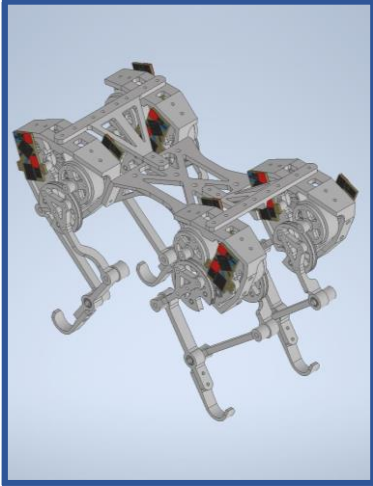


Hardware Mechanical design

8DOF Quad tiny / 12DOF Quad tiny Module design



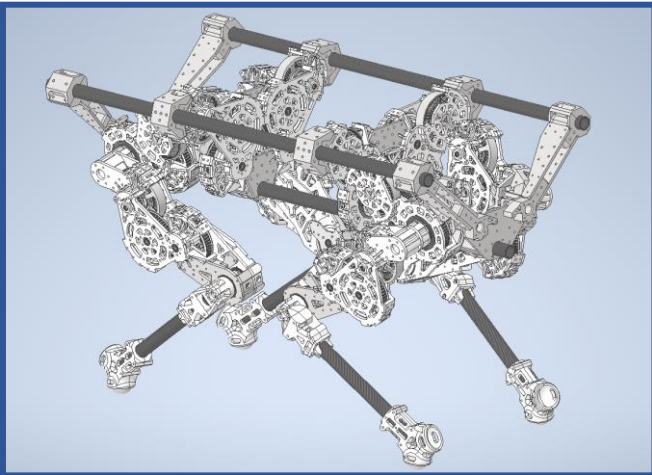
| 180mm*87mm
| 470g

| 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

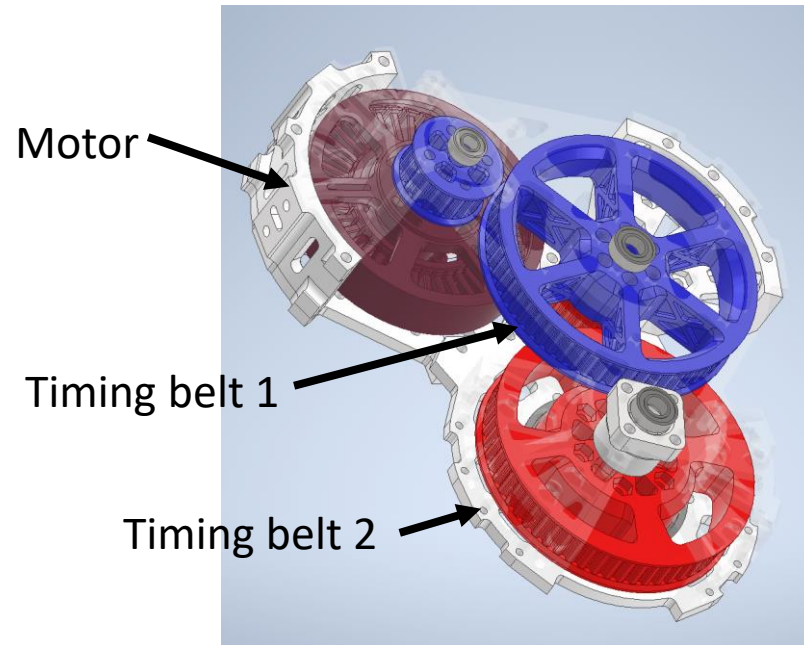
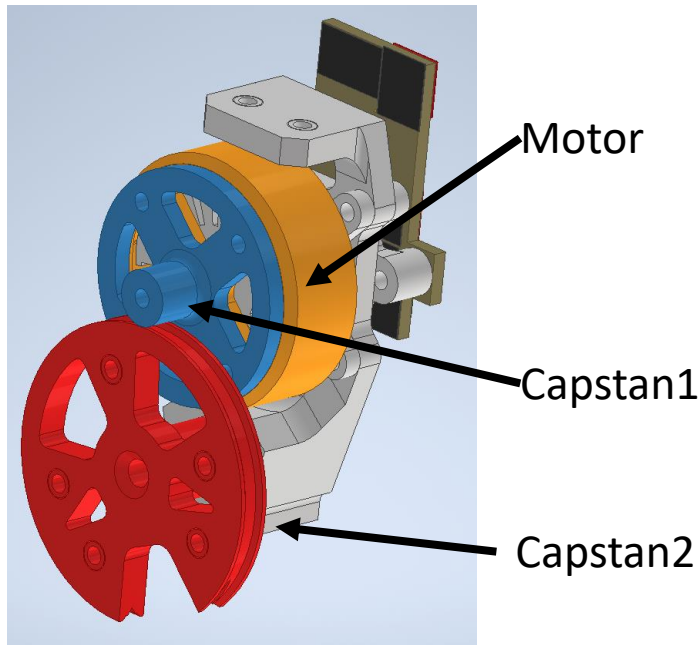
Quad bai – Timing belt reducer 9:1

Pros:

| Small backlash, small moment of inertia,

Cons:

| Higher friction, timing belt needed to be tensioned



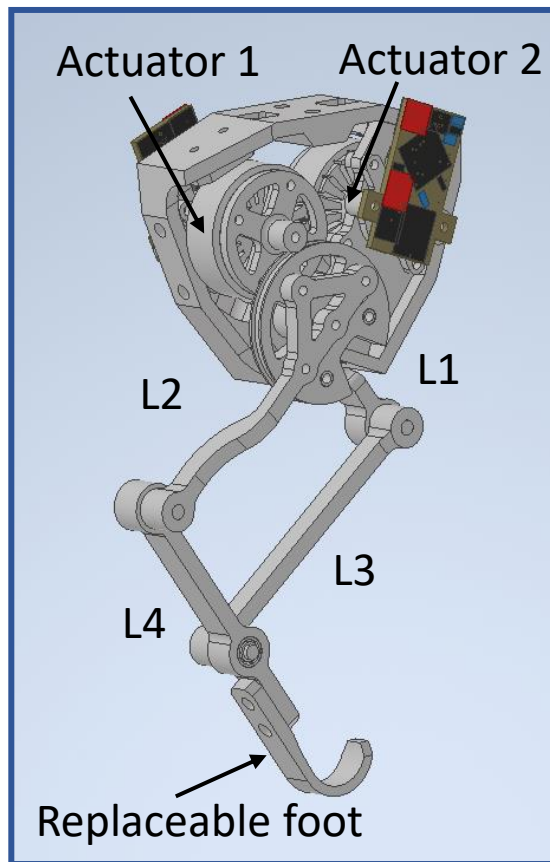
Leg Mechanical design for quad tiny

Guidelines

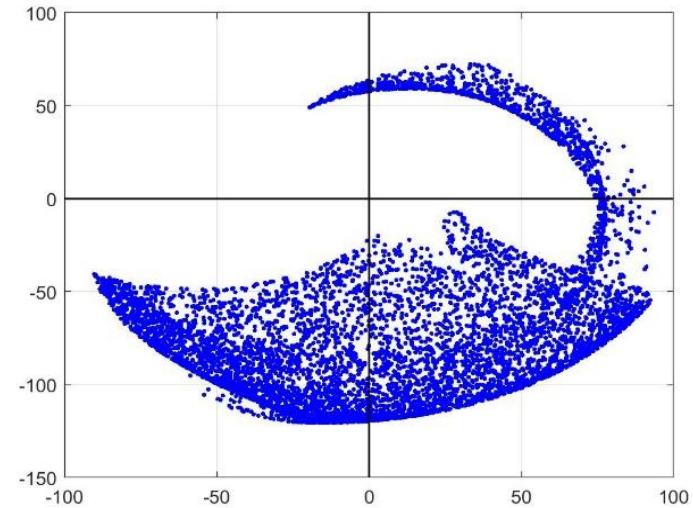
- | Low weight/moment of inertia
- | sufficient strength

For Quad tiny

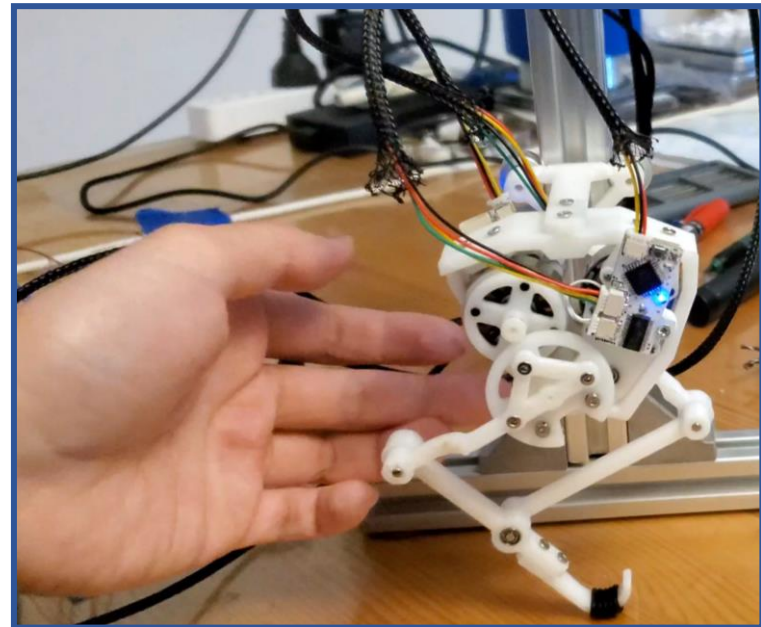
- | Parallel leg mechanical design



Simulation of leg's workspace



Single leg demo



Leg

Mechanical design for quad bai

Guidelines

- | Low weight/moment of inertia
- | sufficient strength

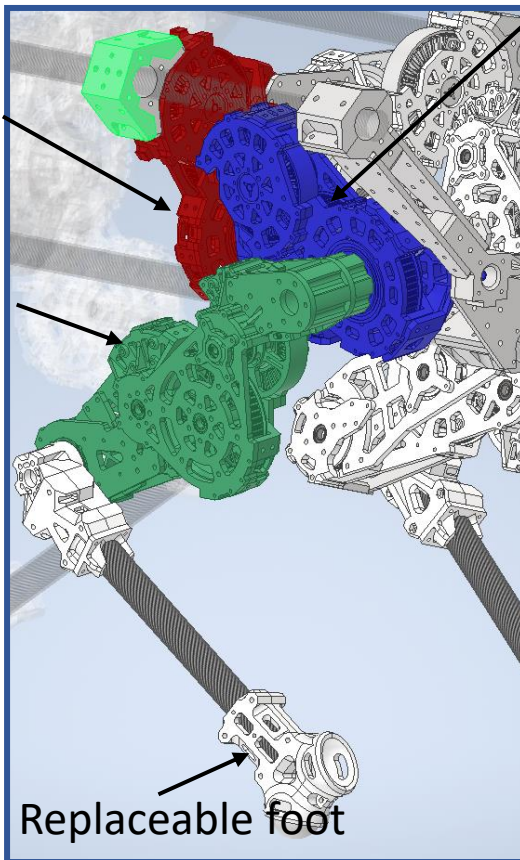
For Quad tiny

- | Serial leg design

Actuator 2

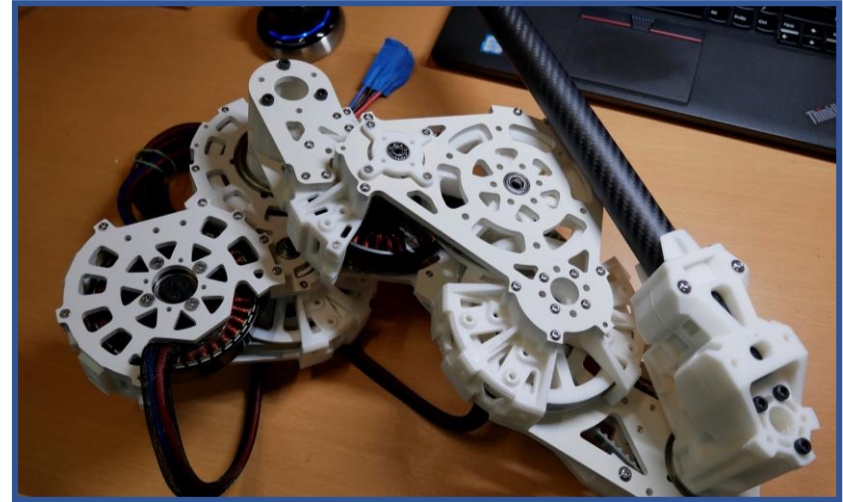
Actuator 1

Actuator 3



Replaceable foot

Assembly a leg



Single leg demo

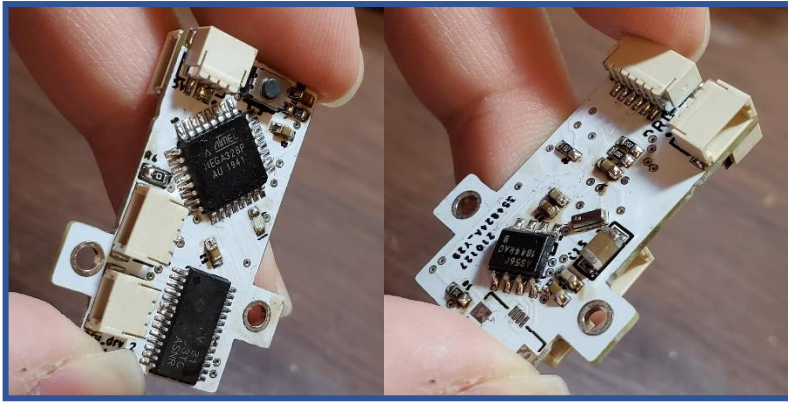


Electronic driver/controller for quad tiny

Motor driver_gen 1:

| Atmega328/Drv8313/AS5600

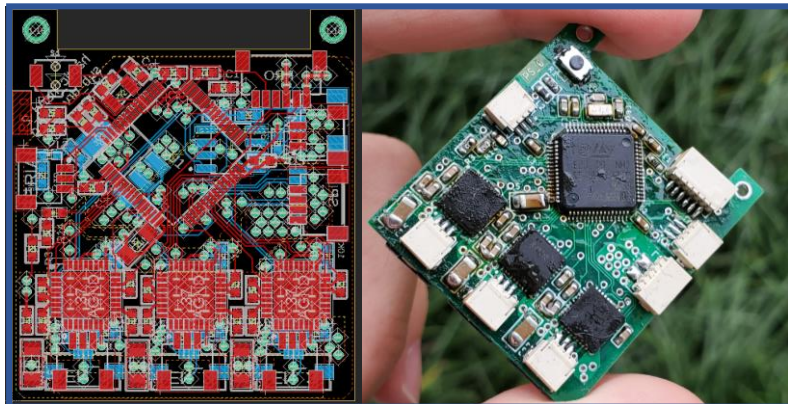
| IIC*1/UART*1 Maximum 1.5A / 5.4g



Motor driver_gen 2:

| STM32f446/Drv8313/AS5600

| IIC*1/UART*2/CAN*1/SPI*1 with torque control mode

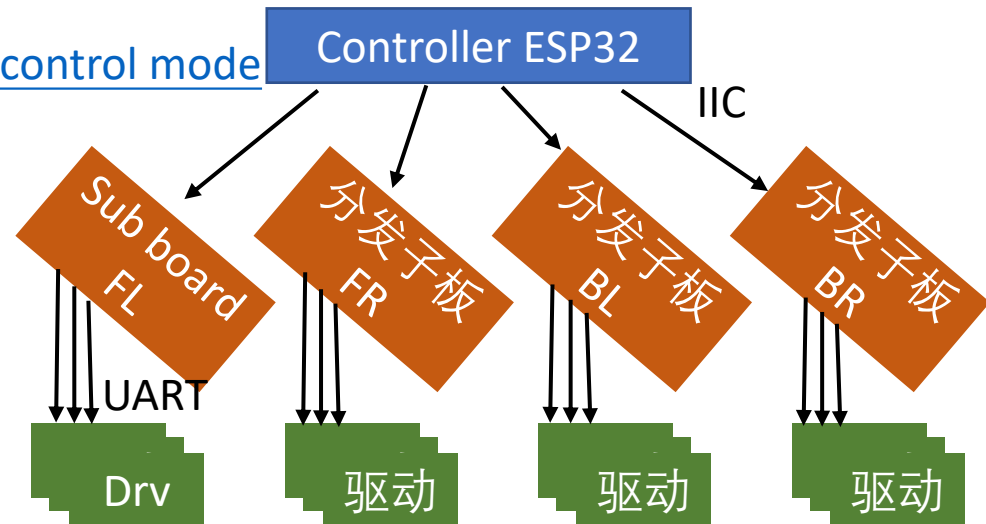
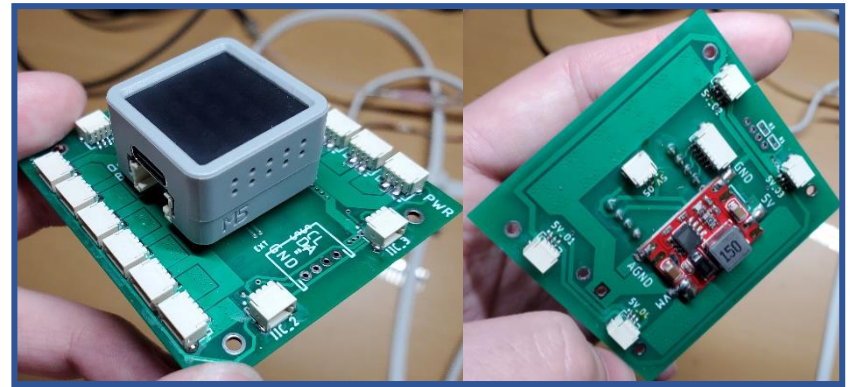


Controller board:

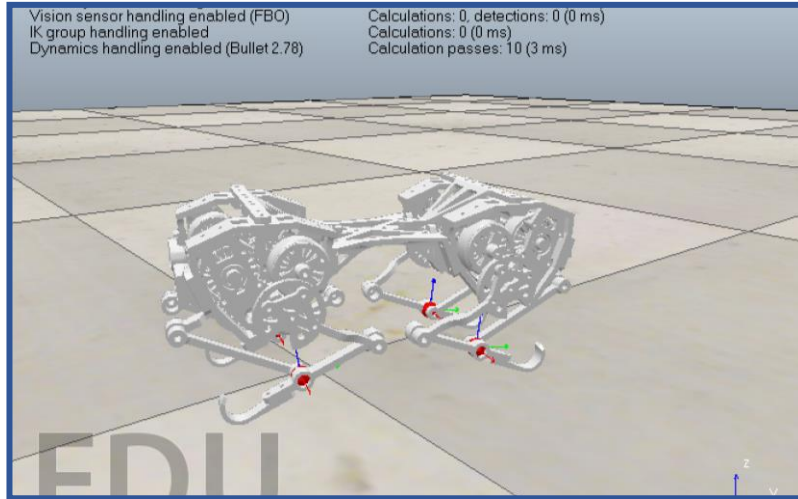
| Esp32 Bluetooth/WIFI/IMU

| IIC*1/UART*1/SPI*1

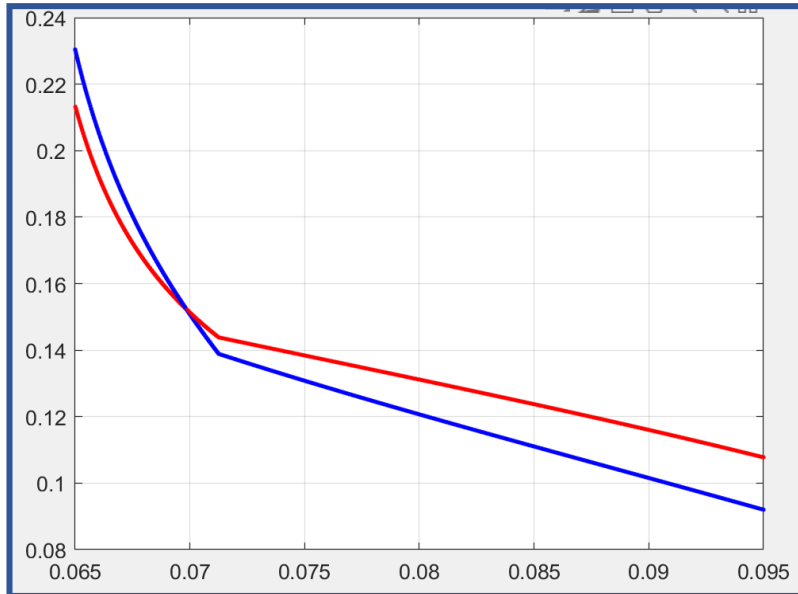
| Battery management, 4S 450mah Lion bat



SIM_v-rep simulation of quad tiny



Hopping torque simed



Hopping with feedforward controller



| 2021, Shuang Peng, www.psrobotics.tech