Assembly Instructions - Text2Robot

Hardware

Item / Link	Quantity
Microcontroller Raspberry Pi 4 Model B	1
Battery Povway 5200 mA Lipo 3S 11.1V 50C	1
Servo Motor Hiwonder HT D − 45H High Voltage Serial Bus Servo 45 KG	8
DC to DC Power Converter DROK 10A Synchronous Step-Down Voltage Regulator DC-DC	1
PLA Filament Ender PLA 3D Printer PLA Filament 1.75 mm 1KG (2.2 lbs) Spool PLA White	1
Motor Controller Hiwonder TTL / USB Debugging Board	1
LiPo Battery Connector Adapter	1
USB C Cable 3A Fast Charge, USB A to Type C	1
12-14 Gauge Wire	

Equipment & Software

Item / Link
Any slicing software (We used Creality Slicer)
Soldering Iron, Solder, Wirestrippers
Access to a 3D Printer (We used a Creality Ender 3)
https://github.com/ethanlipson/PyLX-16A

Assembly Instructions

1. **Slice and Print STL Files**
    - Slice and print every STL file referenced by the selected robot's URDF. This includes one baselink (main body), 4 upper legs, and 4 lower legs. Depending on your printer bed size, you may need to split and splice some parts using strong super glue.
2. **Download and Print Electronics Modules**
    - Download the STL files in the `STL_Files/Electronics_Modules` folder.
    - Slice and print 4 KneeConnectors, 12 MotorCases, and one BatteryBox.
3. **Assemble Components**
    - Snap together the MotorCases, KneeConnectors, and printed robot limbs according to the URDF. Attach the KneeConnectors directly to each foot, following the specified axis orientations.
    - Daisy chain the two servos on each leg together and connect the topmost servo to the Hiwonder Debugging Board.
4. **Prepare Wiring**
    - Cut four 1-foot strips of additional wire. Solder the ground and power of the battery connector adapter into a Y-configuration.
    - Use heat shrink tubing to group together one set of terminals for the Raspberry Pi and one set for the servo board.
    - Connect one Y directly to the ground and power of the servo board. Do not connect the Raspberry Pi directly to the battery as it is only rated for 5V.
    - Connect the second Y to the input of the DC-to-DC power converter. Adjust the potentiometer until the output voltage is 5V with the input battery voltage (11.1V). Carefully check the output voltage with a multimeter to avoid frying the Raspberry Pi.
5. **Connect Power to Raspberry Pi**
    - Cut off the USB-A end of the USBC-to-USB charging cable. Connect the ground and power wires to the outputs of the DC-to-DC power converter.
    - Plug the USB-C terminal into the Raspberry Pi power. See **Figure 1** for the final soldered connector.
6. **Final Assembly**
    - Screw the Raspberry Pi, Debugging Board, and DC-to-DC step-down into their respective housings in the BatteryBox. Place the battery into its housing.

Initialization

1. **Set Up SSH Communication**
    - Establish SSH communication with your Raspberry Pi.
    - Install the PyLX-16A repository, which enables remote control of the robot's servos.
2. **Center the Servos**

- Run the `servo-test.py` script to center each servo at 120 degrees, the default position specified by the URDF.
- Set servo limits to avoid harmful self-collision.

3. **Replay Trained Locomotion Policy**
   - Refer to the Sim2Real documentation in the ReadMe file to replay the trained locomotion policy on your assembled robot.

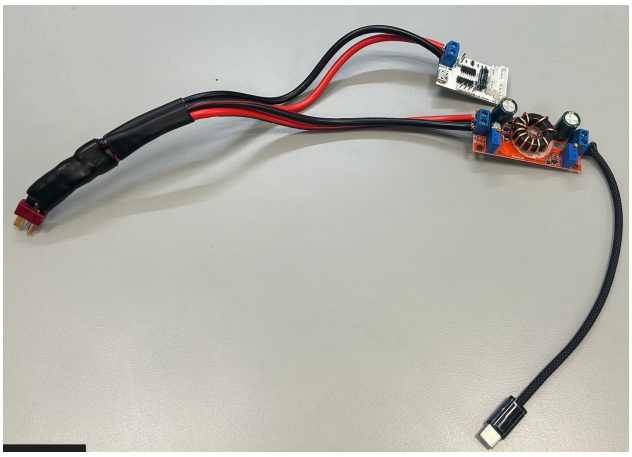

Figure 1: Soldered T-Connector to two Ys. One powers the servo board, one connects to the DC step down, and then to the RaspberryPi