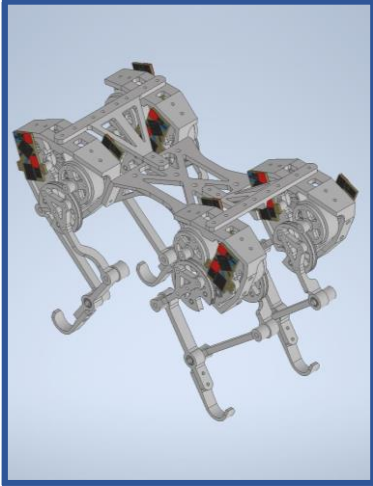# Hardware Mechanical design

8DOF Quad tiny / 12DOF Quad tiny Module design
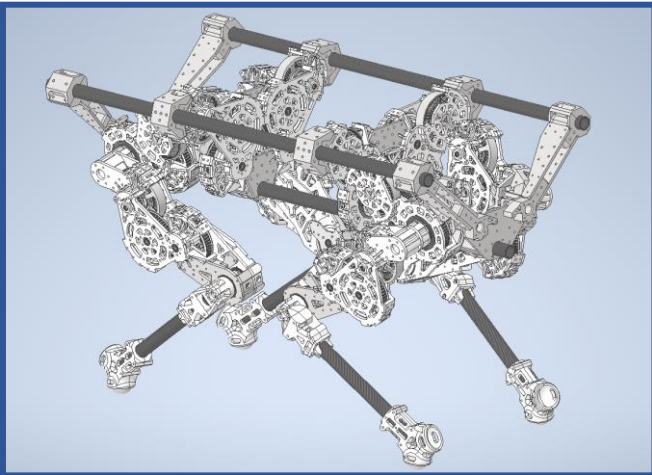

| 180mm*87mm
| 470g

| 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
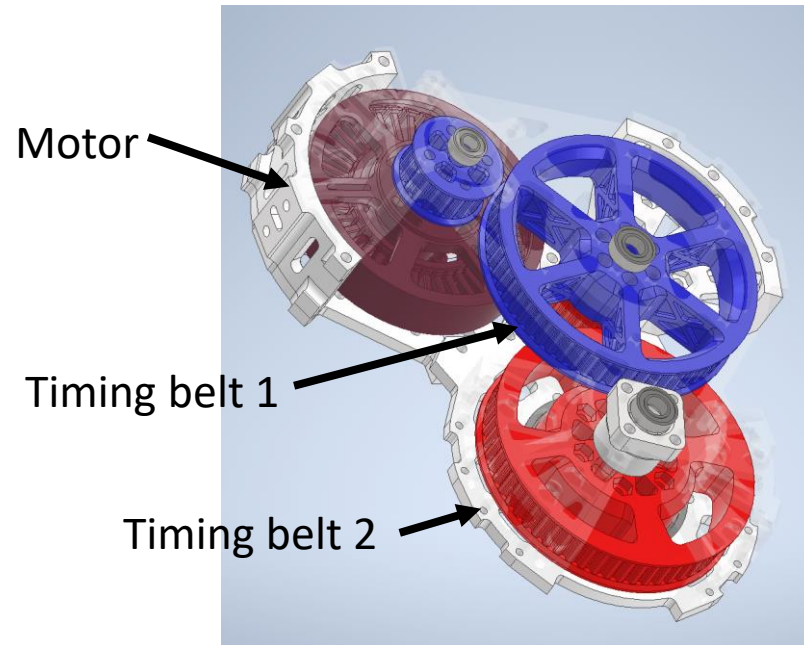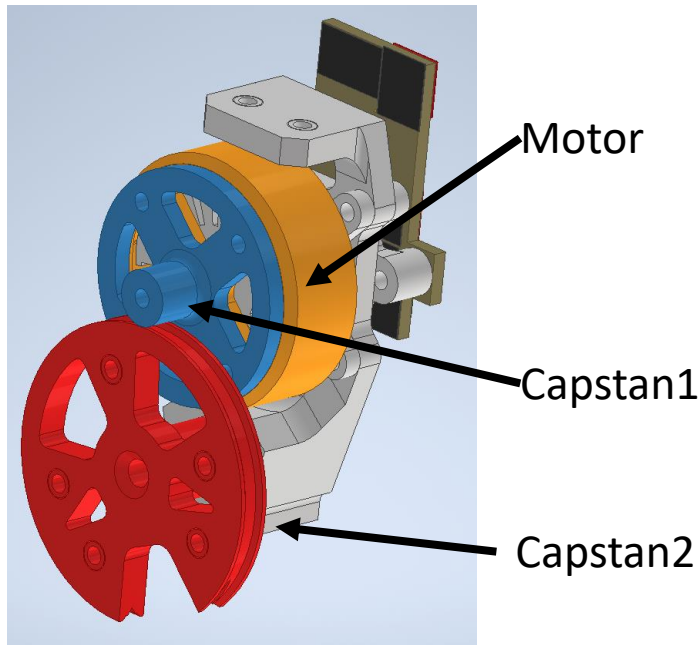**Cons:**
|Pre-tensioned rope is vital

Quad bai – Timing belt reducer 9:1

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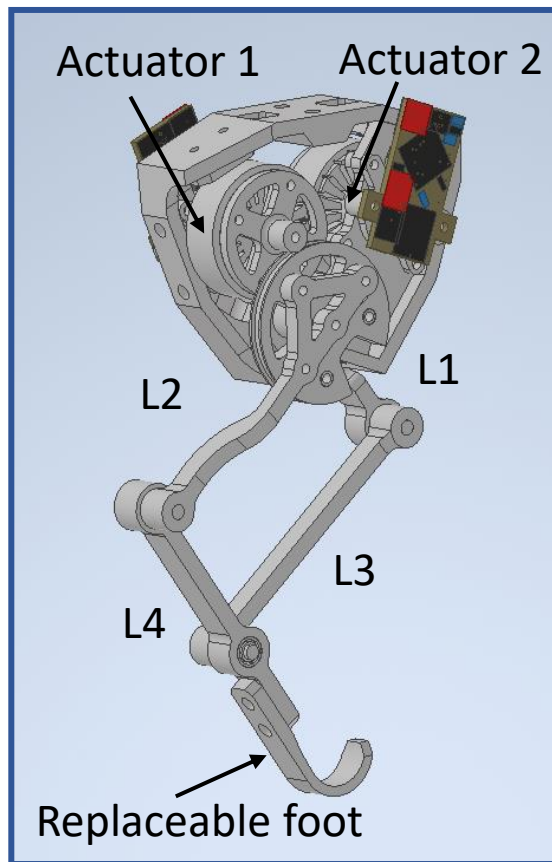|Higher friction, timing belt needed to be tensioned

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
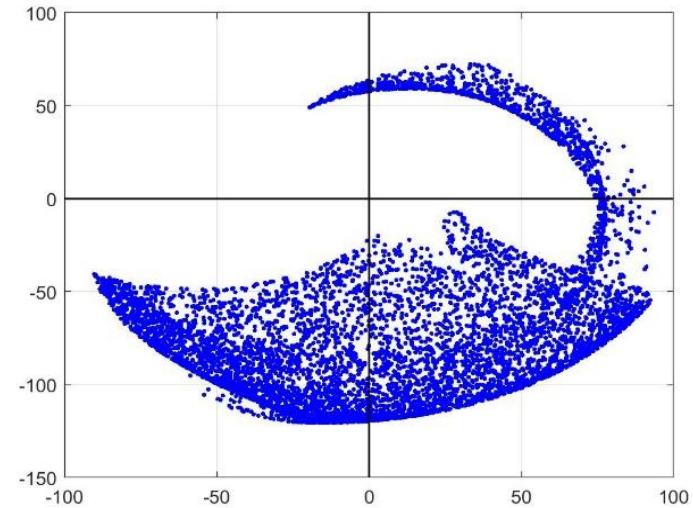
Single leg demo
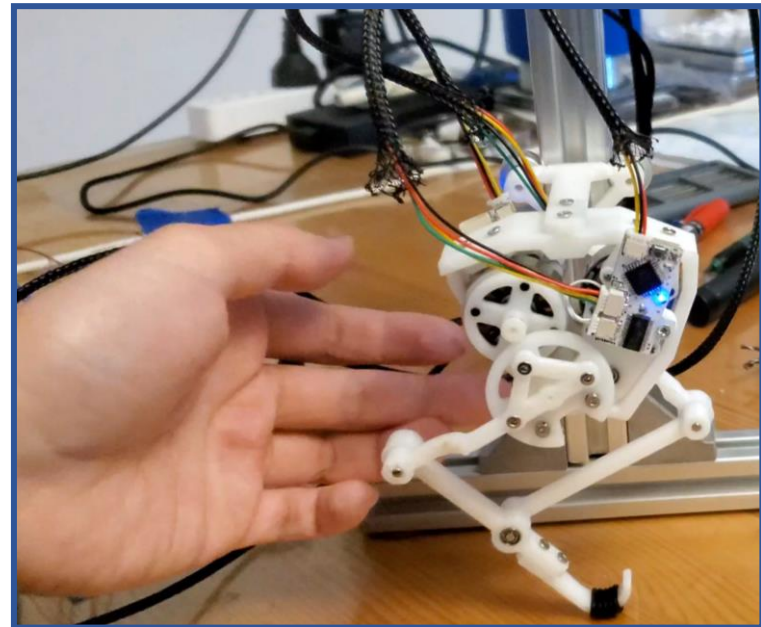
Leg Mechanical design for quad bai

Guidelines
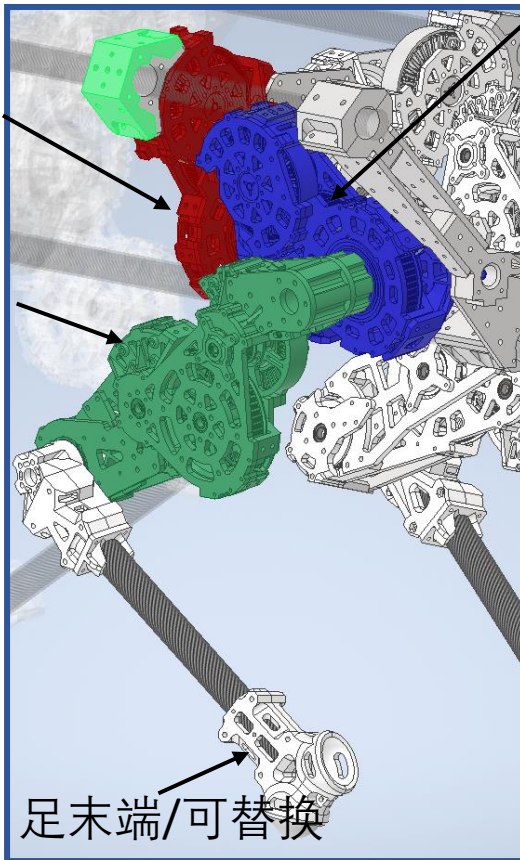
| Low weight/moment of inertia /sufficient strength

For Quad tiny

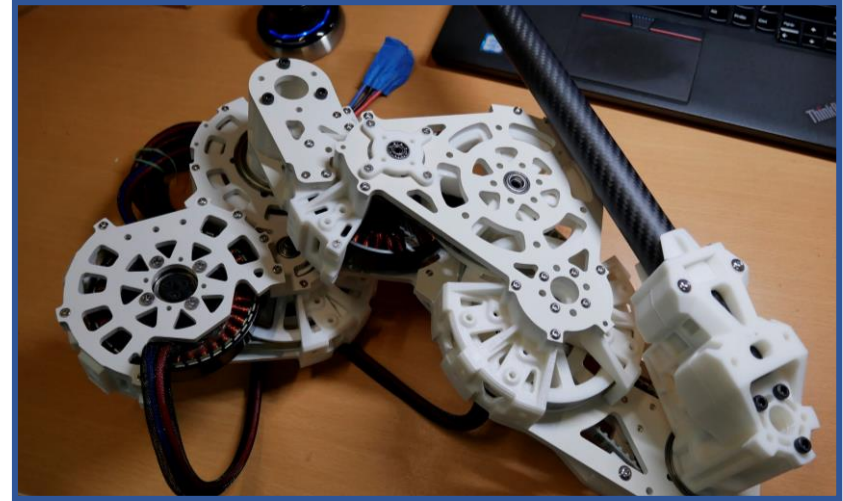**|** Serial leg design

Actuator 1

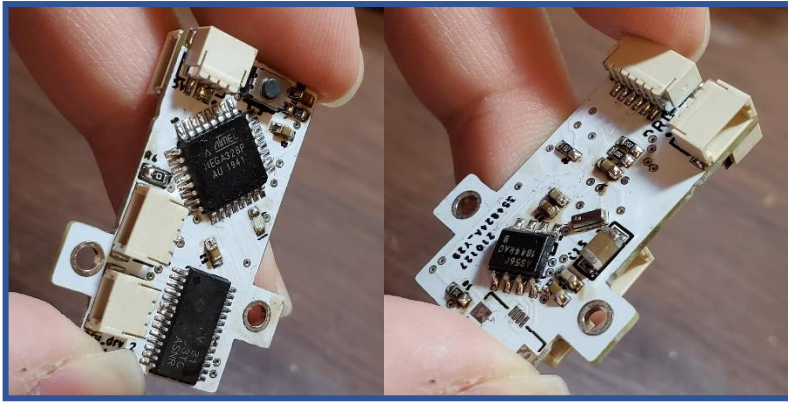Actuator 2

Actuator 3

足末端/可替換

Assembly a leg

Single leg demo

Eletronic driver/controller for quad tiny

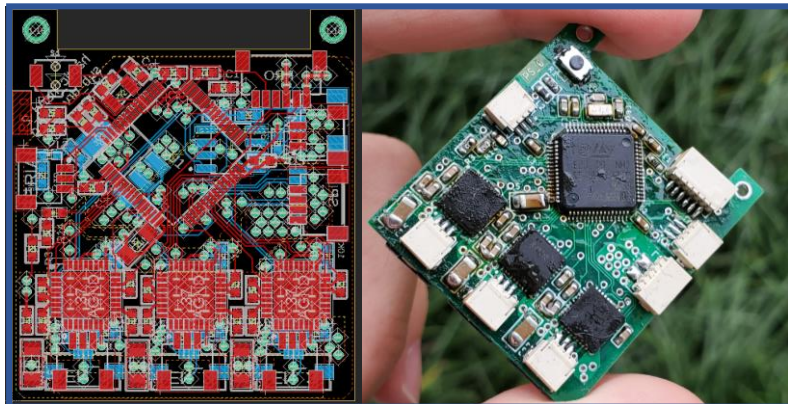## Motor driver_ gen 1:

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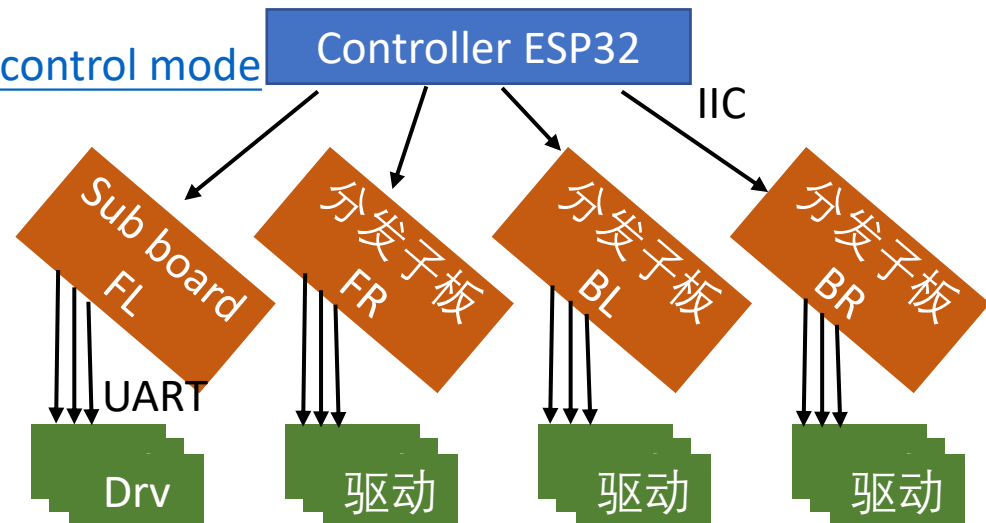| IIC*1/UART*1   Maximum 1.5A / 5.4g

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}
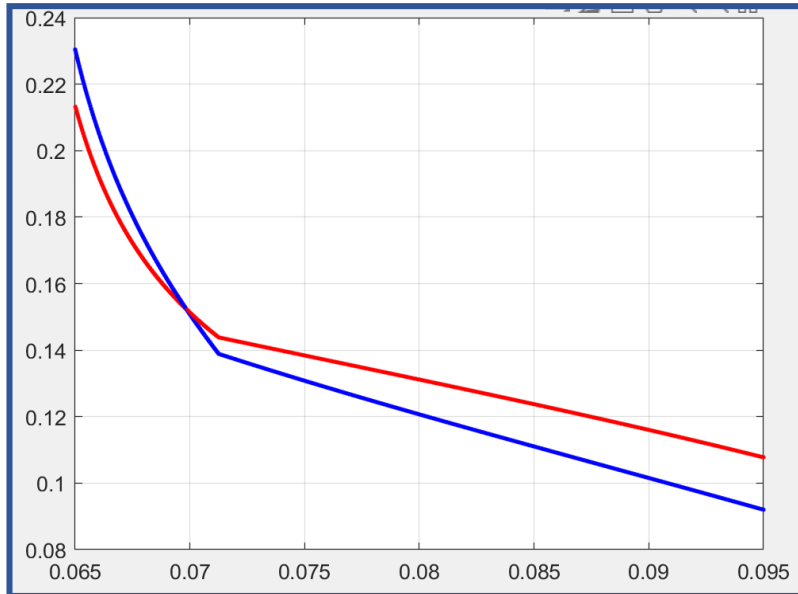
SIM v-rep simulation of quad tiny

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)
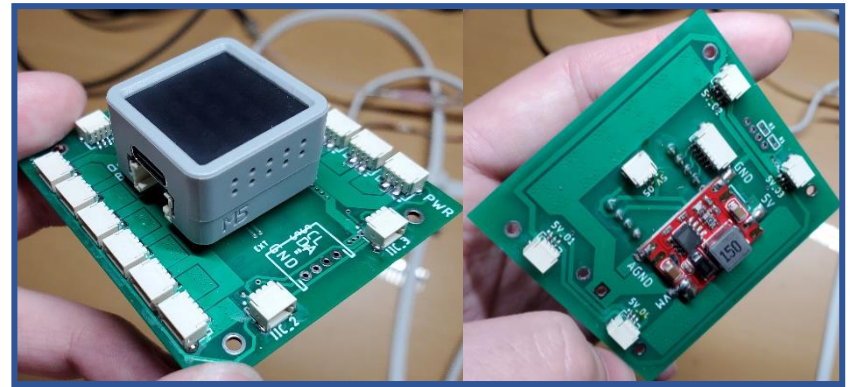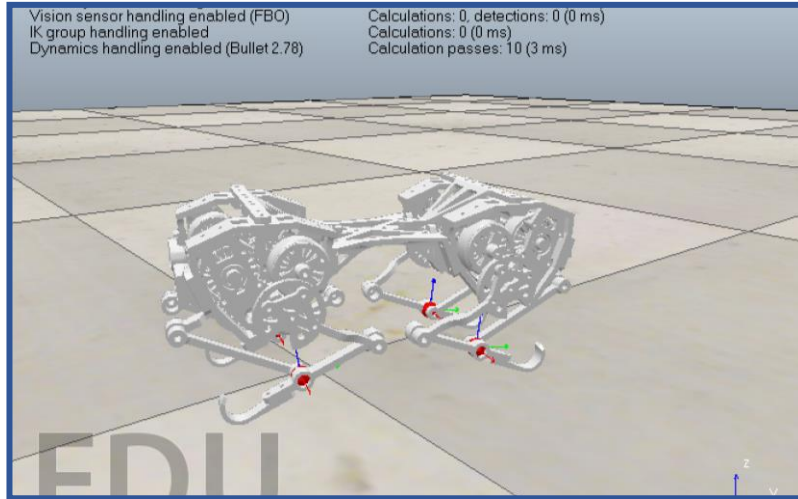
|Hopping torque simed

|Hopping with feedforward controller

|2021, Shuang Peng, www.psrobotics.tech