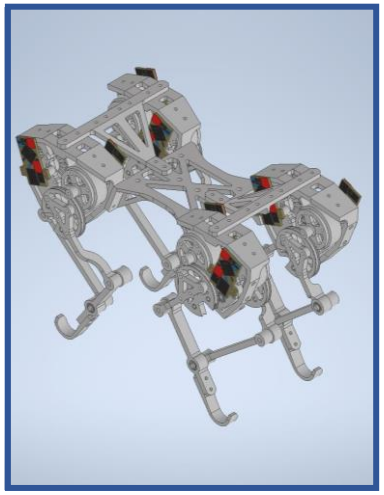
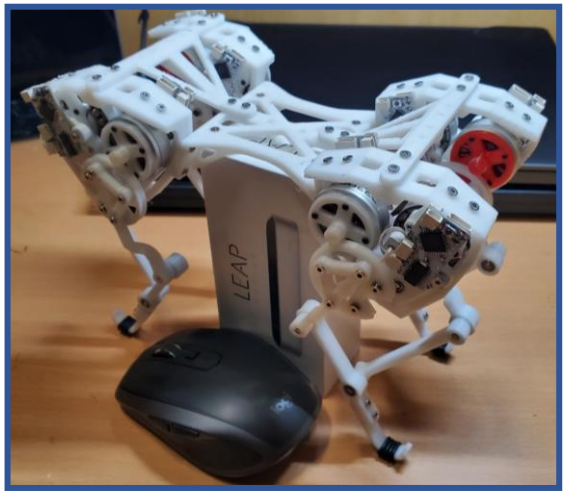
Hardware Mechanical design

8DOF Quad tiny / 12DOF Quad tiny Module design

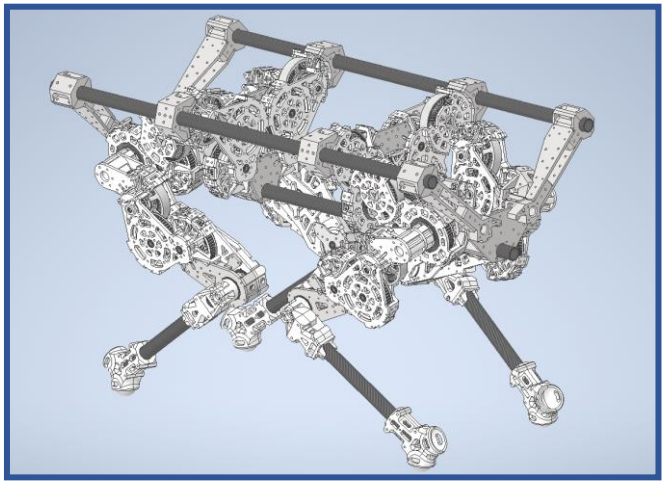


- 180mm*87mm
- 470g
- Capstan reducer –

Maximum output- 0.8N*M

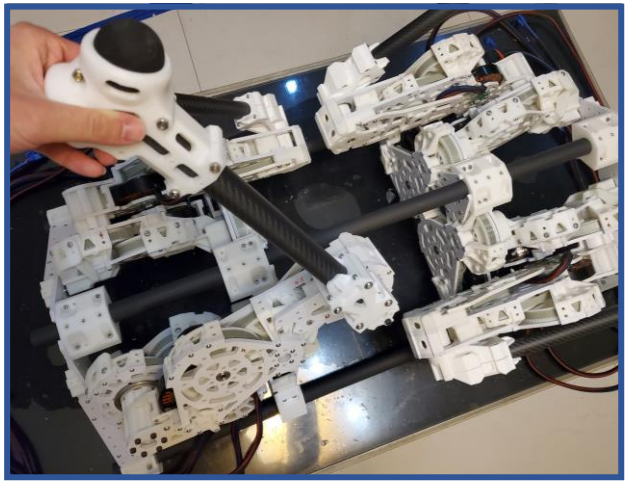


12DOF Quad bai



- 1000mm*550mm
- 18kg
- Timing belt reducer -

Maximum output- 40N*M



Joint actuator Mechanical design

Quad tiny – Capstan reducer 6:1

Pros:

|Without backlash, small moment of inertia, achievable high transmission ratio in limited space

Cons:

|Pre-tensioned rope is vital

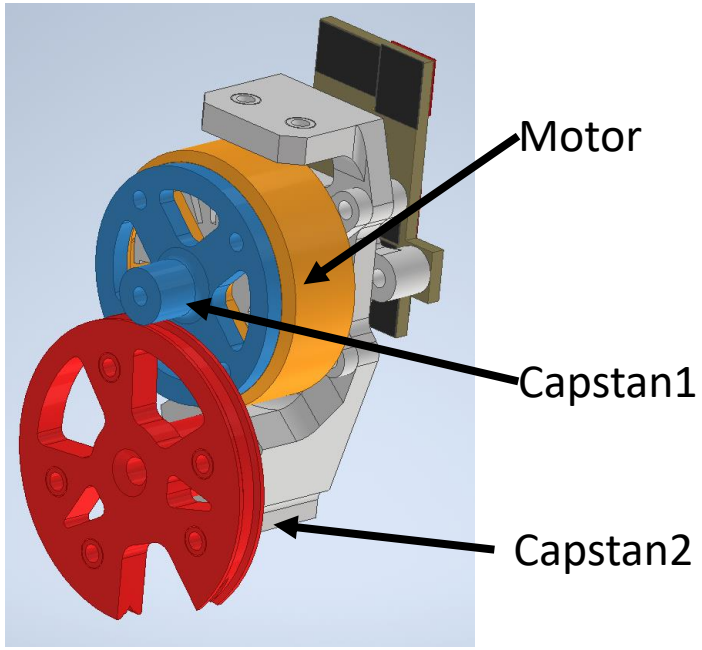
Quad bai – Timing belt reducer 9:1

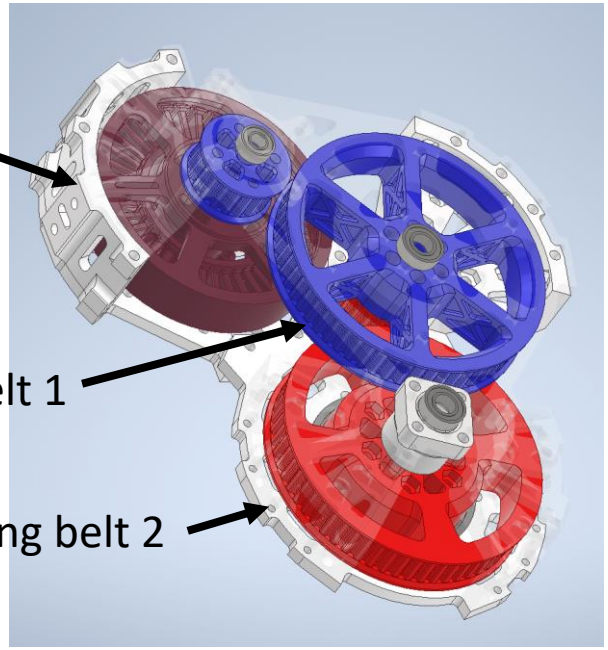
Pros:

|Small backlash, small moment of inertia,

Cons:

|Higher friction, timing belt needed to be tensioned





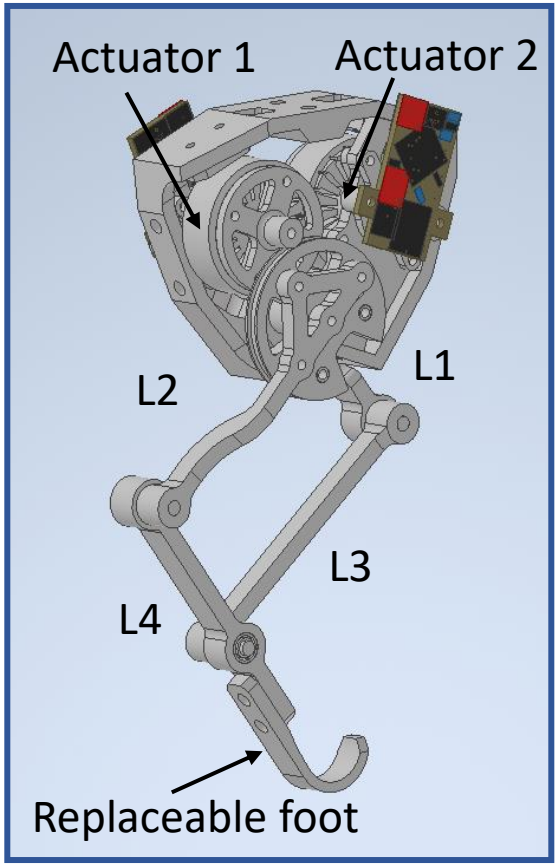
Leg Mechanical design for quad tiny

Guidelines

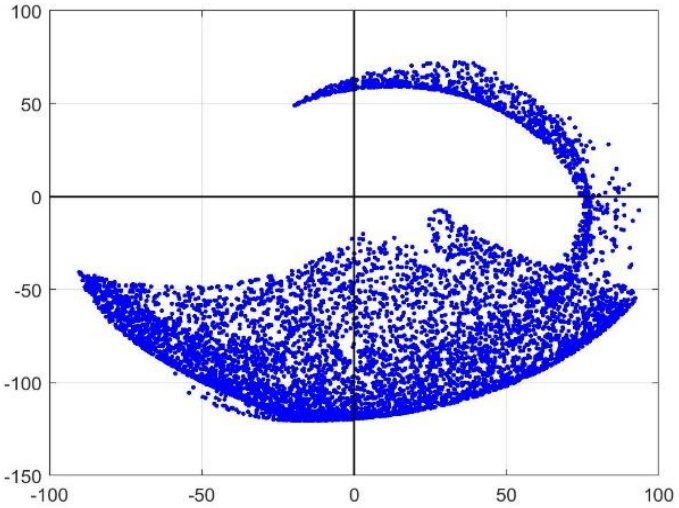
| Low weight/moment of inertia /sufficient strength

For Quad tiny

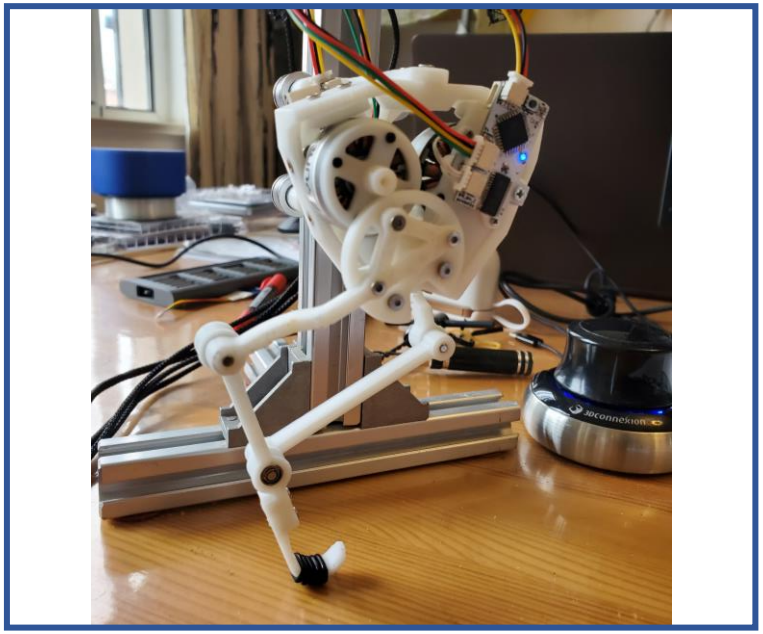
| Parallel leg mechanical design



Simulation of leg's workspace



Single leg demo



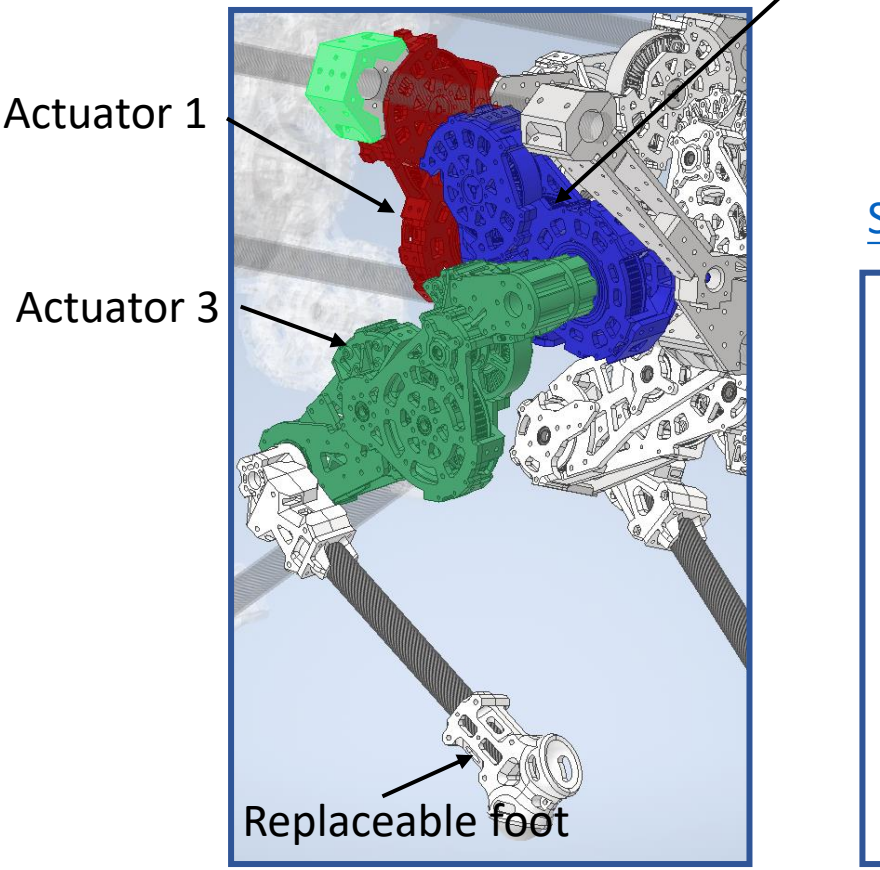
Leg Mechanical design for quad bai

Guidelines

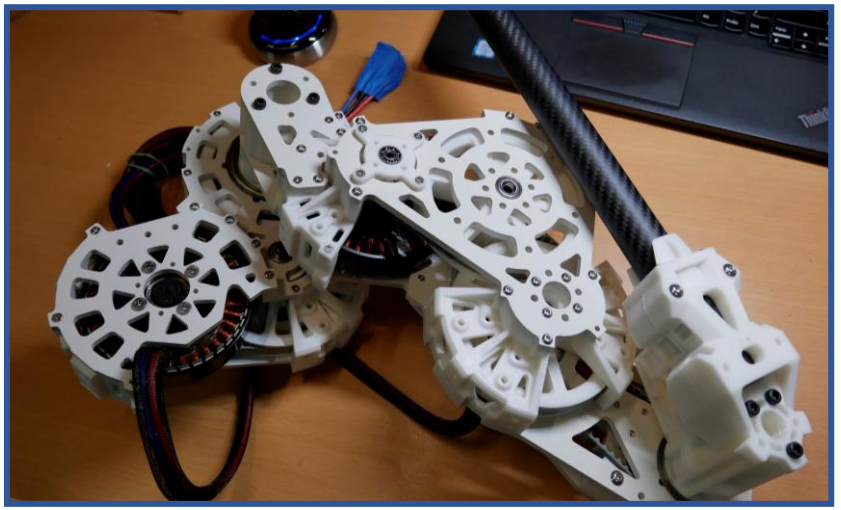
| Low weight/moment of inertia /sufficient strength

For Quad tiny

| Serial leg design



Assembly a leg

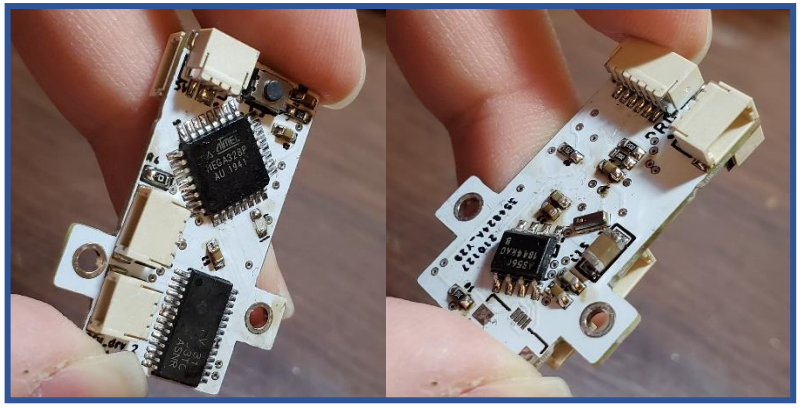


Single leg demo

Eletronic driver/controller for quad tiny

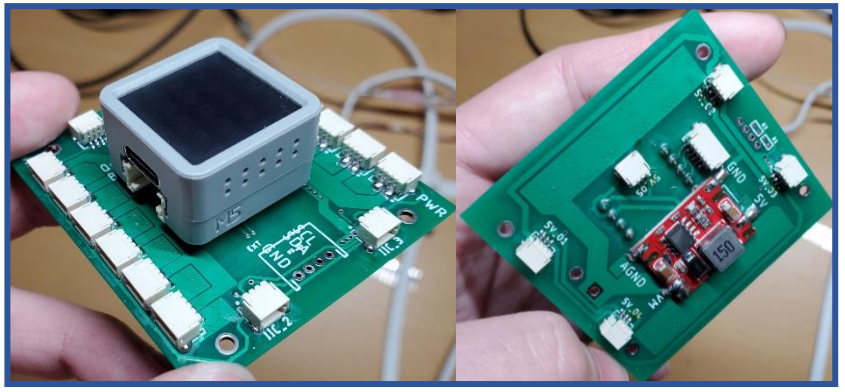
Motor driver_ gen 1:

- Atmega328/Drv8313/AS5600
- IIC*1/UART*1 Maximum 1.5A / 5.4g



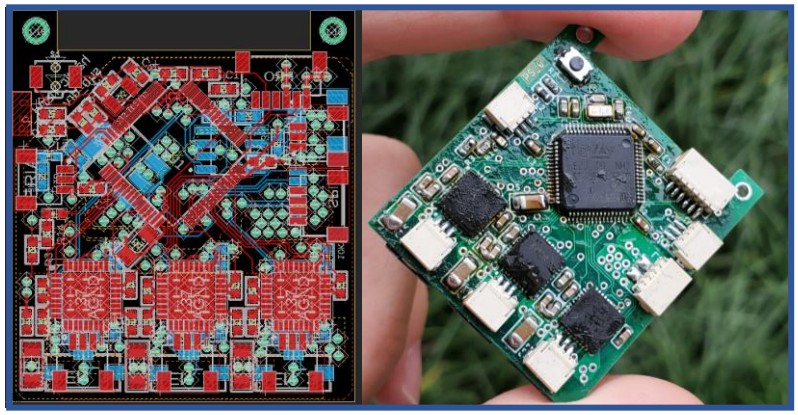
Controller board:

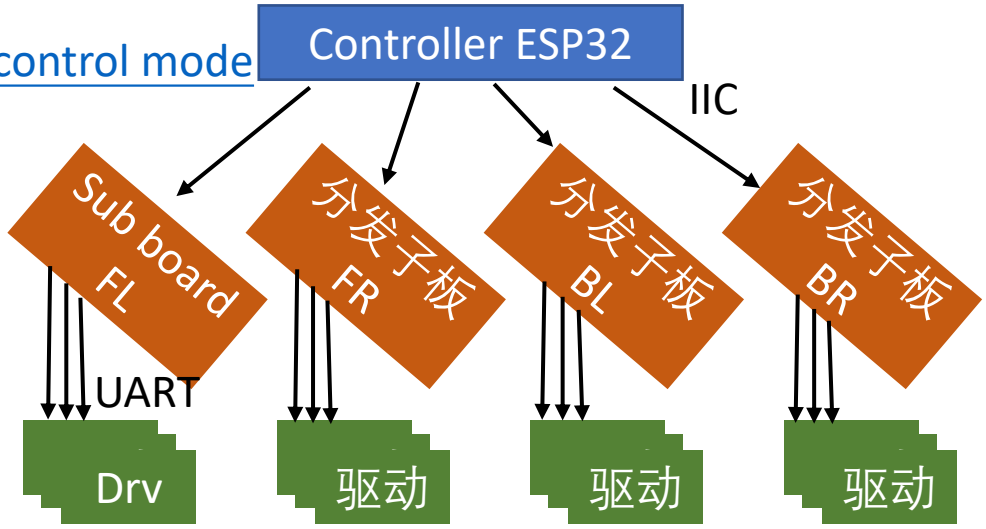
- Esp32 Bluetooth/WIFI/IMU
- IIC*1/UART*1/SPI*1
- Battery management， 4S 450mah Lion bat



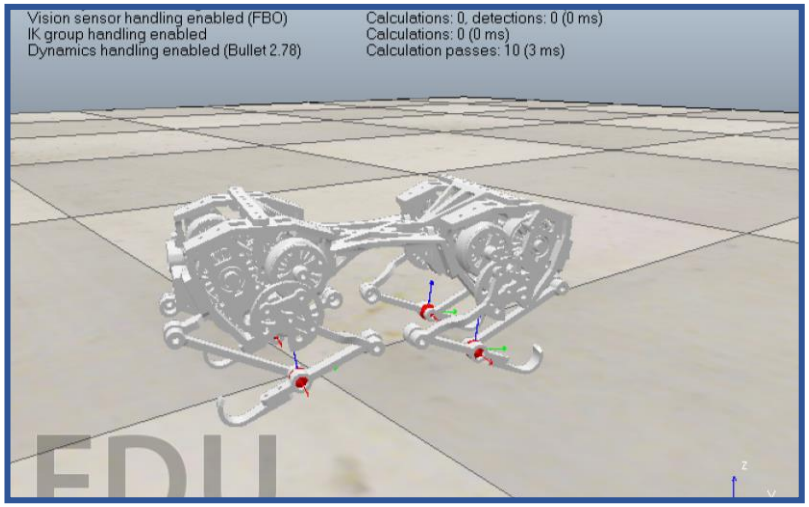
Motor driver_ gen 2:

- STM32f446/Drv8313/AS5600
- IIC*1/UART*2/CAN*1/SPI*1 with torque control mode

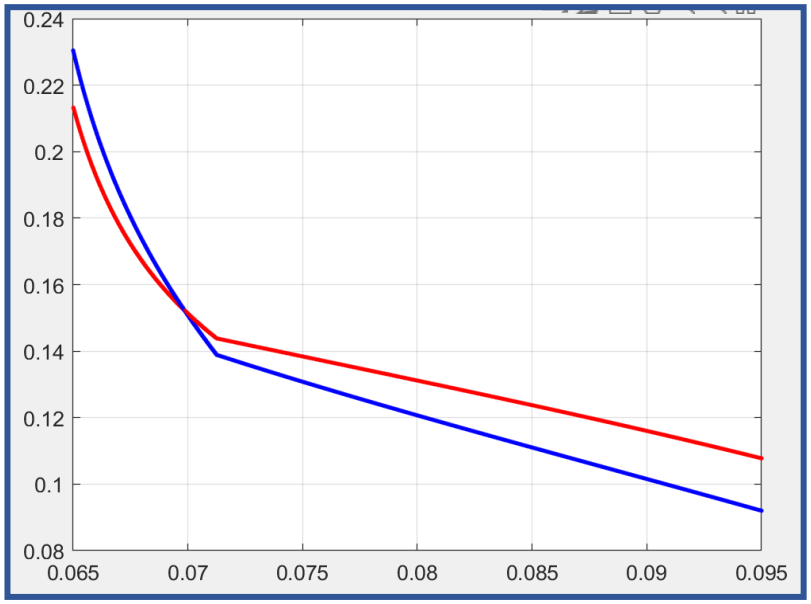




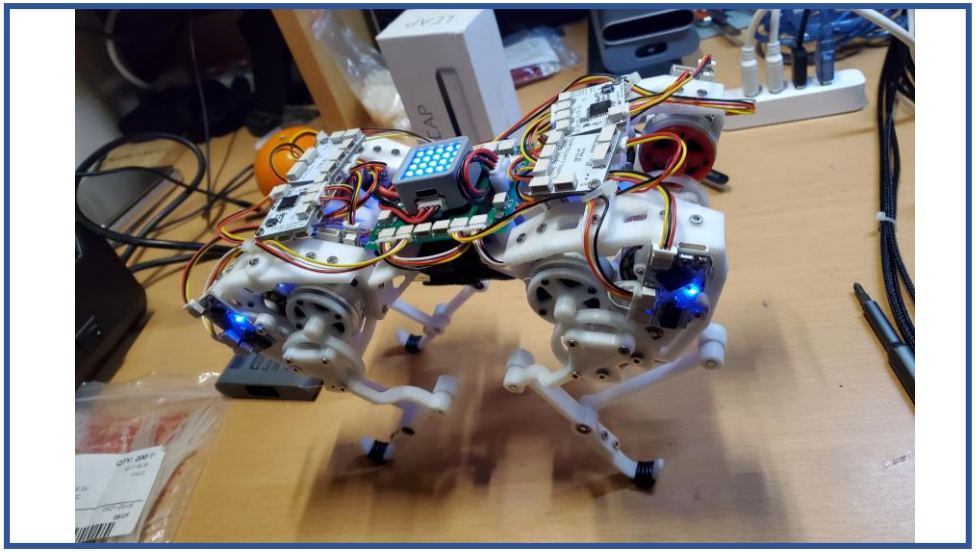
SIM v-rep simulation of quad tiny



Hopping torque simed



Hopping with feedforward controller



2021, Shuang Peng, www.psrobotics.tech