Dyson School of Design Engineering

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DE2   Electronics 2

Using Lithium Battery with mini-Segway

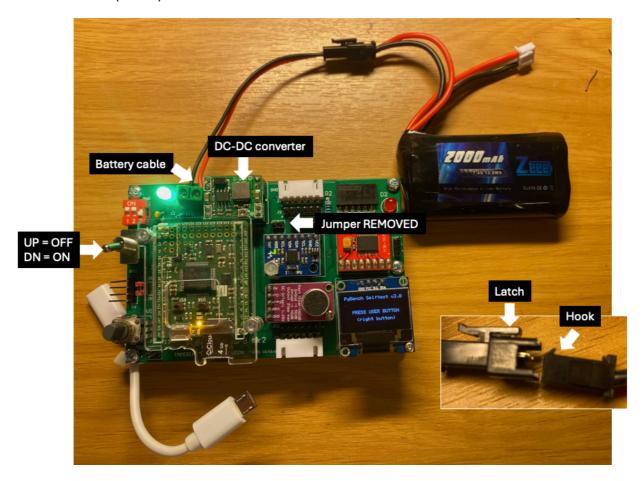(webpage: http://www.ee.ic.ac.uk/pcheung/teaching/DE2_EE/)

Introduction

This instruction is for those who wish to use the 7.4V lithium battery with the mini-Segway. In theory, you could run the Segway using the USB cable supply the 5V to Pybench board. However, the USB supply from your laptop, after going through the Pyboard, will only provide a 4.75V supply. This is way below the DC motors' nominal operating voltage, which is 7V. Furthermore, most laptop cannot supply more than 1A of instantaneous current to drive the motors adequately. This is not a problem if you only want to try challenges that do not involve self-balancing. However, if you want to balance the mini-Segway, you would likely need to drive the Pybench and the motors using the 7.4V (2 cells) lithium battery.

Connecting the Battery to Pybench

Figure 1 shows Pybench connected to the battery with the 2-pin battery cable. Check the following:

1. Make sure that the cable is wired correctly with the 7.4V (RED) wire on the right, and the GND terminal (BLACK) on the left as shown.

2. When connecting the lithium battery, make sure that the latch and hook of the male and female parts of the connector line up. DO NOT USE FORCE – the two sides should click in easily.

3. The toggle switch is connected to the battery terminal so that UP position is disconnecting the battery from the board, and DOWN position is ON. If the board is supplied by the battery, a GREEN LED is turned ON.

4. Make sure that the DC-DC converter is plugged in. The 7.5V lithium battery supply is too high for the neopixel. The DC-DC converter module converts 7.5V down to a 5V ± 0.5V to supply power to the rest of the board.

5. Make sure that the jumper link is removed (bottom right corner of the DC-DC converter). If installed, the 7.5V is connected directly to the rest of the Pybench board, bypassing the DC-DC converter.

In Figure 1, the Pybench is untethered to the computer because the USB cable is not connected. This allows the mini-Segway and the Pybench board to operate without using the laptop.

The entire system is design such that you CAN connect both the USB cable AND the lithium battery to the Pybench simultaneously. You therefore can download your .py files to the SD card without disconnecting the battery. However, I recommend that you turn the toggle switch to the OFF position unless you are testing your programme. Otherwise, you may have a run-away Segway.

Fixing the lithium battery to the Segway

Thick and long cable ties are available for you to strap the lithium battery to the Segway, either under the Pybench module or above the motor assembly. Beware that the tuning of the PID controller depends on the position of the battery. Therefore the cable ties must be tight so that the battery does not move after you completed tuning the PID controller.