



Karate Kid IV: Attack of the Cyborgs

Group 5: Stephanie Bentley,
Allison Moore, Mohammed Tonkal



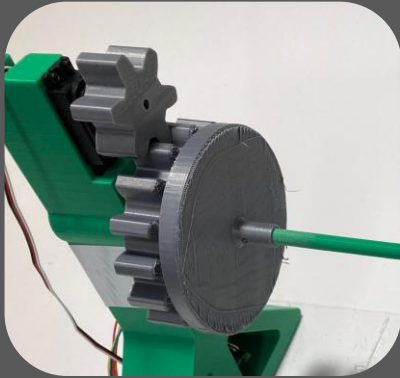


Karate Kid IV: Attack of the Cyborgs

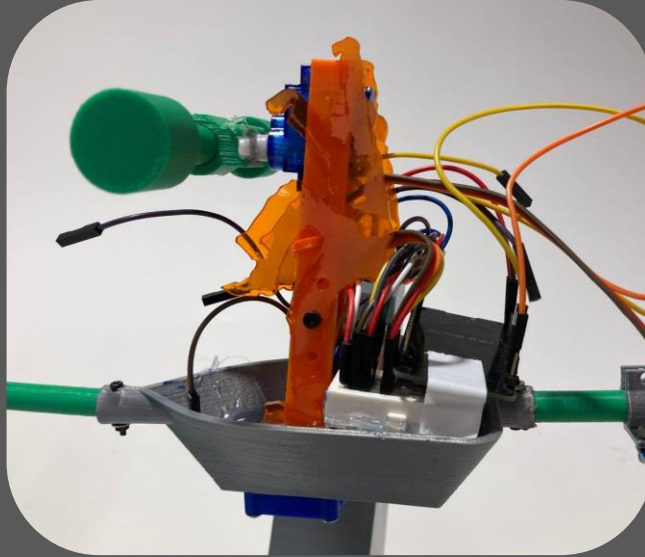
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Creativity & Innovation



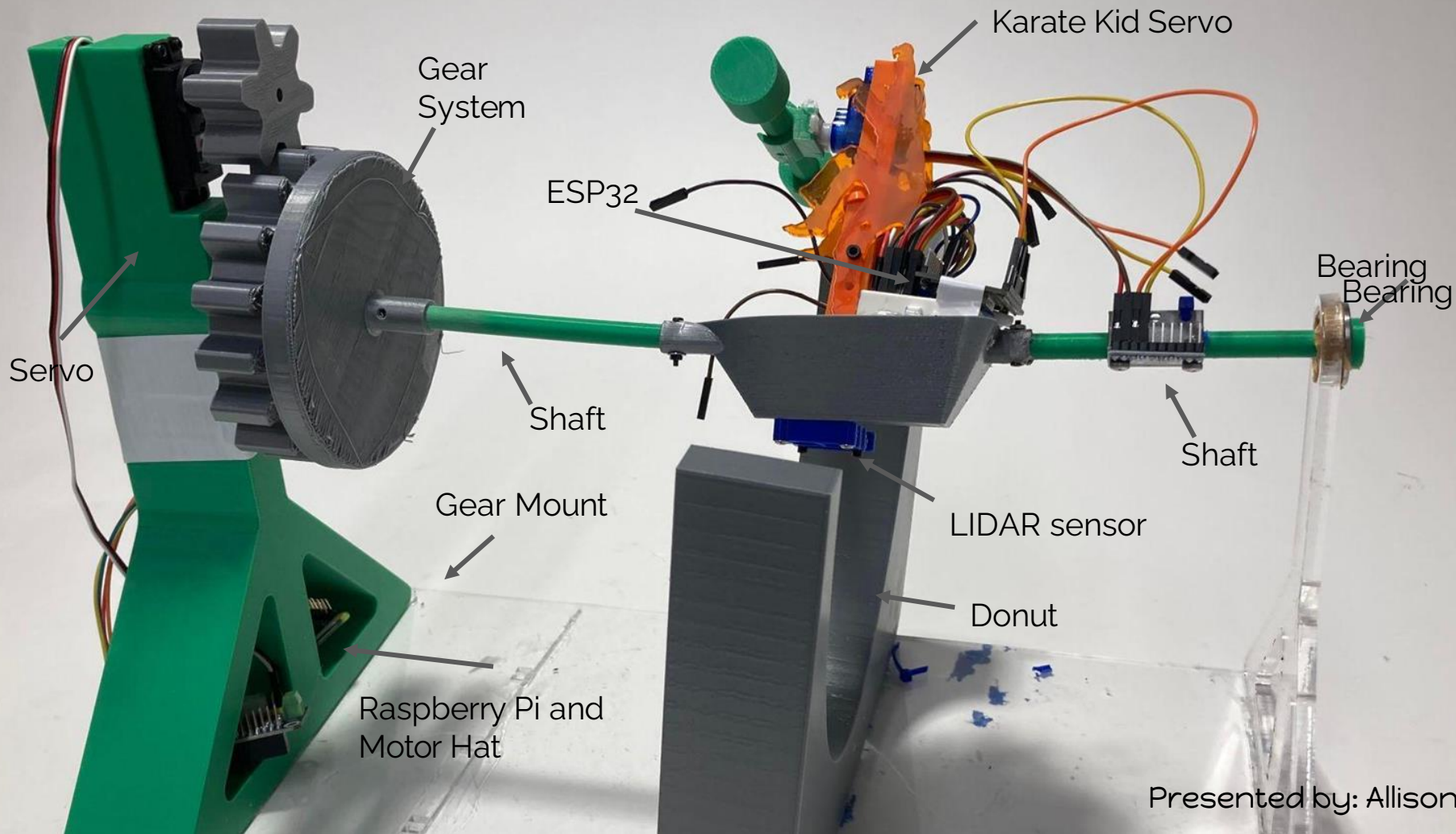
Gear System



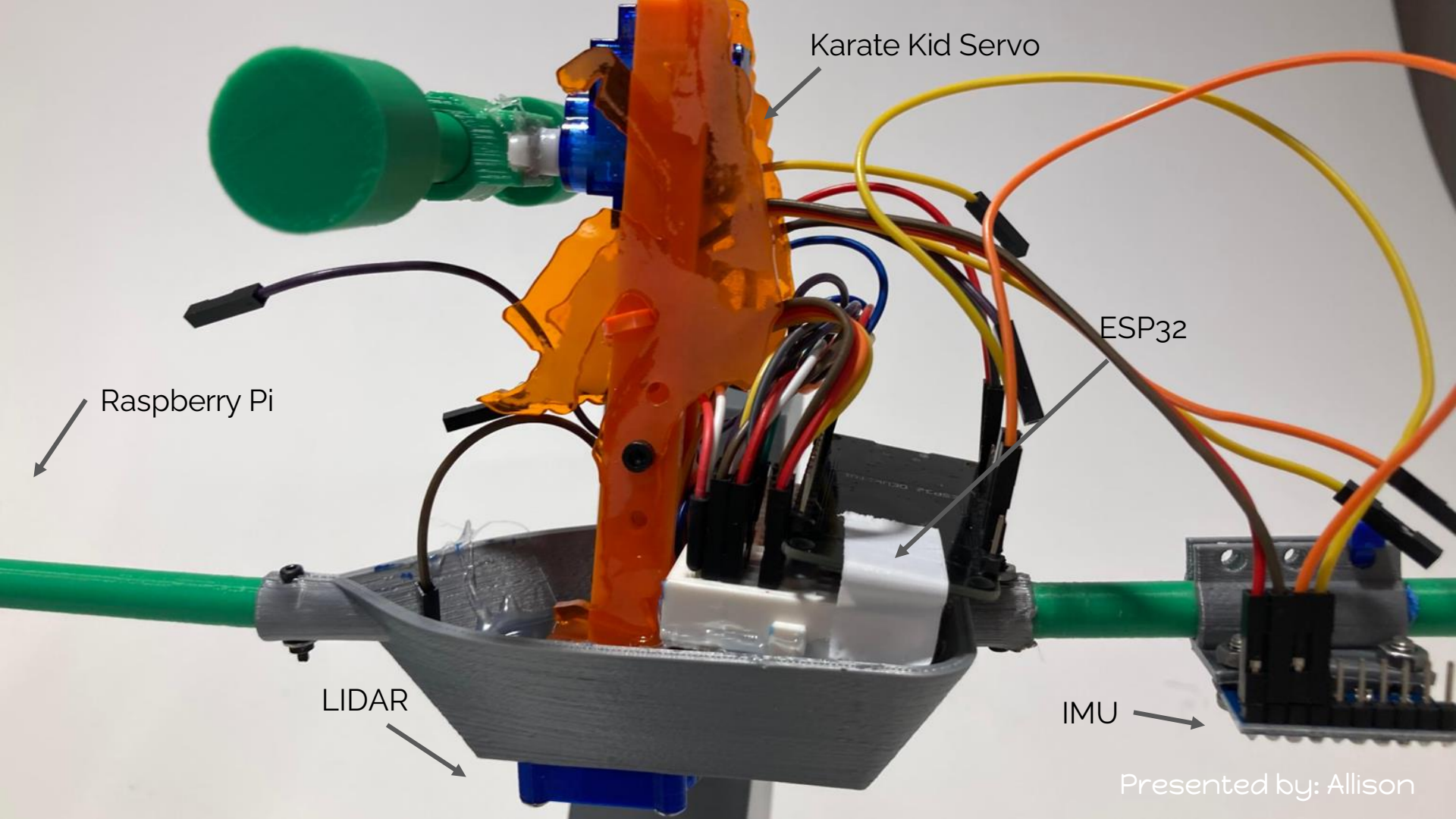
Balancing System and
Concept



Thematic Design



Presented by: Allison



Karate Kid Servo

ESP32

Raspberry Pi

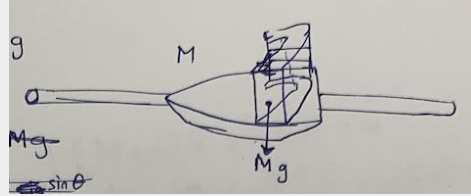
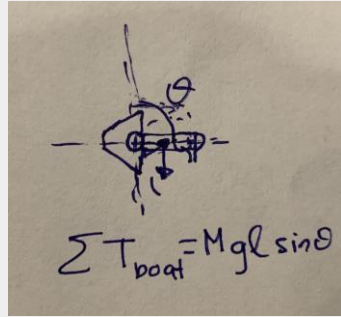
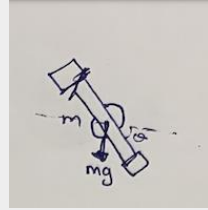
LIDAR

IMU

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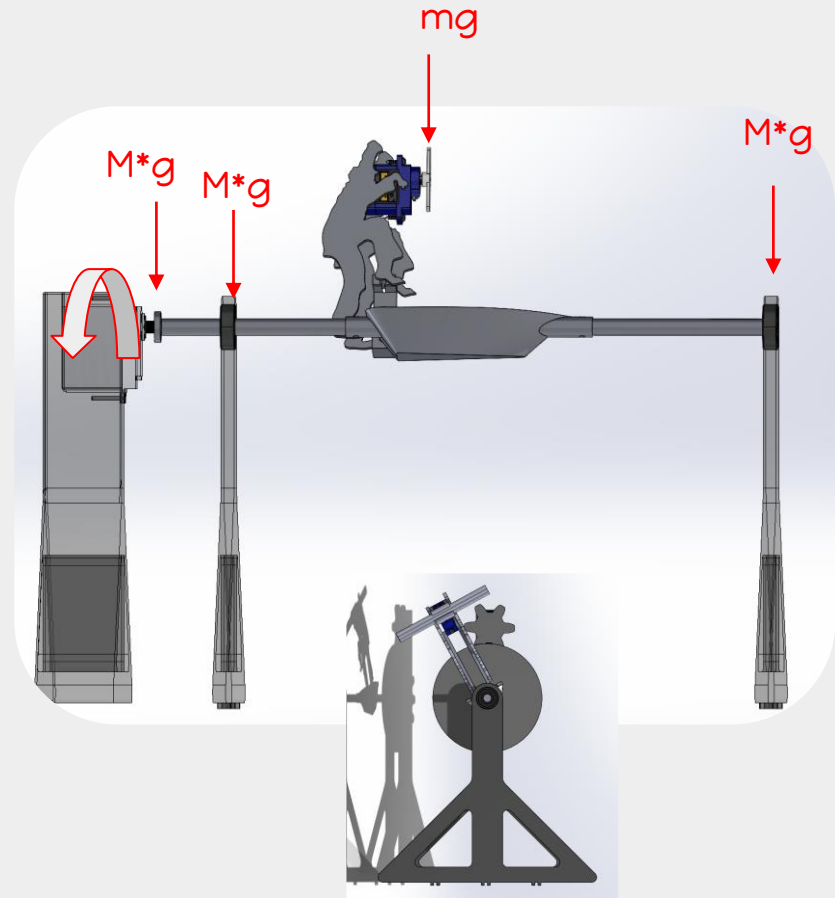
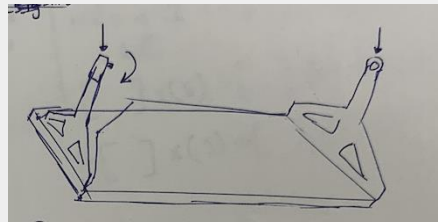
Free Body Diagram

$$\sum F_{\text{boat}_y} = mg$$



$$\sum T_{\text{base motor}} = Mgl \sin \theta$$

$$\sum F_{\text{base}_y} = Mg$$



Using the Lidar

The concept:

The equation for an ellipse in polar coordinates

$$r(\theta) = \frac{ab}{\sqrt{(b \cos \theta)^2 + (a \sin \theta)^2}}$$

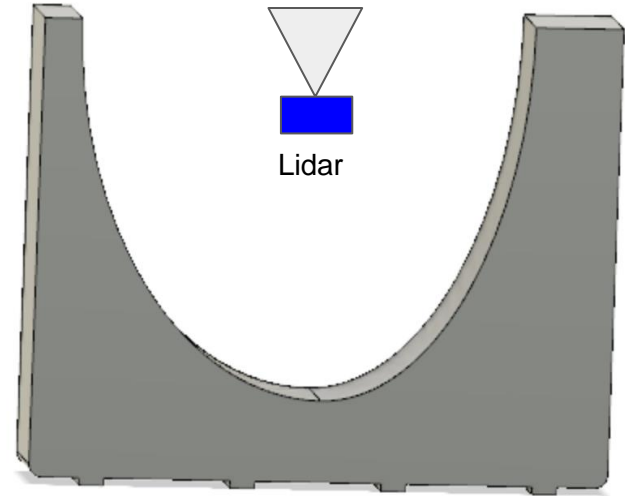
When $\theta = 0$, $r = a$, and when $\theta = \frac{\pi}{2}$, $r = b$

So the formula you're looking for (where $d = 2r$) is

$$r(\theta) = \frac{2ab}{\sqrt{(b \cos \theta)^2 + (a \sin \theta)^2}}$$

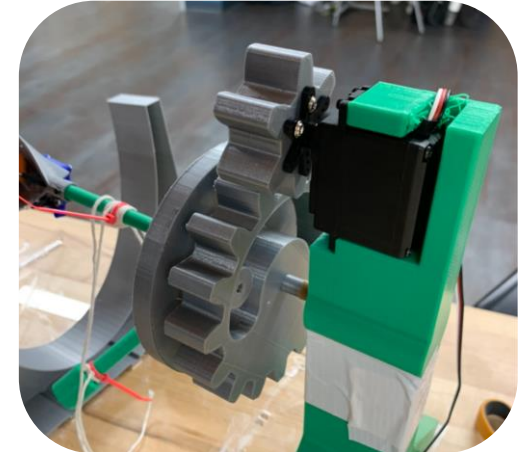
Problems:

- The lidar is not mounted at the center
- Connecting the lidar and the IMU on the same ESP



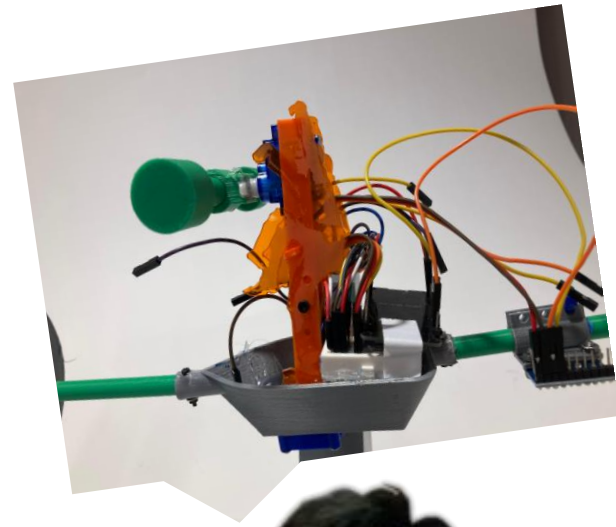
Gearing Mechanism

- Added a bearing between desk and gear
- Gear ratio is 5:2
 - To get 90 degrees, we have to rotate the motor 225 degrees
- Solutions:
 - Continuous servo
 - Stepper motor
 - DC motor with limit switch



Controls and Electronics

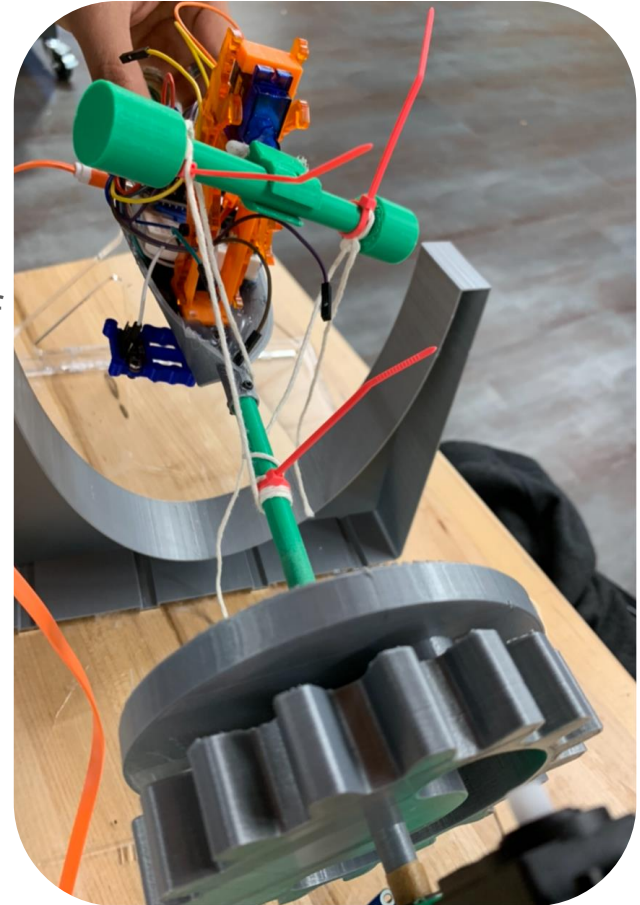
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- Angle inputs: compare average of recent angle measurements to setpoint
- Control: Use proportional controller to set rod angle
- Resetting: Theoretically triggers Raspberry Pi with gear mechanism

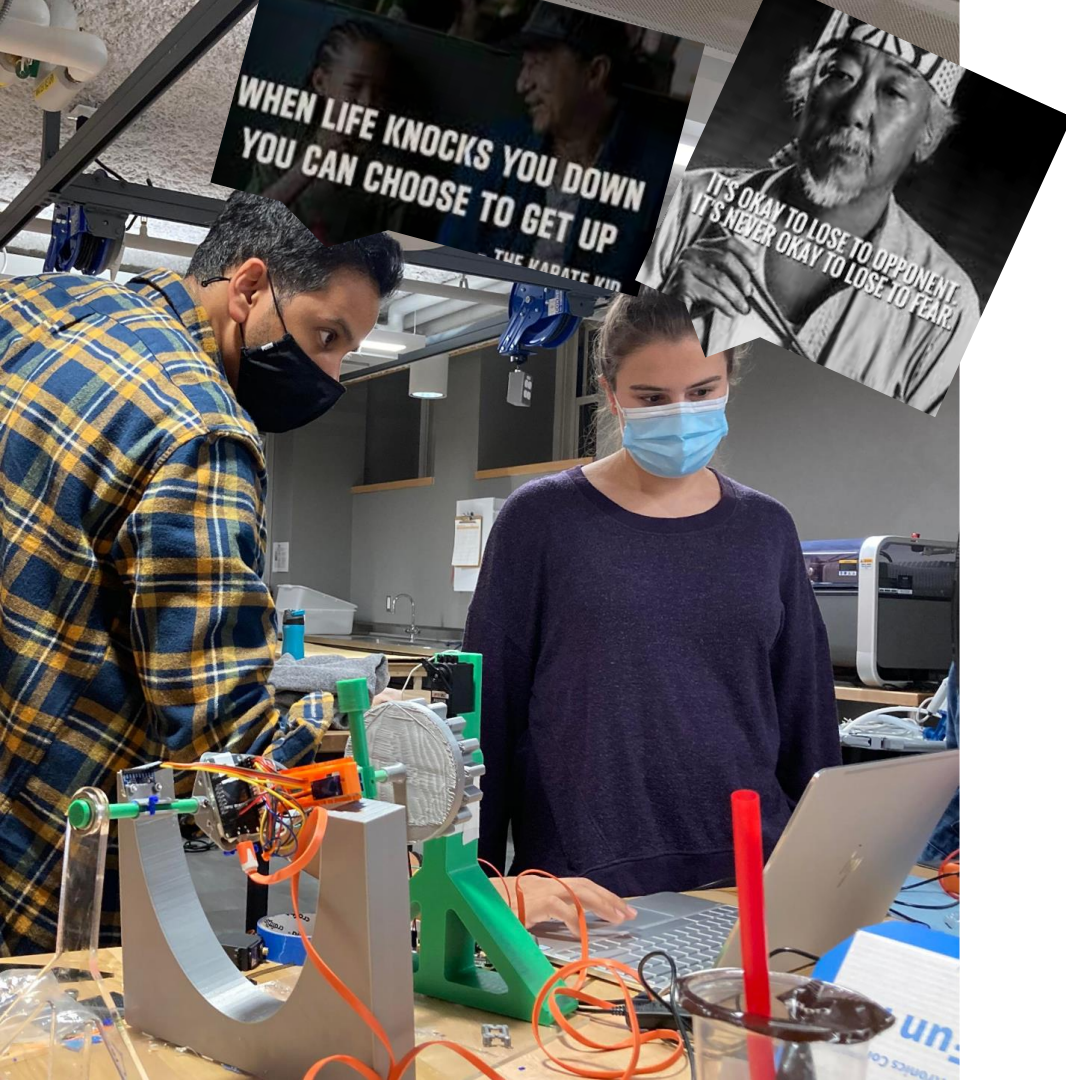


One last last last ~~modification~~ hope!

We have added a string from the balancing rod to the shaft. The karate kid will try to rotate the shaft by pulling the strings while trying to balance himself on the boat

Success??



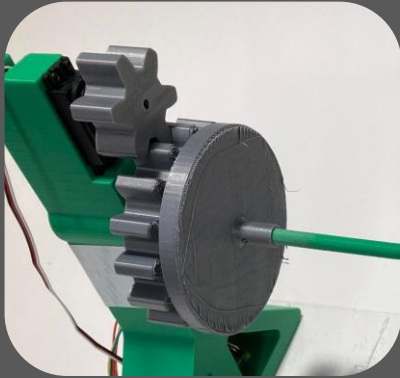


Thank you!
Questions?

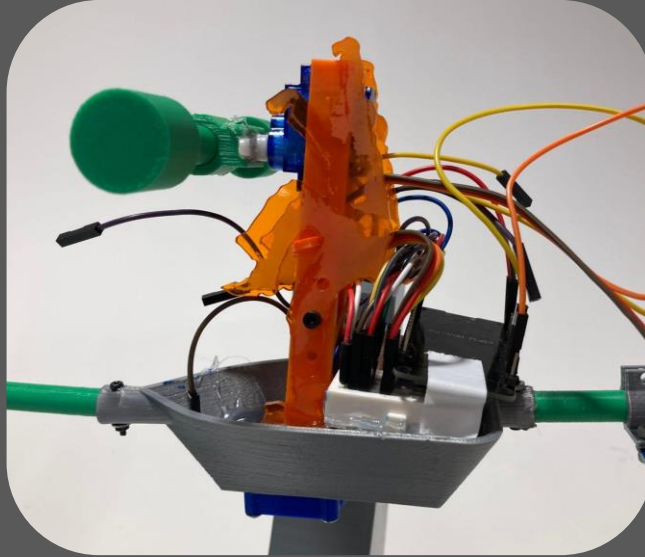


The Karate Kid

Creativity & Innovation



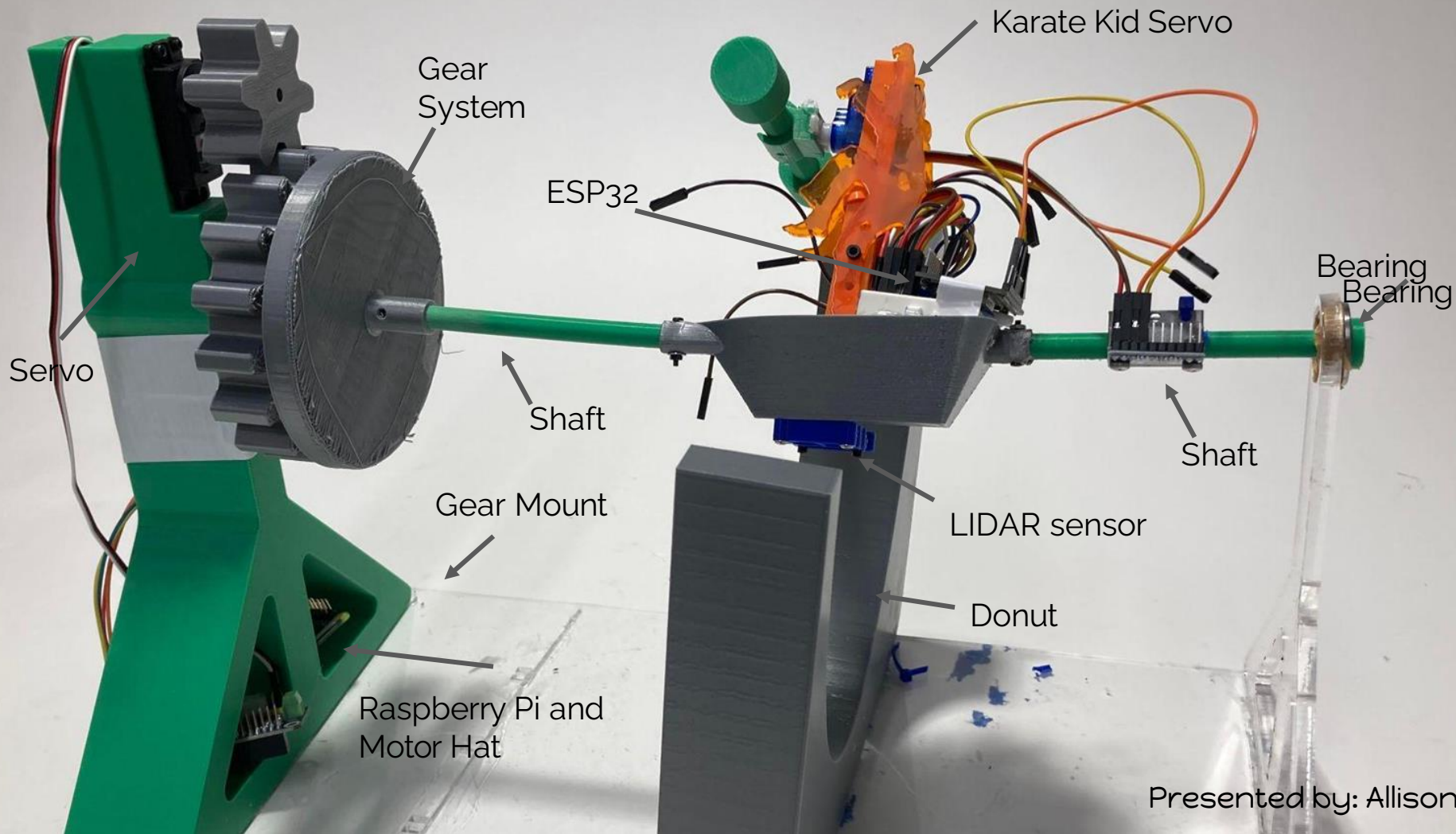
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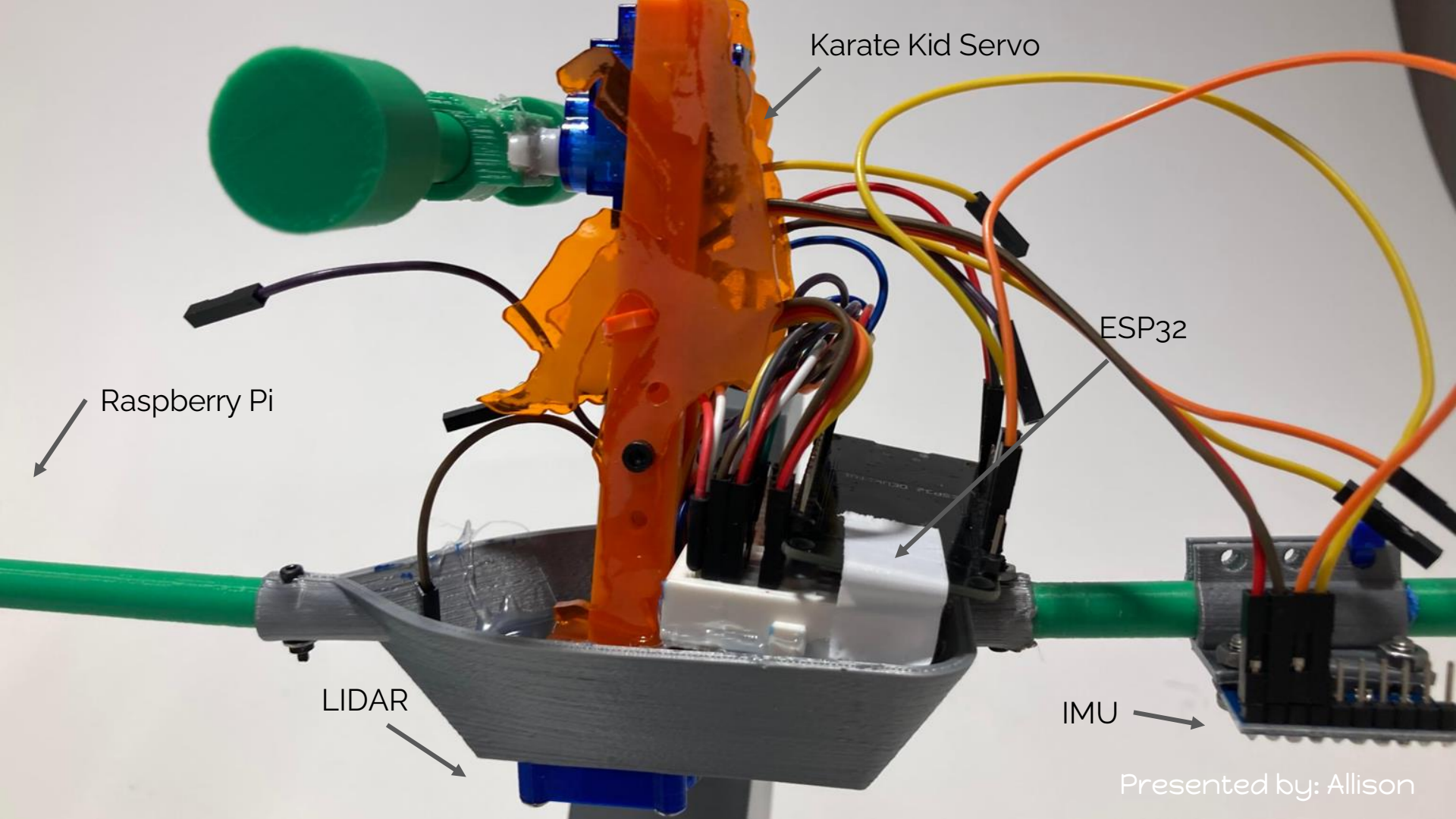
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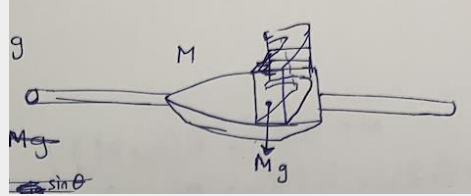
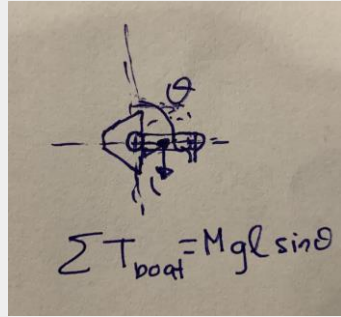
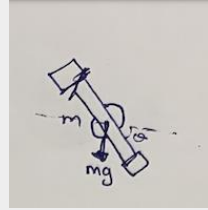
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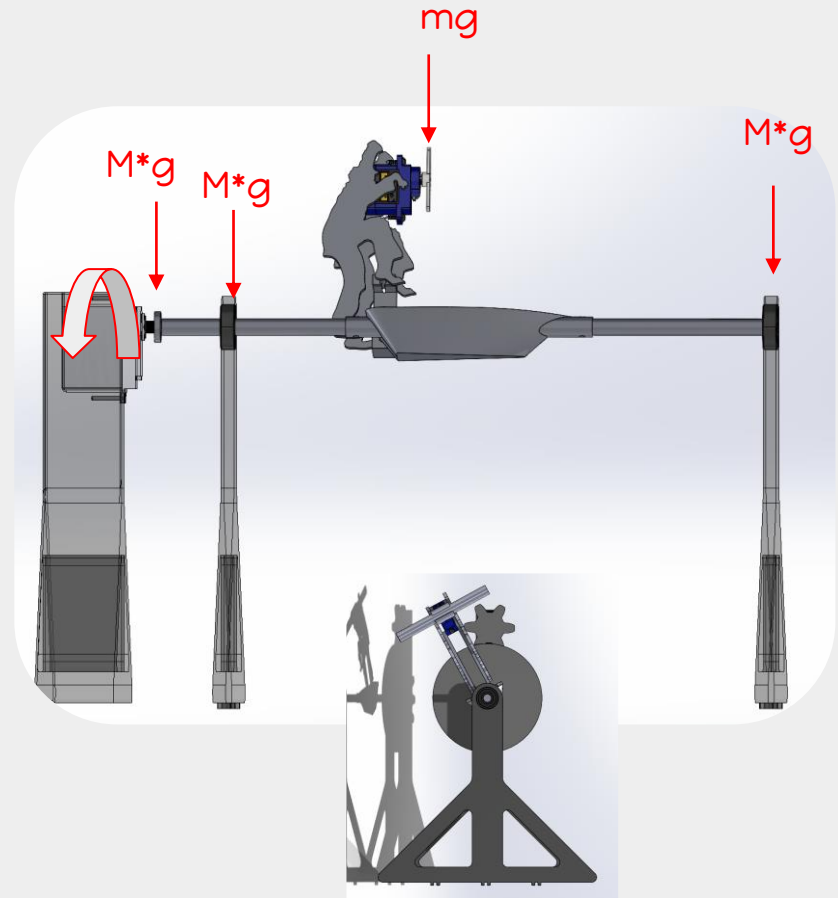
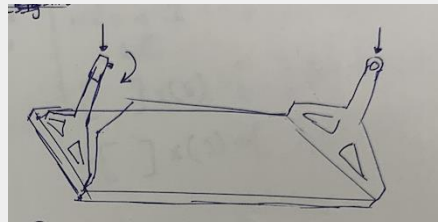
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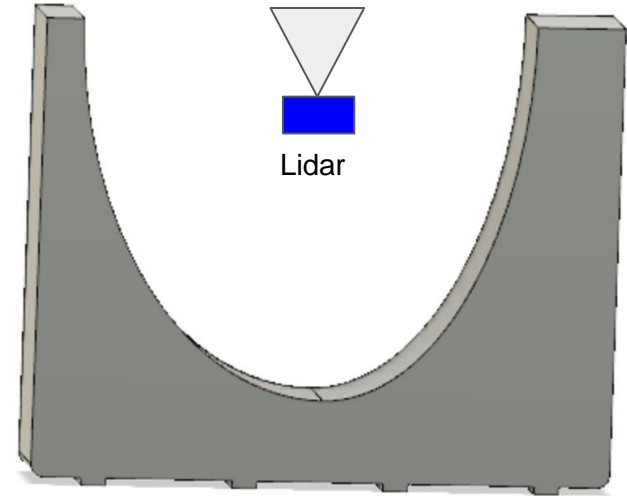
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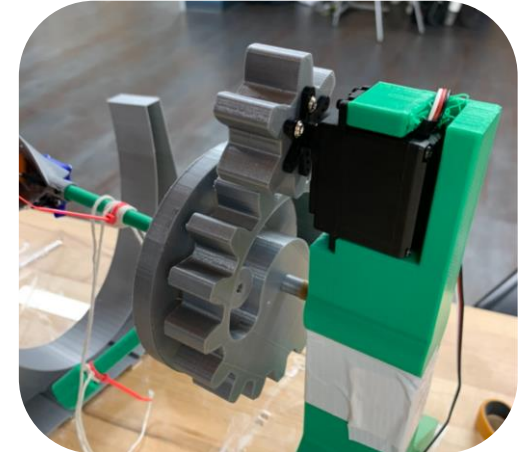
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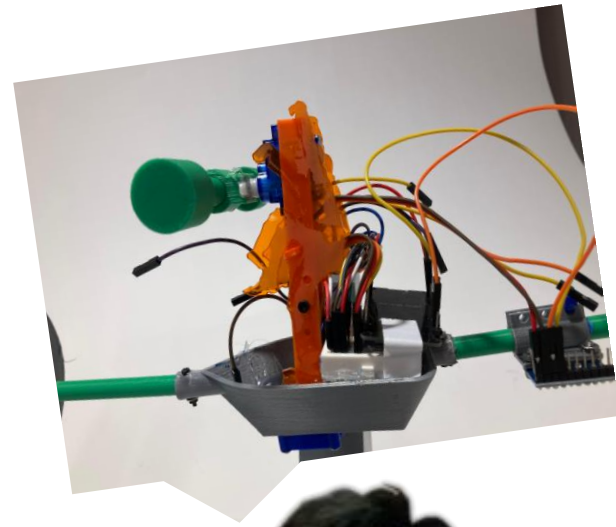
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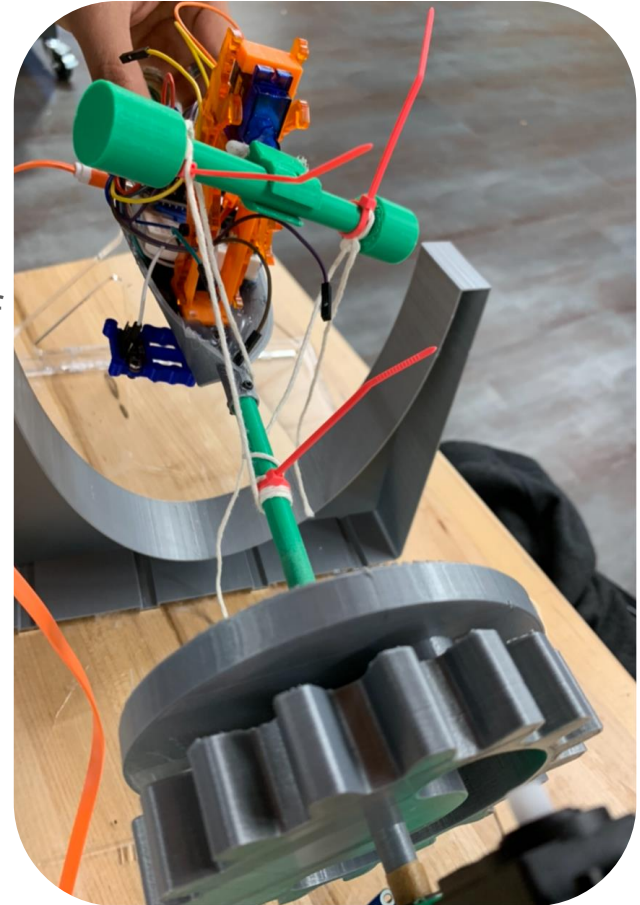
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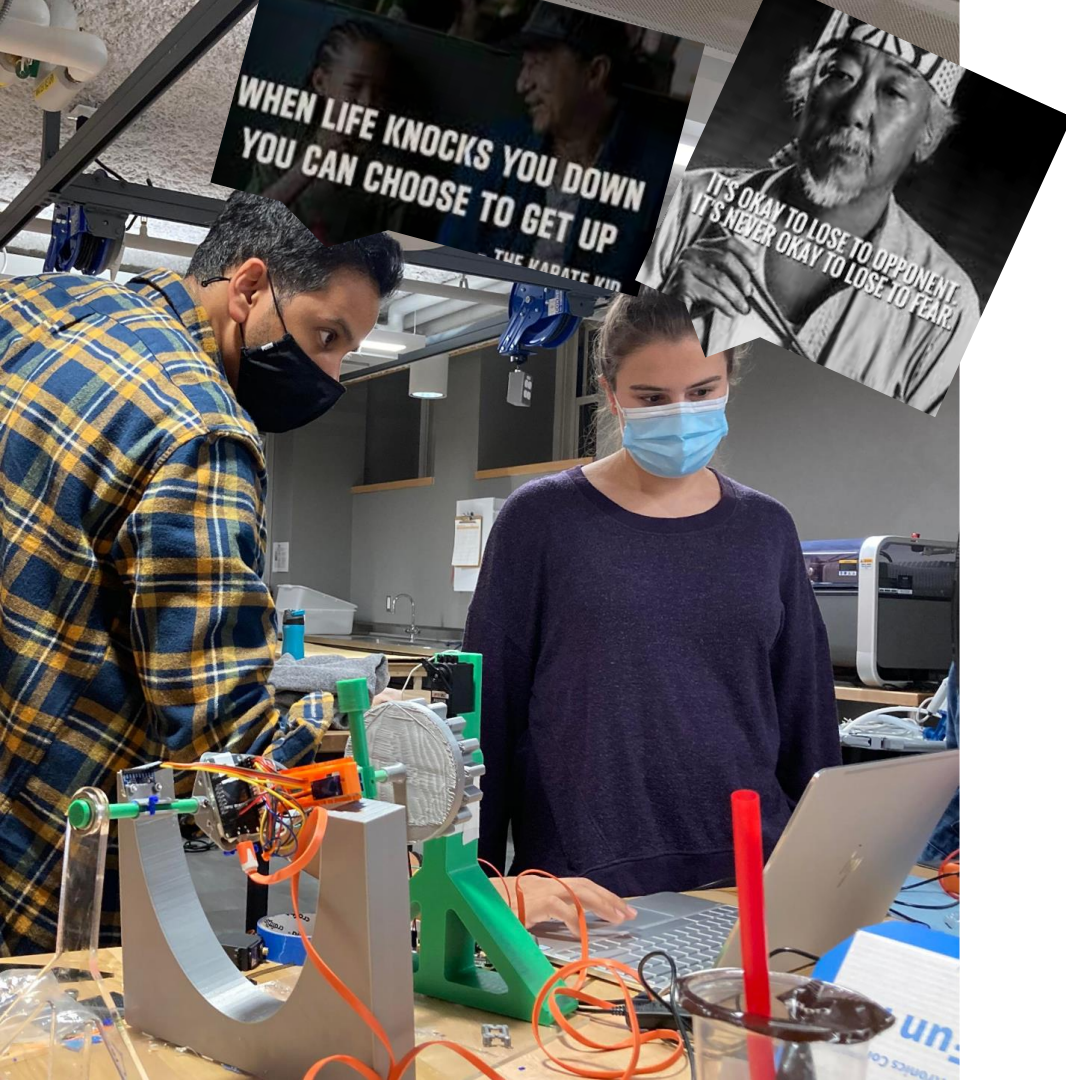


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