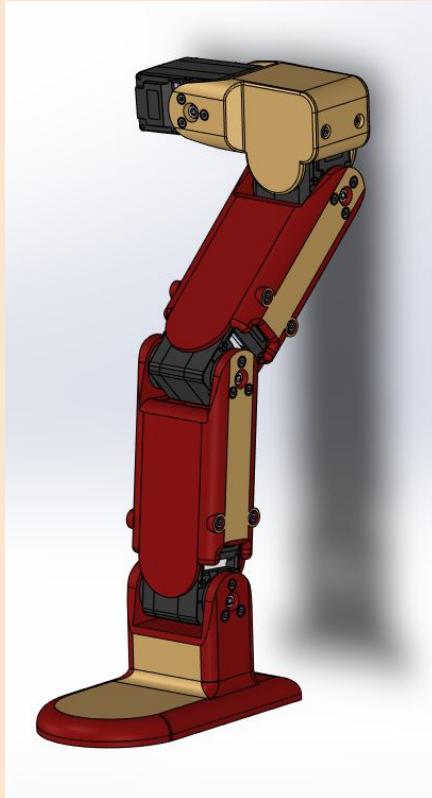
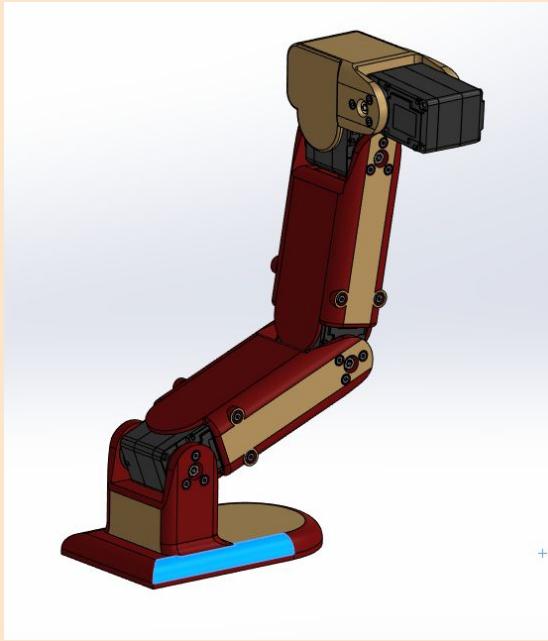
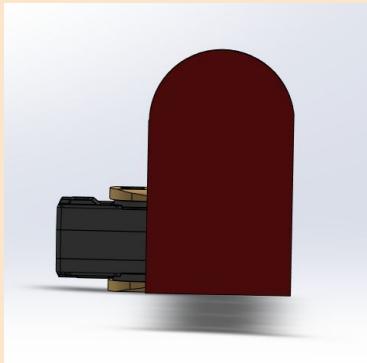
# Photorealistic Rendering



# New Fortnite Skin Drop!

- Penguin → Iron Man Penguin
- Make Legs 50% Smaller
- Round Body → Rounded Cuboidal Body

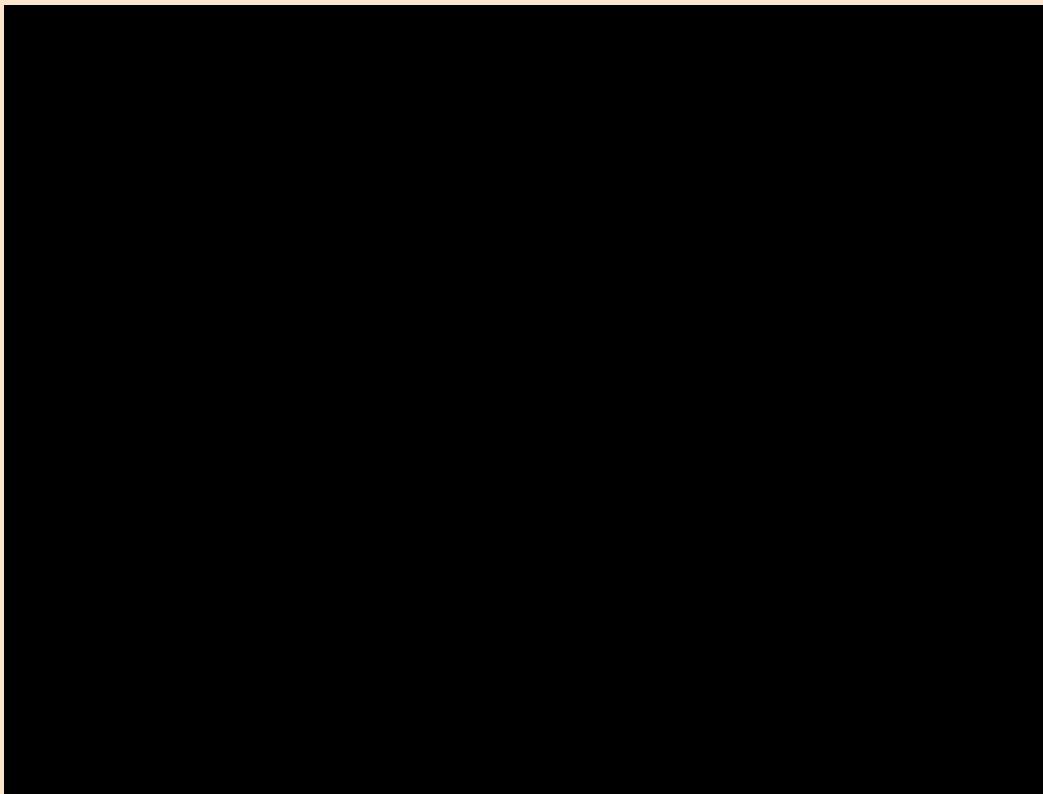
# Legs - Assembly (adding a little bit of spice)



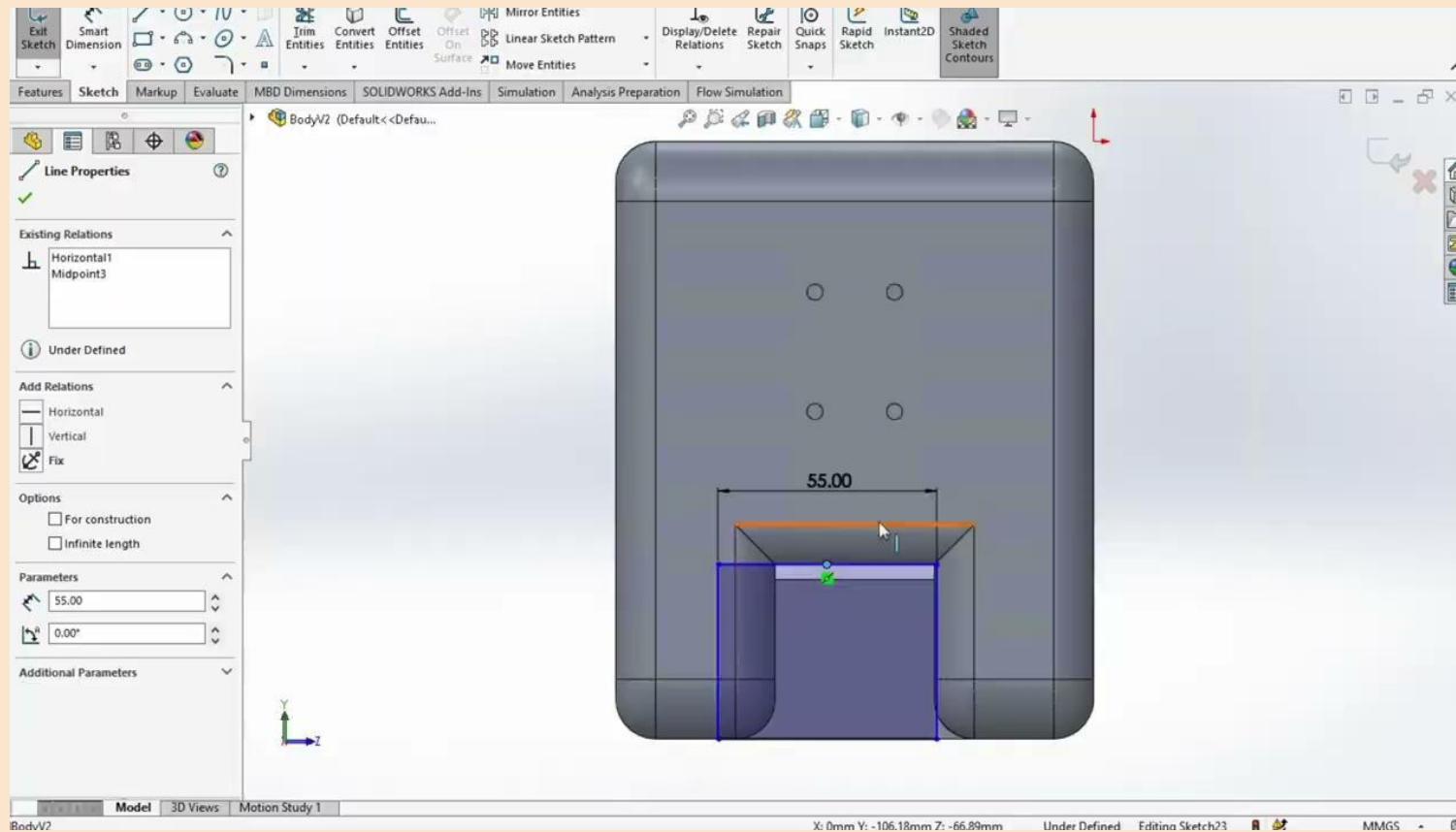
# Legs - Render (He gyms)



# **Body - Exploded View**

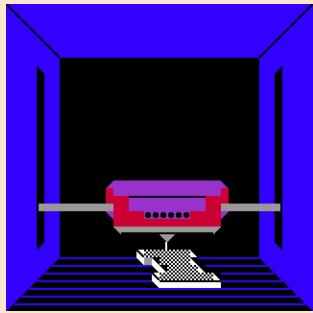


# Iterate again and again..

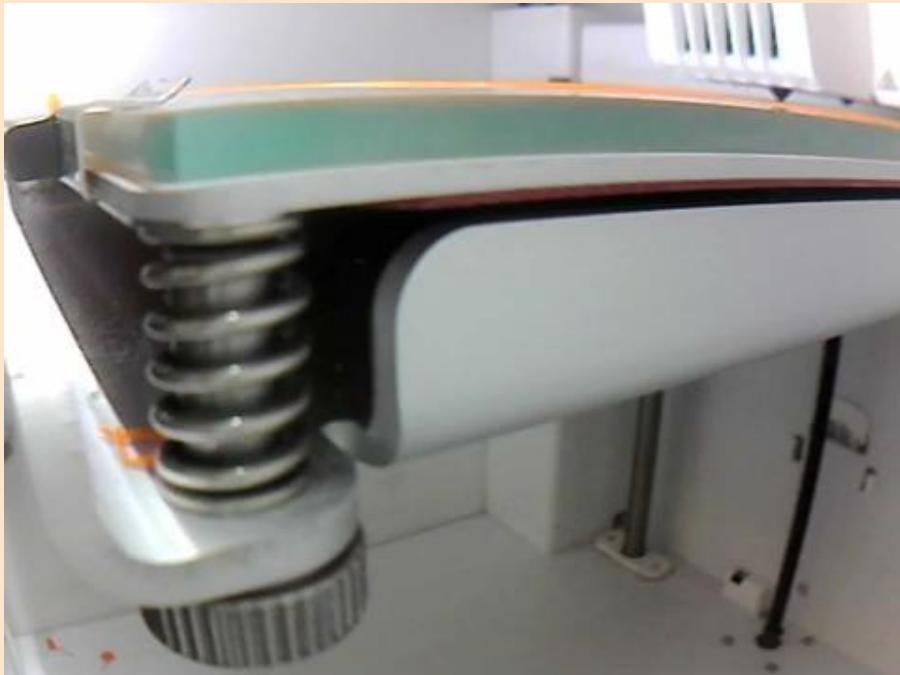
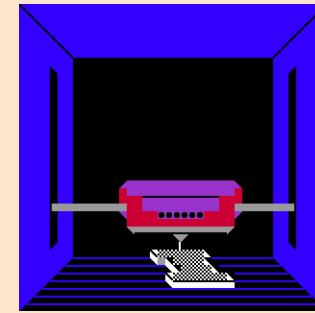


# Body - Final Render





# CAD Printing



# Assembly (and god tier sanding)



# Assembly (and god tier sanding)



# HE IS ALIVE!!!



# Form/Fit Issues

## Gaps between joints

- Friction when motors were moving
- Issues when running code
- Addressed by sanding the edges

## Screws and Spacing

- Problem with stripping of screws
- Some screw holes were a little off center
- Issues with length of screws
- Addressed by searching through kit and changing dimensions

## Wiring

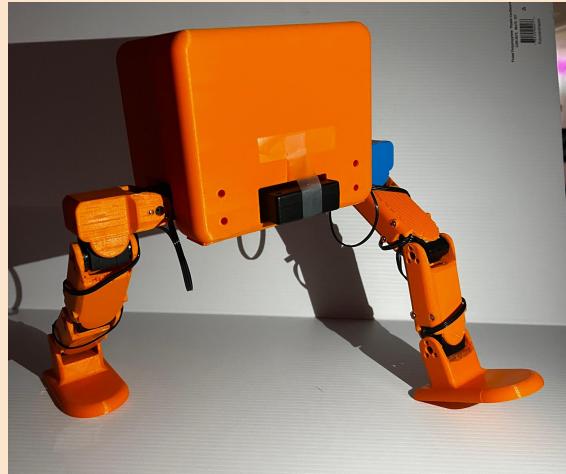
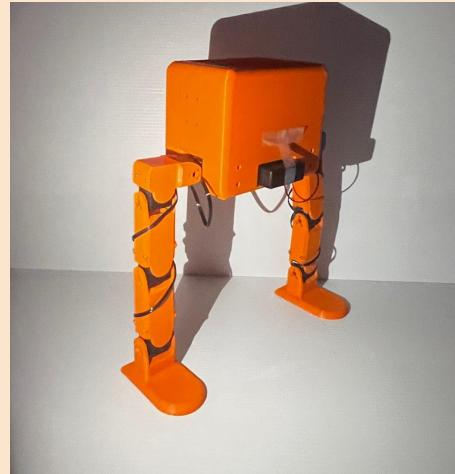
- Entanglement of wires while running code
- Will be fixed by running wires through the hollow insides of joints



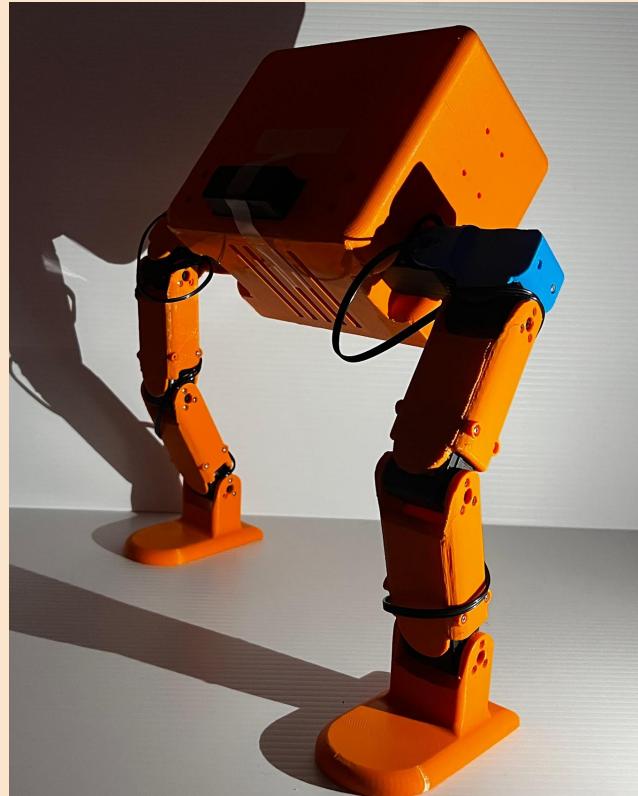
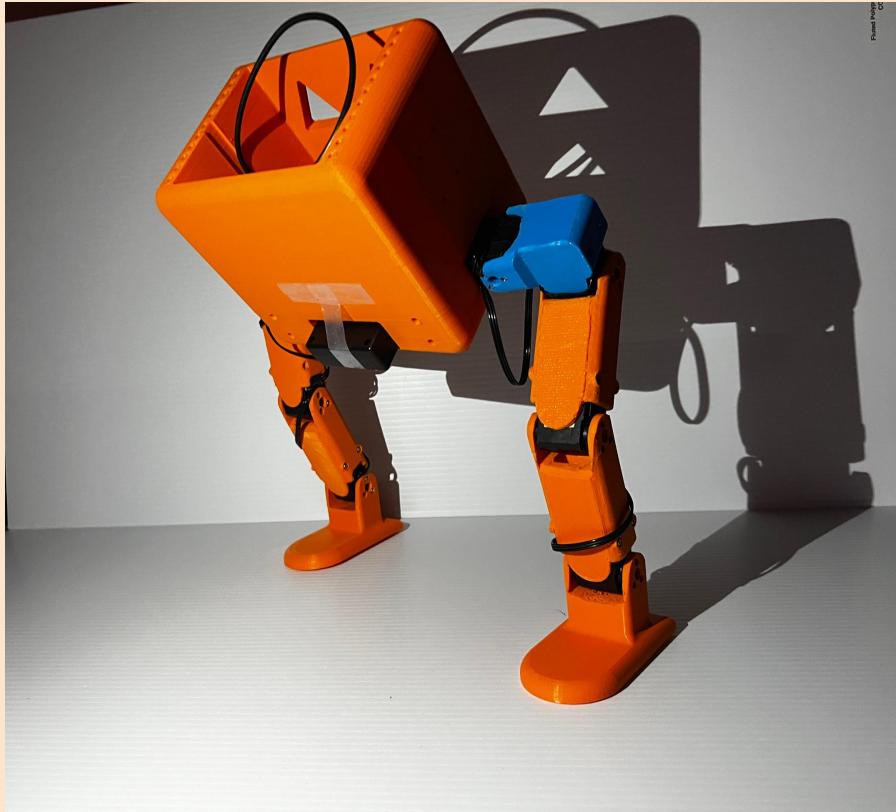
# Bucko's Form/Fit Problems



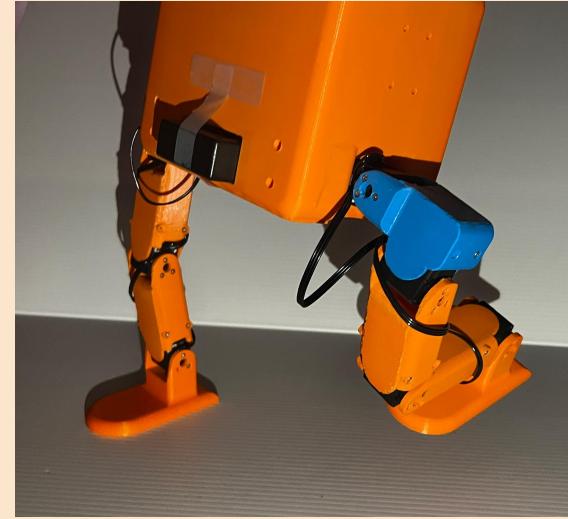
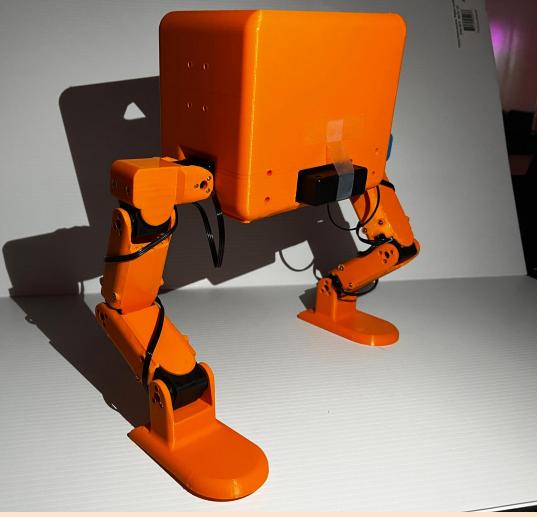
# Bucko's Photoshoot - Power Stance



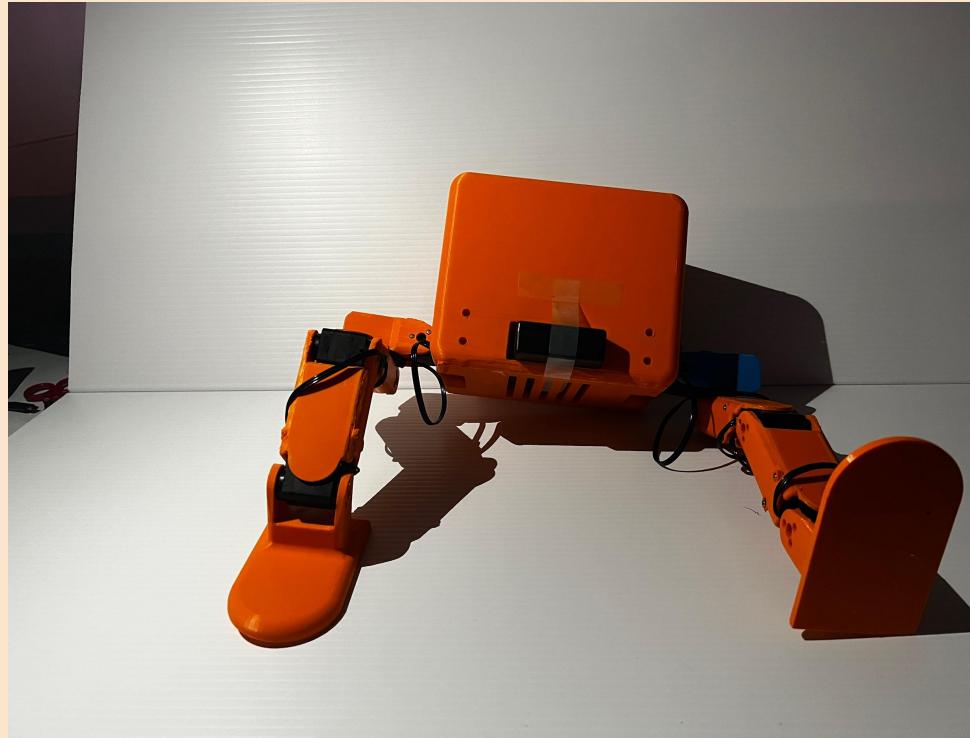
# Bucko's Photoshoot - Gazing at the stars and checking out his shoes



# Bucko's Photoshoot - Action Time



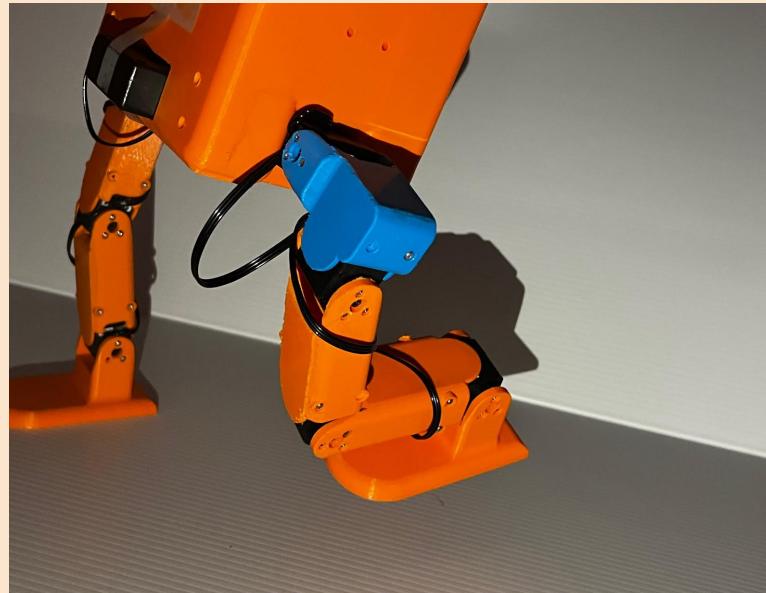
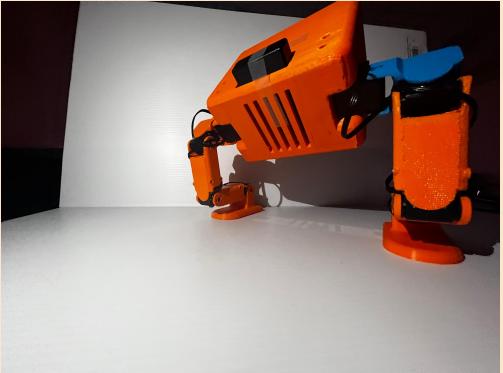
# Bucko's Photoshoot - J Chillin with the homeboys



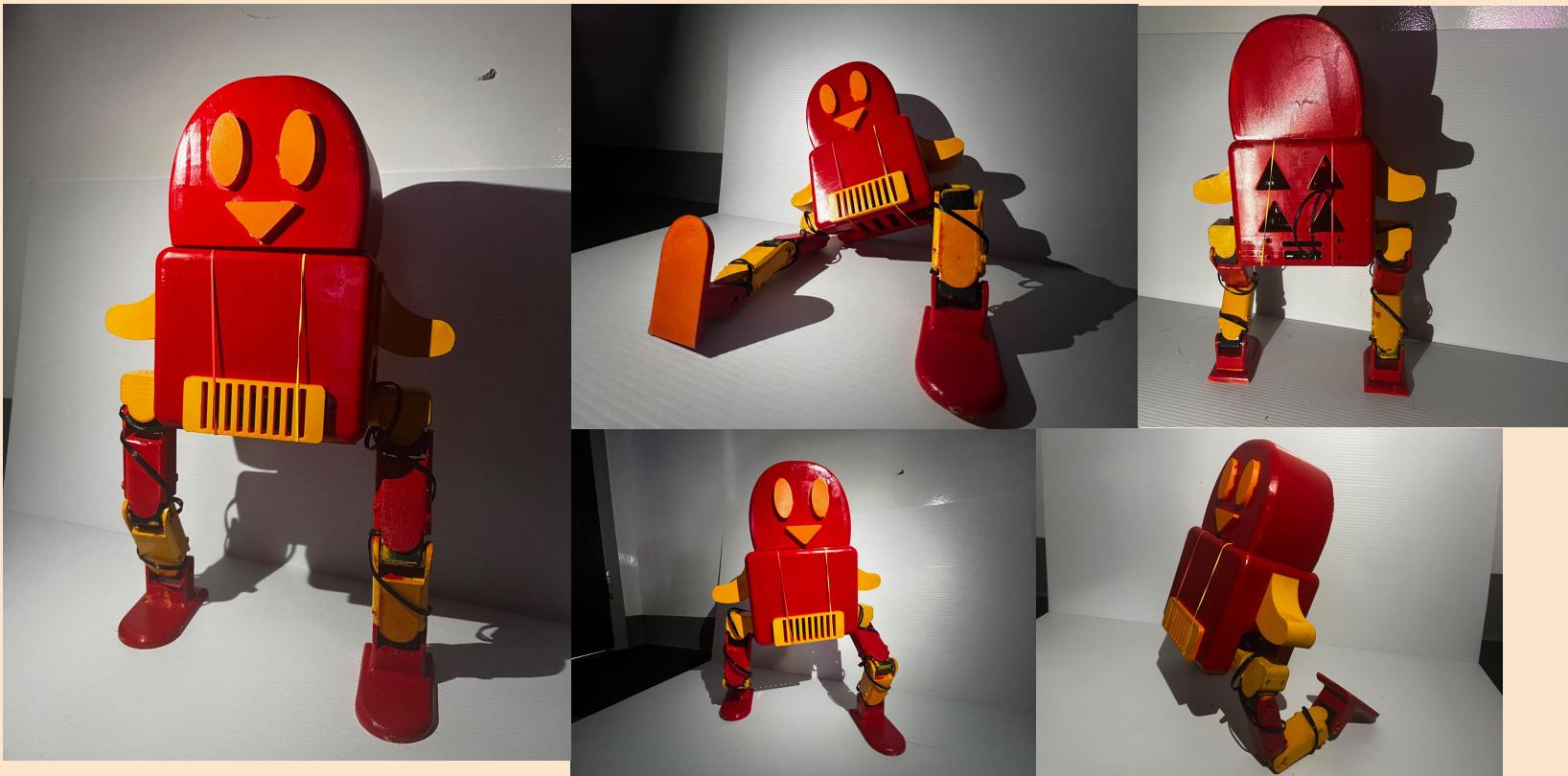
# Bucko's Leg and Neck day at Jim



# Bucko's Stretching



# Glamour Photos



# Moving Robot



<https://youtube.com/shorts/Z8mnIxbk6Dq?feature=share>

# Plotted Motor Angles vs Time - Squat



# Sanded and Painted 3D Prints



# Stability

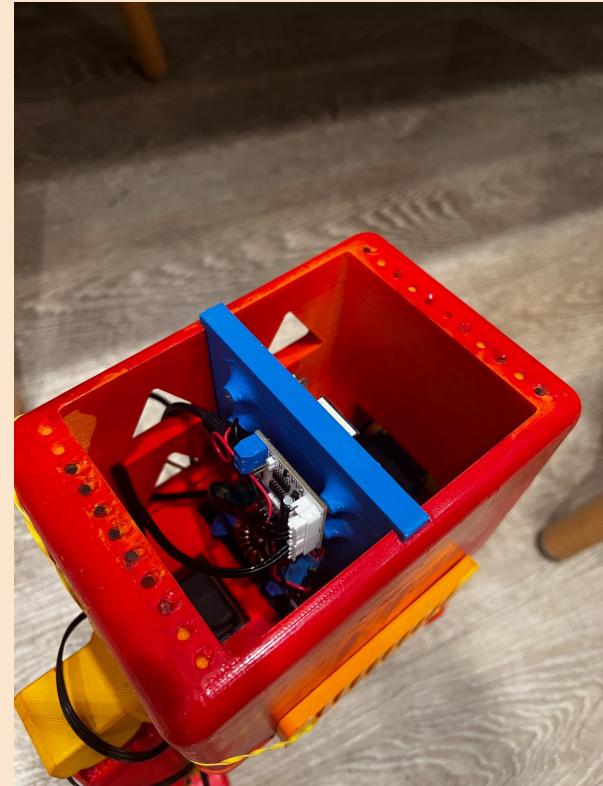


[https://youtube.com/shorts/u9J\\_uCPzm8w?feature=share](https://youtube.com/shorts/u9J_uCPzm8w?feature=share)

# Electronic Components



Battery without the case for  
the picture



# Raspberry Pi Connection



**Raspberry Pi Name** dadmehr@dadmehr-desktop

**Raspberry Pi Password**

\*\*\*\*\*

**Raspberry Pi Dynamic IP Address**

172.28.2255.70

## Problems

- 1) Finding the correct port (/dev/ttyUSB0)
- 2) Finding IP address in case change
- 3) File Transfers

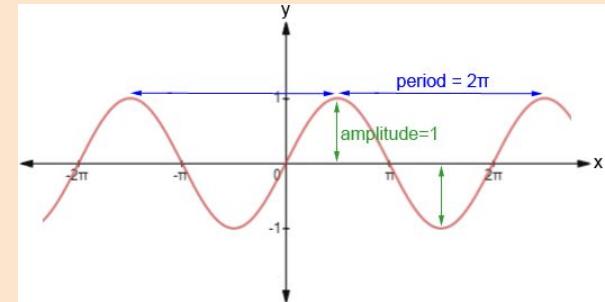
## Solutions

- 1) Sudo chmod a+r /dev/ttyUSB0
- 2) Use an IP scanner app on iPhone to find hostname
- 3) Use WinSCP and the GUI transfer interface

# Different Walking Patterns

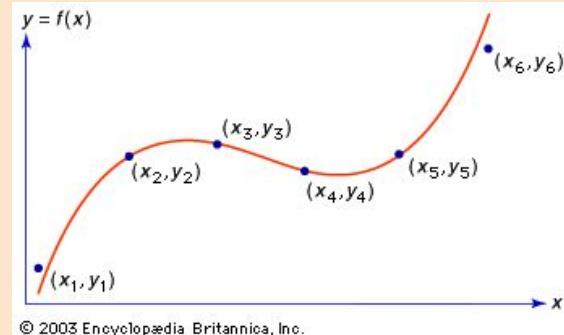
1) sinusoidal input  $\rightarrow \Theta(t) = A * \sin(B*t + C)$

Issues  $\rightarrow$  too many parameters, COM never stable, never “natural” looking, bug with LX16A library



2) joint state keypoint [basic]  $\rightarrow \Theta(t) = (1-t)*\text{StateA} + t*\text{StateB}$

Issues  $\rightarrow$  movements too exaggerated, too much movement and too much torque



# Different Walking Patterns

**3) keypoint [damped]** → same as above but calculate the difference between state(t) and home\_pos to find differential. Divide by some number (0.5 worked best for Bucko). This makes the movements and speeds smaller

Issues → when he ran his hip would lean too far back. Realized we need independent hip control

**4) keypoint [hip correction]** → same as above but add a correction factor for only the hips so that bucko's body can be independently controlled (lean forward vs lean back but at hips only). This way we put COM above foot

Issues → None!! Worked perfectly every time ever :))))

# Online Portfolio

Alejandro Assael (aa604)

Home   Bock-O'clock   Gazebo Simulation and Code   STL Files and Solidworks   About Me   

## BOCK-O'CLOCK



Alejandro: <https://sites.google.com/view/me-442-final-project-alejandro/bock-oclock>

Daniel: <http://www.danielghasemfar.com>