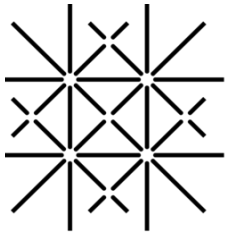


Universität Basel

Robo Retriever

Computer Architecture Project

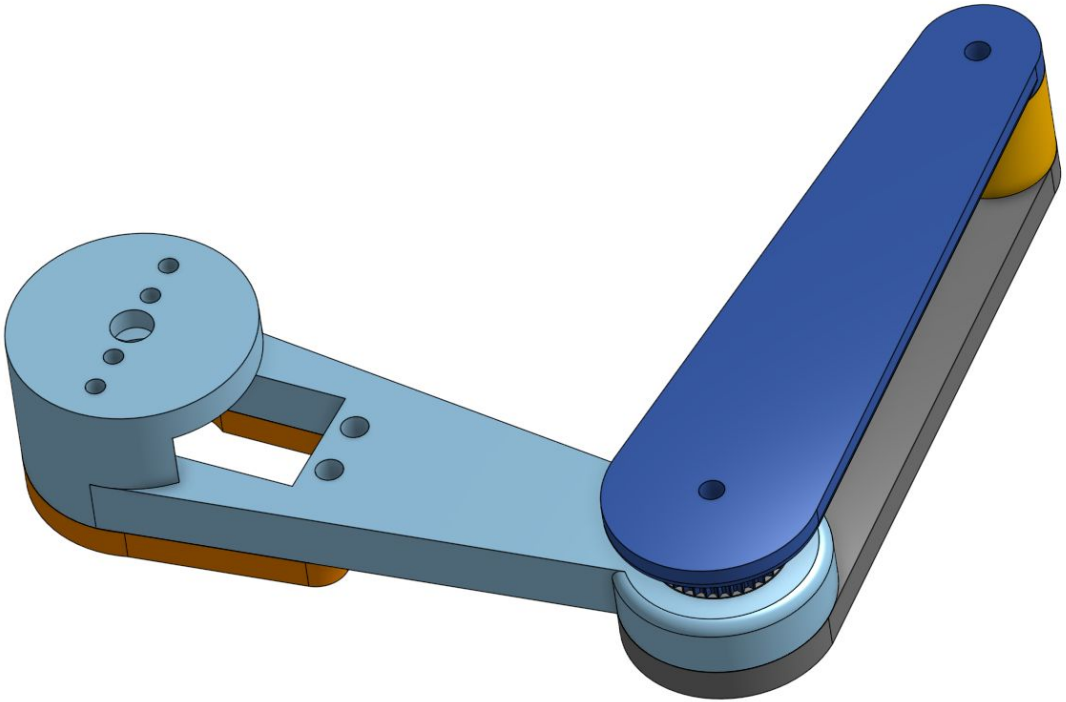
A. Merkushova, J. Käser, M. Groenen, R. Kempf

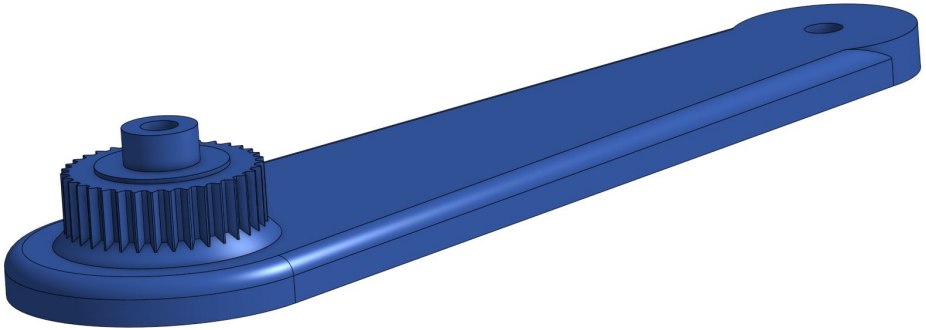
Fall 2024

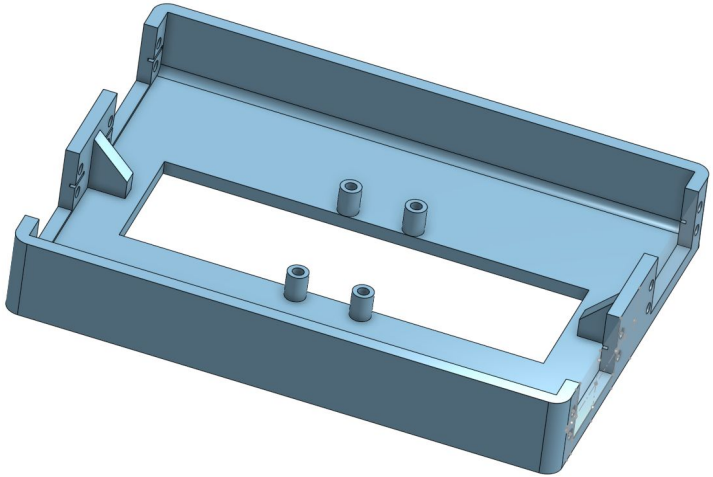
- **Goal:**
  - Develop a quadruped four-legged robotic pet controlled via Wi-Fi

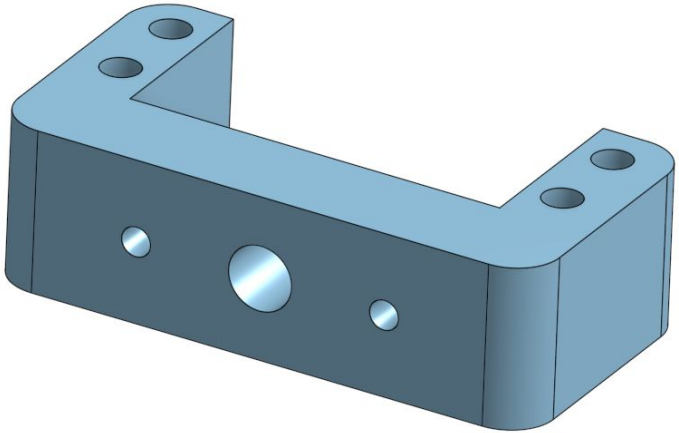
- **Steps:**
  - Design parts and print them
  - Design electronics and solder
  - Assembly and calibration
  - Programming

- Legs
- Shoulder
- Main body





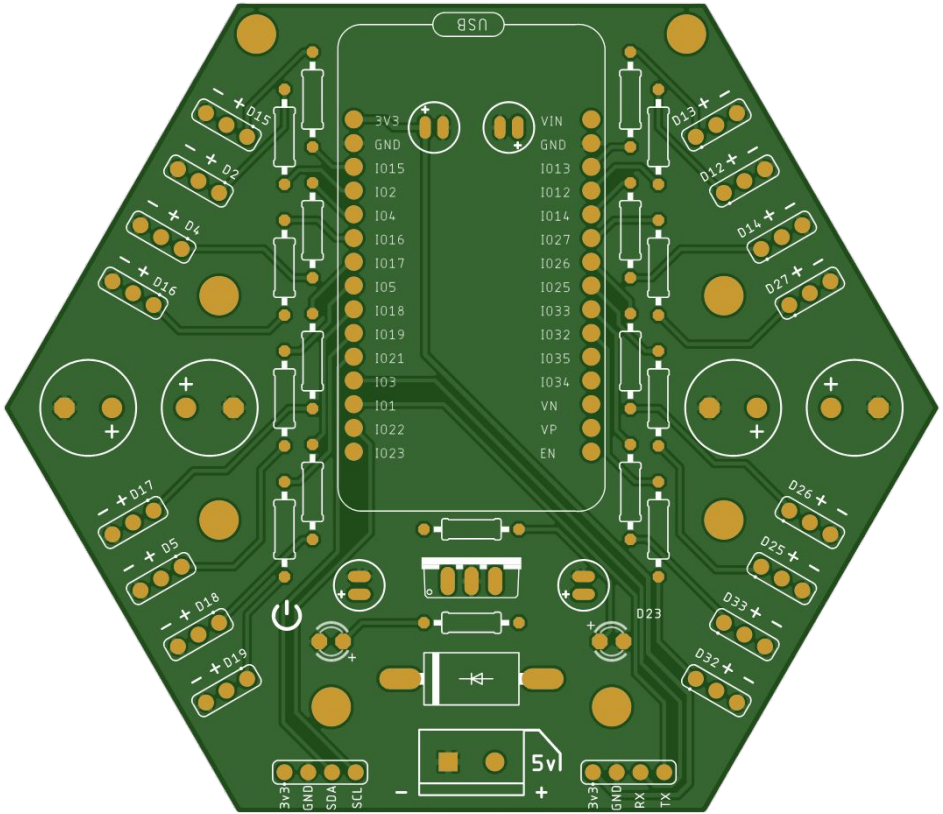




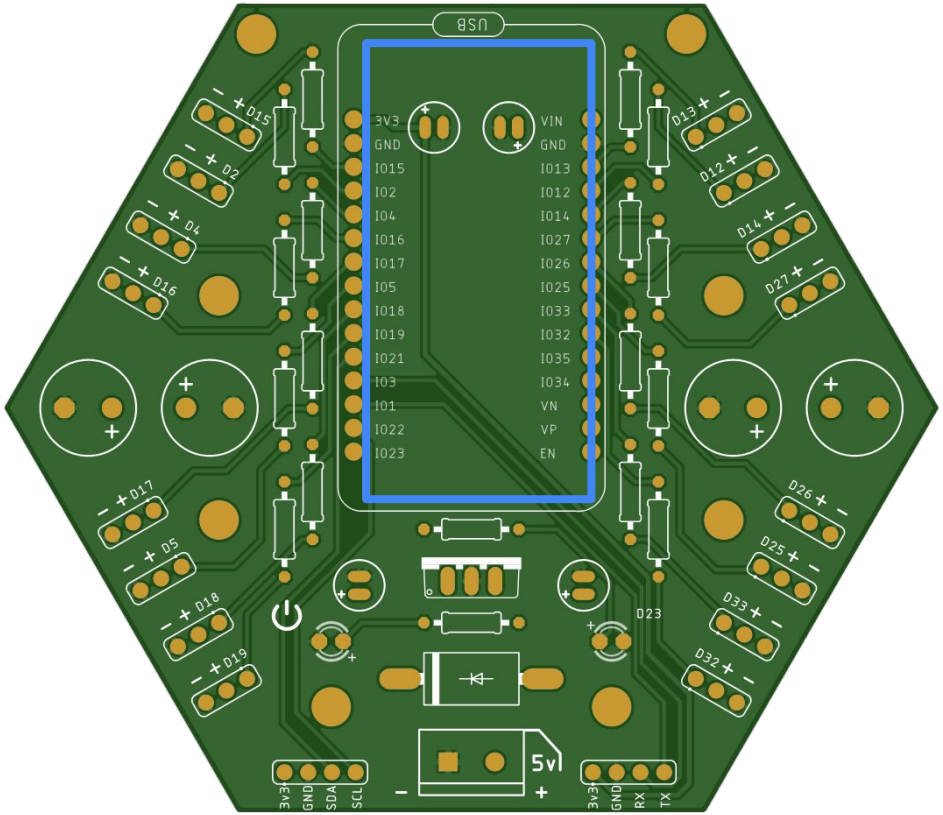
Jiri: Problems While Designing

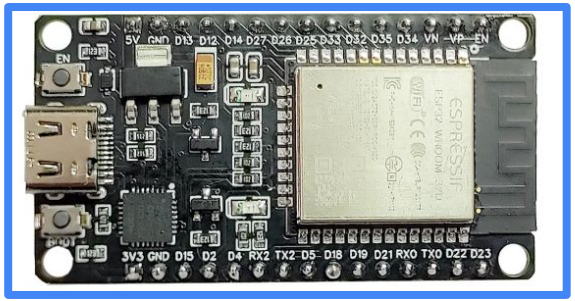
- Too perfect fit
- Not good enough fit
- Belt slipping
- Servo mount slightly off
- Belt distance management
- …

Anastasiya: Electronics

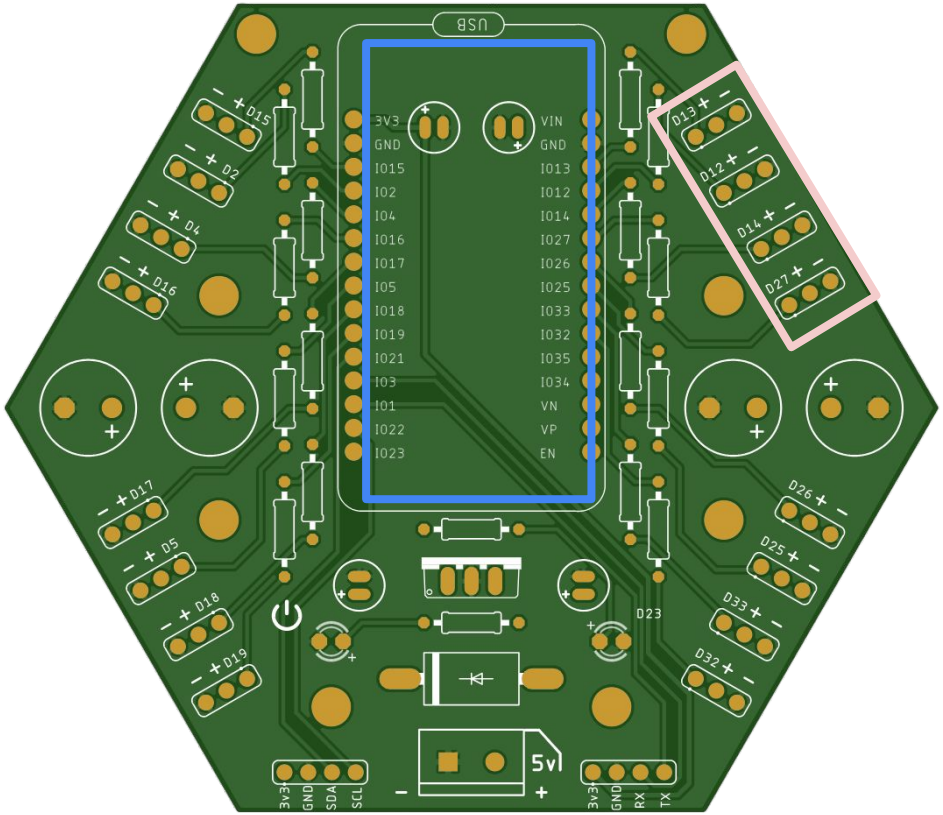


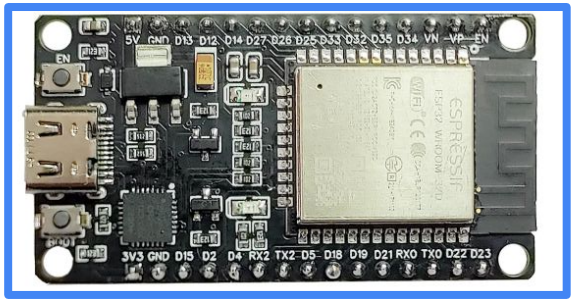
Anastasiya: Electronics



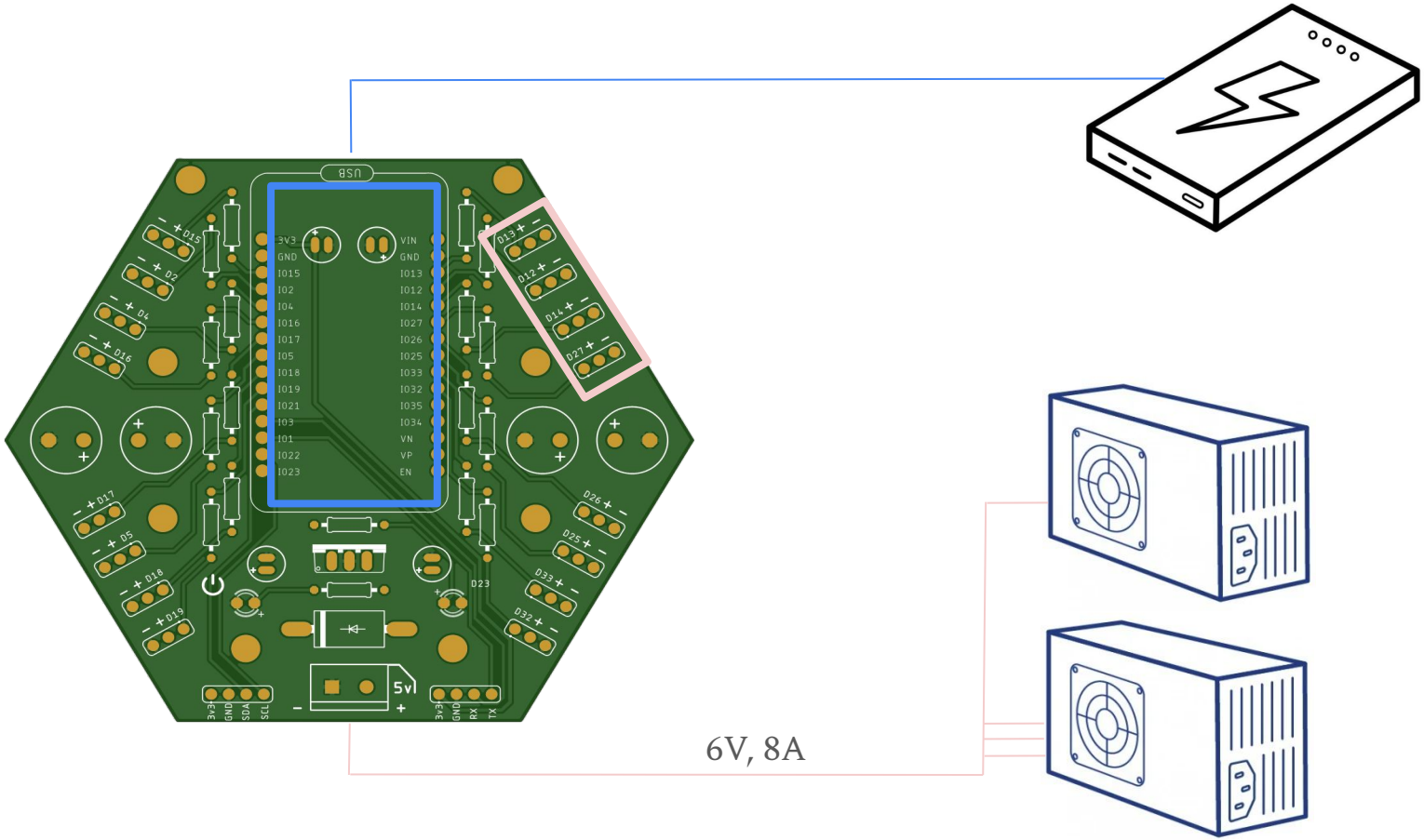


Anastasiya: Electronics



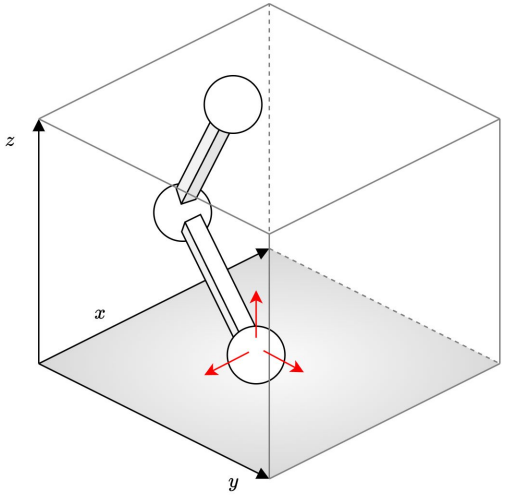


Anastasiya: Electronics



Inverse Kinematics

- Leg movement by specifying the desired coordinates (x, y, z) and calculating the angles.

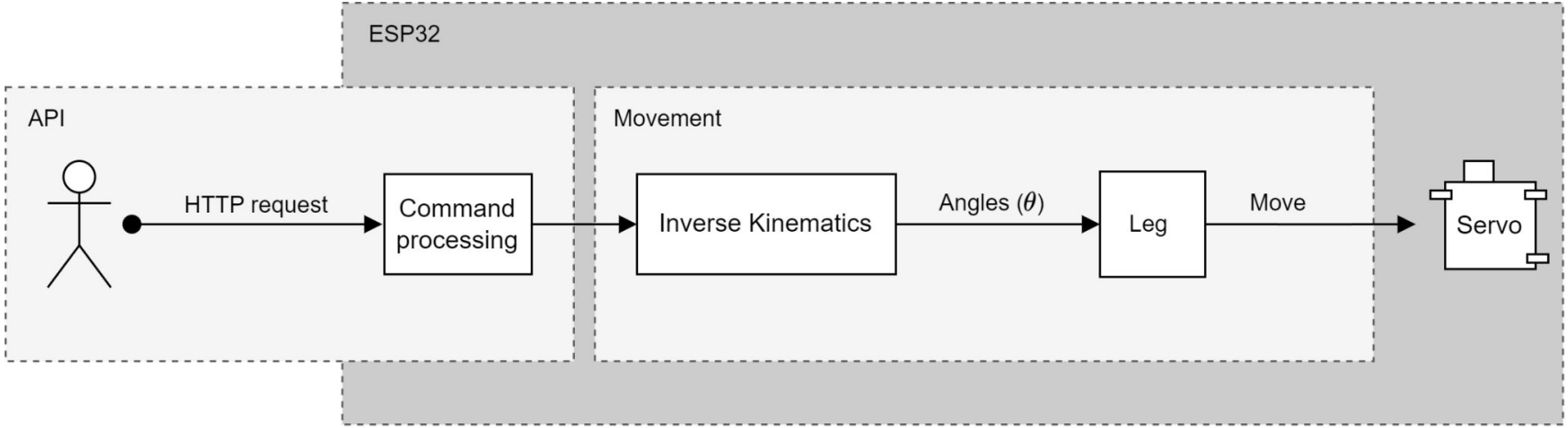


Implementation

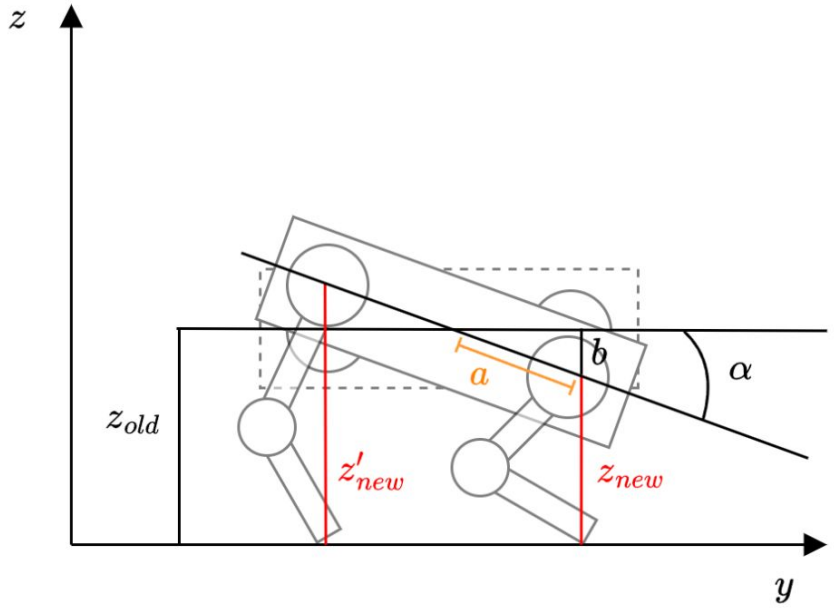
- Implemented in C++
- Angle calculations
- Each leg governs over its servos, allowing for individual movement

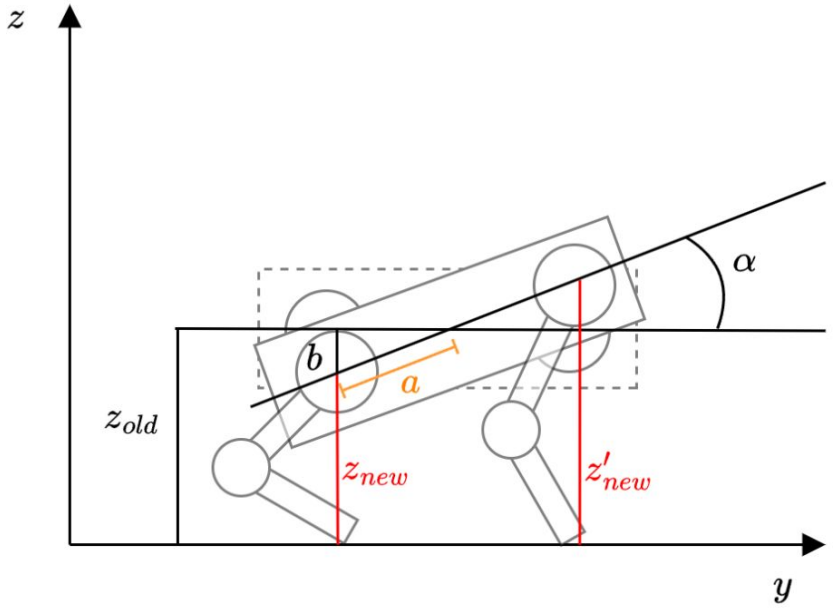
Wi-Fi

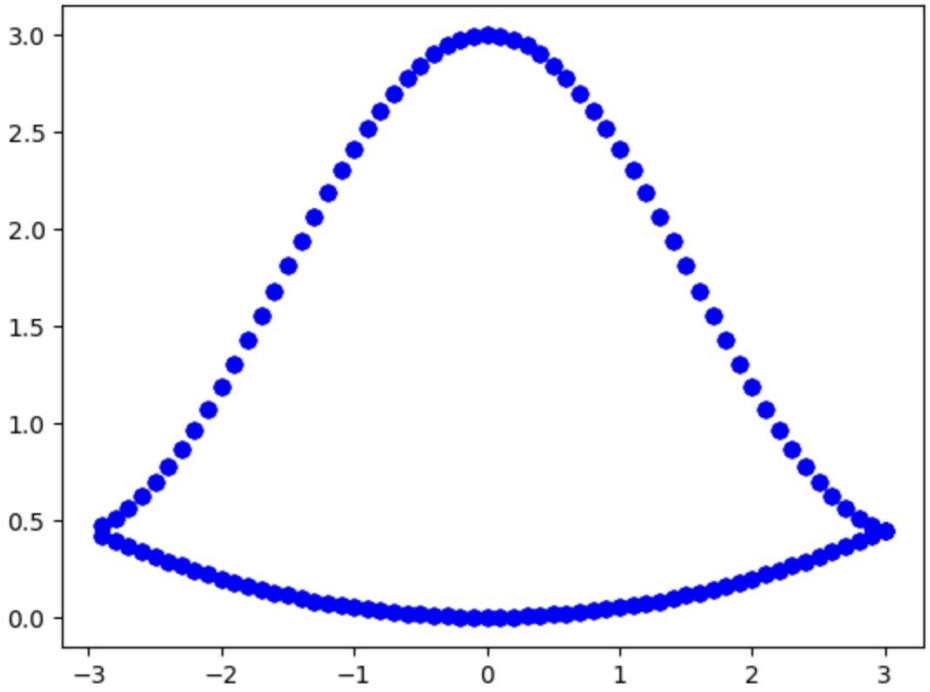
- Async HTTP Server for remote control of the robot


ESP32
API
HTTP request
Command processing
Movement
Inverse Kinematics
Angles (θ)
Leg
Move
Servo

- Stand up / Sit
- Tilt forward and backwards
- Walk forwards


z
z_{old}
z'_{new}
a
b
z_{new}
α
y


z
z_{old}
b
a
z_{new}
z'_{new}
α
y


3.0
2.5
2.0
1.5
1.0
0.5
0.0
−3
−2
−1
0
1
2
3

- **Results:**
  - Functional 3D design
  - Electronic setup capable of controlling multiple servos
  - Basic movement

- **Future Work:**
  - Refine 3D design for stability
  - Include rechargeable battery
  - Optimize walking
  - Remote Control with Interface

Questions ?