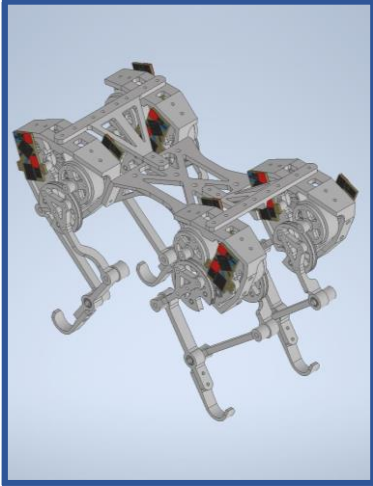# Hardware Mechanical design

8DOF Quad tiny / 12DOF Quad tiny Module design
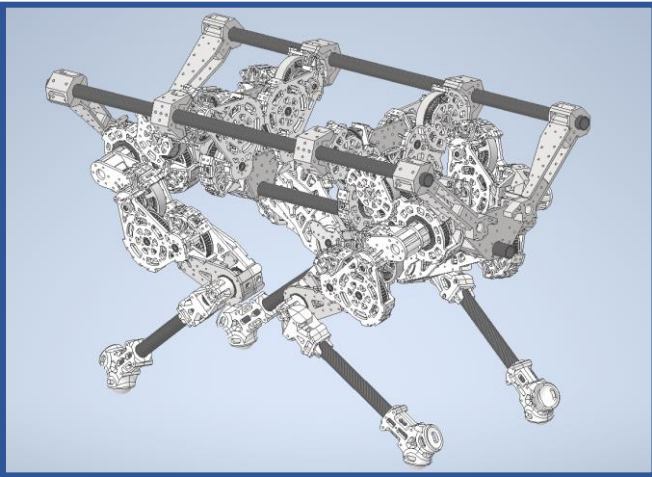

| 180mm*87mm
| 470g

| Capstan reducer –
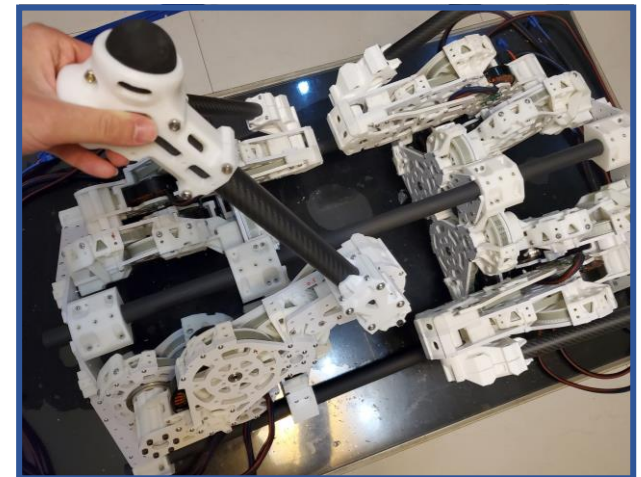
Maximum output-0.8N*M

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:
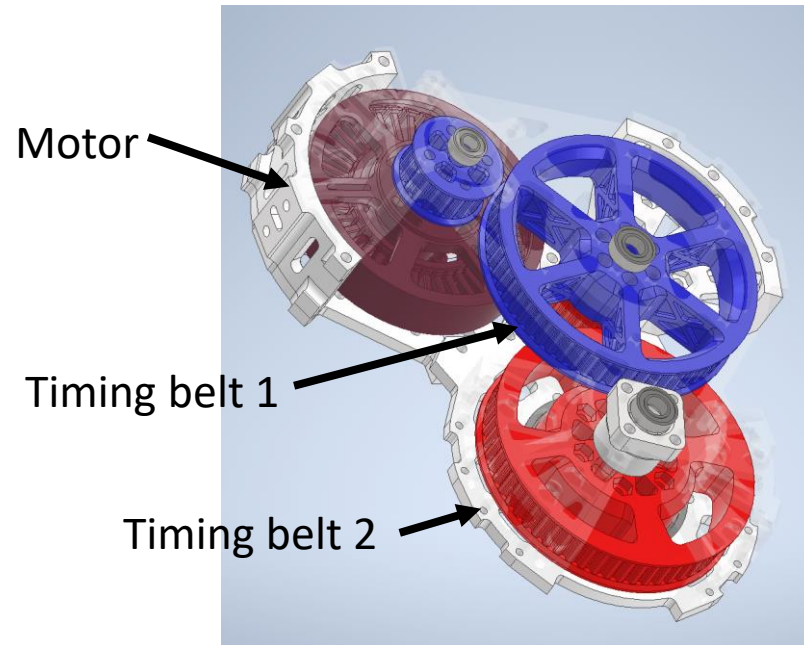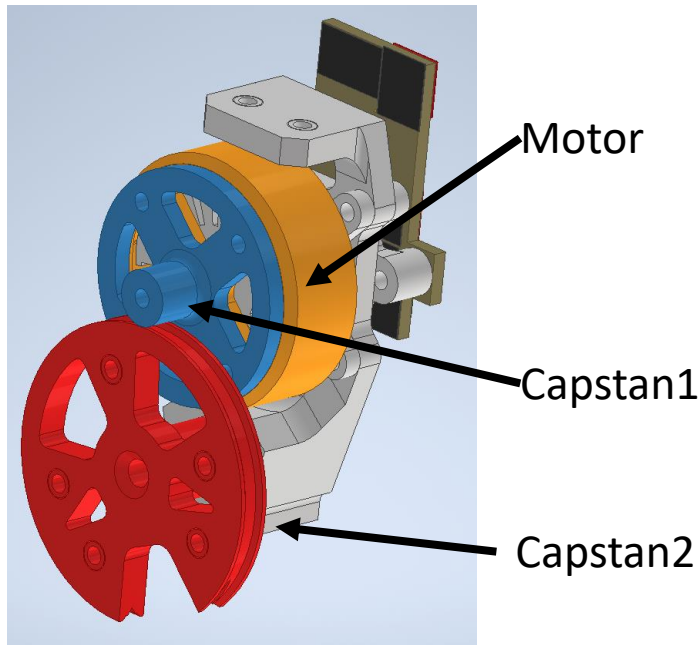|Pre-tensioned rope is vital

Quad bai – Timing belt reducer 9:1

Pros:
|Small backlash, small moment of inertia,
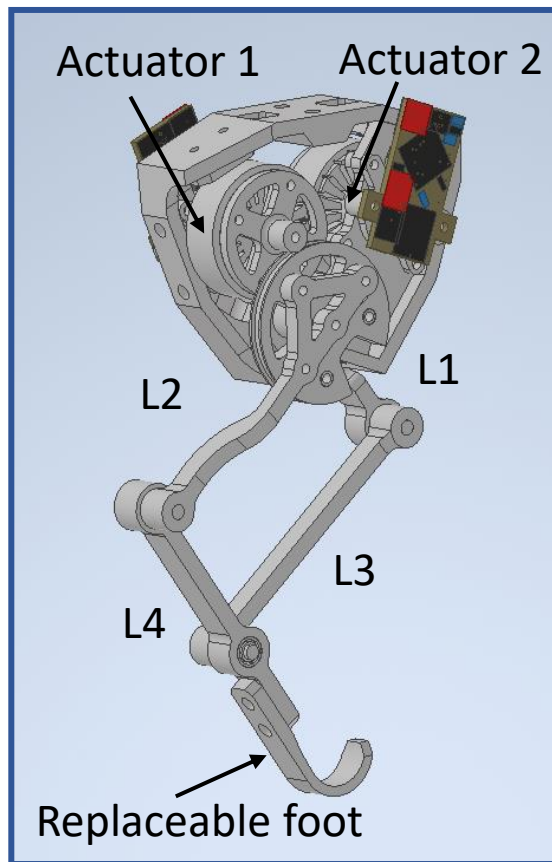**Cons:**
|Higher friction, timing belt needed to be tensioned

Motor

Capstan1

Capstan2

Motor

Timing belt 1

Timing belt 2

Leg Mechanical design for quad tiny

Guidelines

| Low weight/moment of inertia /sufficient strength

For Quad tiny

| Parallel leg mechanical design

Actuator 1   Actuator 2

L1
L2
L3
L4

Replaceable foot

Simulation of leg's workspace

Single leg demo

Leg Mechanical design for quad bai

Guidelines
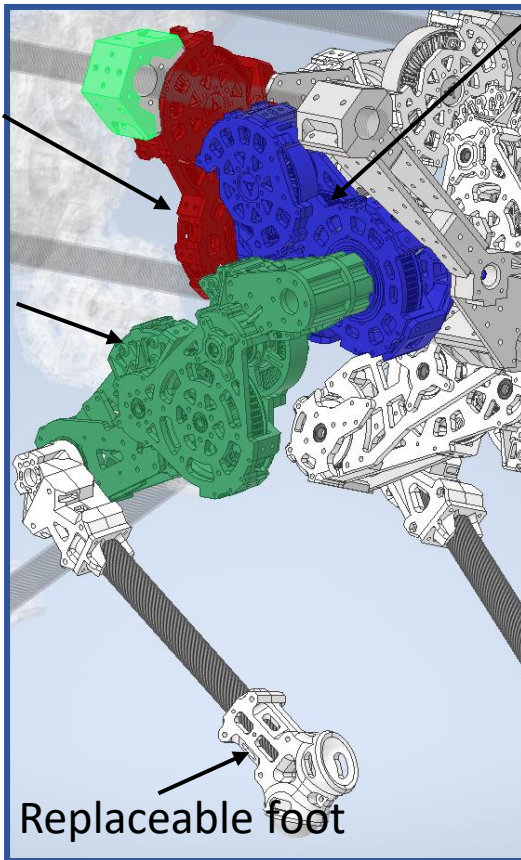
| Low weight/moment of inertia /sufficient strength

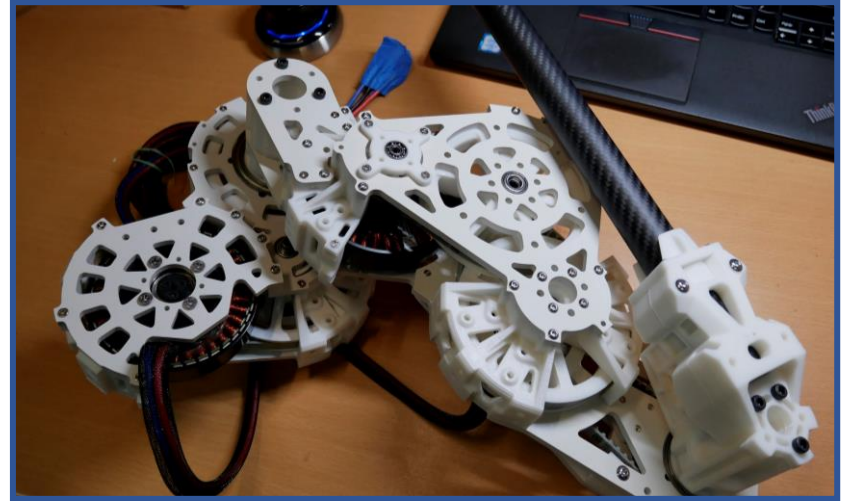**For Quad tiny**

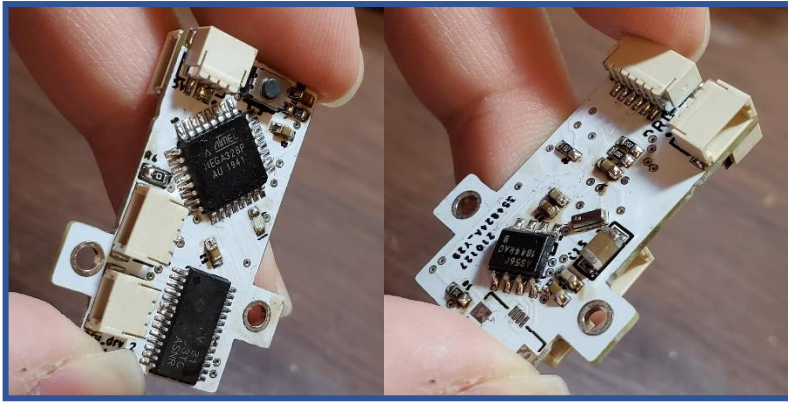**|** Serial leg design

Actuator 2

Actuator 1

Actuator 3

Replaceable foot

Eletronic driver/controller for quad tiny

Motor driver_ gen 1:

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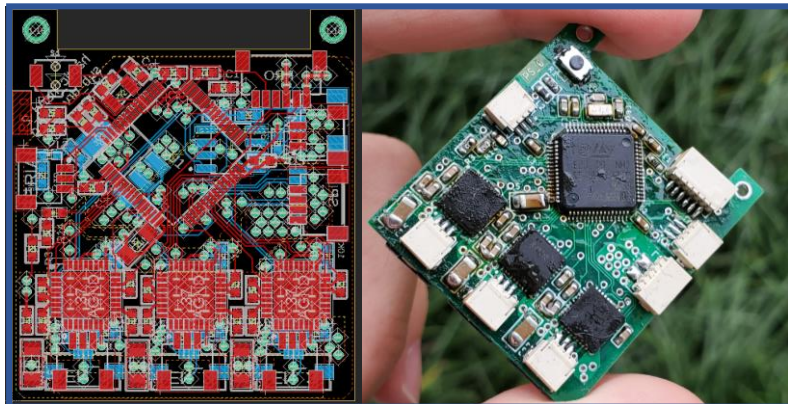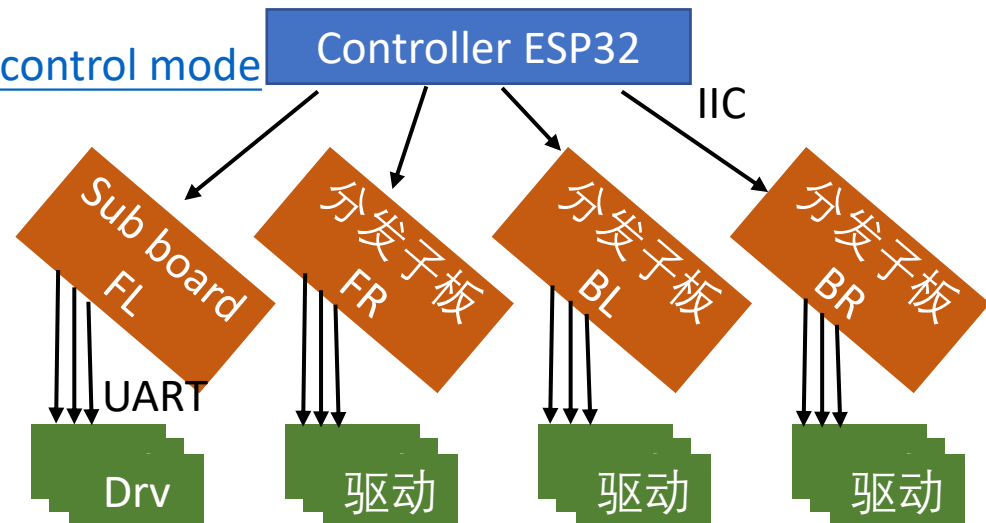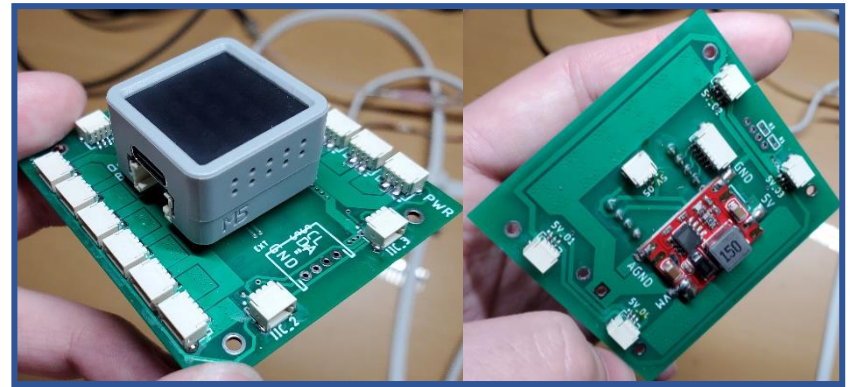

Controller board:

|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

Controller ESP32

IIC

Sub board FL

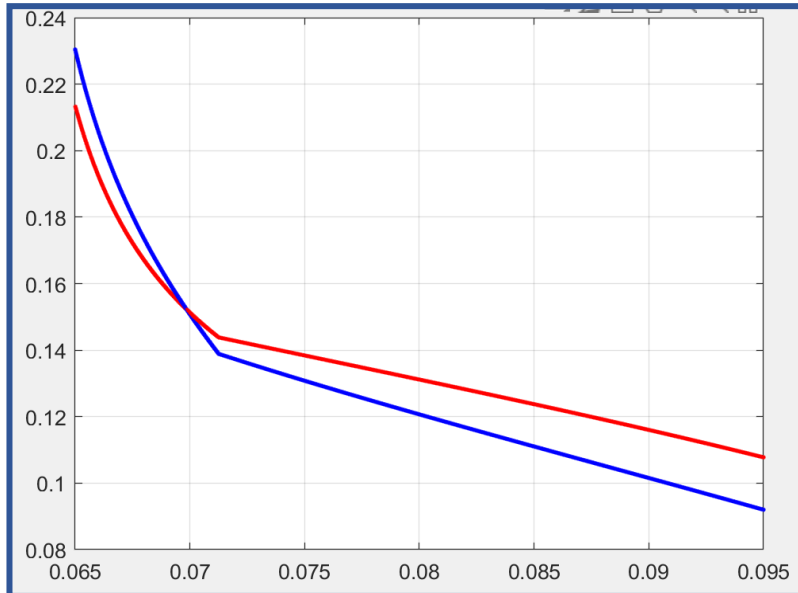分发子板 FR

分发子板 BL

分发子板 BR

UART

Drv

驱动

驱动

驱动

SIM_{v-rep simulation of quad tiny}

SIM v-rep simulation of quad tiny

Vision sensor handling enabled (FBO)   Calculations: 0, detections: 0 (0 ms)
IK group handling enabled   Calculations: 0 (0 ms)
Dynamics handling enabled (Bullet 2.78) Calculation passes: 10 (3 ms)
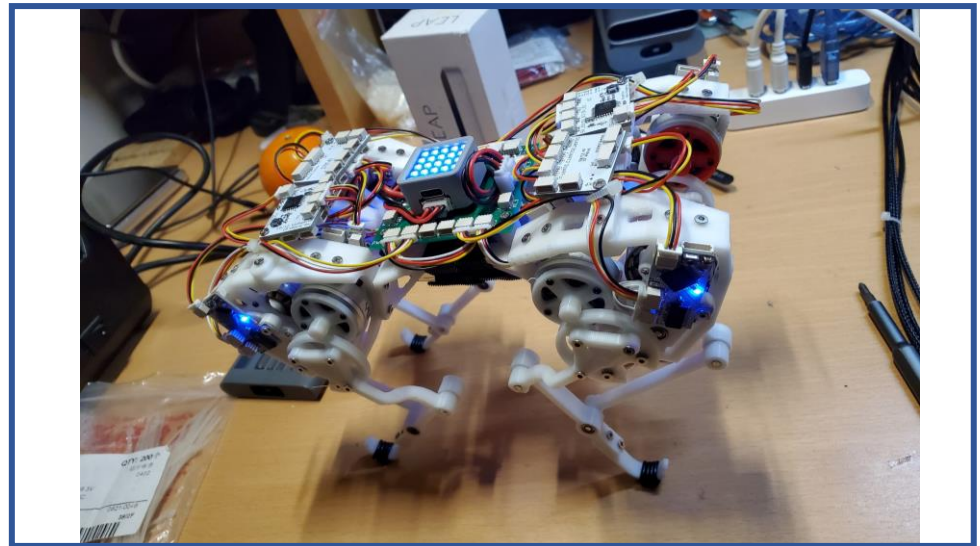
| Hopping with feedforward controller

| Hopping torque simed

| 2021, Shuang Peng, www.psrobotics.tech