AutoFinder With a Raspberry Pi Zero

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Abstract

We aim to control a 42PM48L Stepper Motor, commonly branded under Meade or Celestron telescope companies as "Dual Axis Motor Kit." Using a Raspberry Pi Zero connected via USB, a L293D chip, solderless breadboard, RJ11 6P4C connectors and associated wirings, direct and precise control can be attained. Using these hardware components, we will scrape astronomical coordinates from the web to command the attached telescope to "go to".

1 Raspberry Pi Zero Setup

To be able to control a Raspberry Pi Zero via USB, some simple modifications to the OS need to be made. There is a guide that can be followed at https://gist.github.com/gbaman/975e2db164b3ca2b51ae11e45e8fd40a . We will transcribe it here, to preserve it just in case it is removed.

Raspberry Zero Setup:

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For this method, alongside your Pi Zero, MicroUSB cable and MicroSD card,
only an additional computer is required, which can be running Windows
(with Bonjour, iTunes or Quicktime installed), Mac OS or Linux
(with Avahi Daemon installed, for example Ubuntu has it built in).
1. Flash Raspbian Jessie full or Raspbian Jessie Lite onto the SD card.
2. Once Raspbian is flashed, open up the boot partition
(in Windows Explorer, Finder etc) and add to the bottom of the config.txt
file dtoverlay=dwc2 on a new line, then save the file.
3. If using a recent release of Jessie (Dec 2016 onwards), then create a
new file simply called ssh in the SD card as well. By default SSH is now
disabled so this is required to enable it. Remember - Make sure your file
doesn't have an extension (like .txt etc)!
4. Finally, open up the cmdline.txt. Be careful with this file, it is very
picky with its formatting! Each parameter is seperated by a single space
(it does not use newlines). Insert modules-load=dwc2,g_ether after rootwait.
5. That's it, eject the SD card from your computer, put it in your Raspberry
Pi Zero and connect it via USB to your computer. It will take up to 90s to
boot up (shorter on subsequent boots). It should then appear as a USB
Ethernet device. You can SSH into it using raspberrypi.local as the address.
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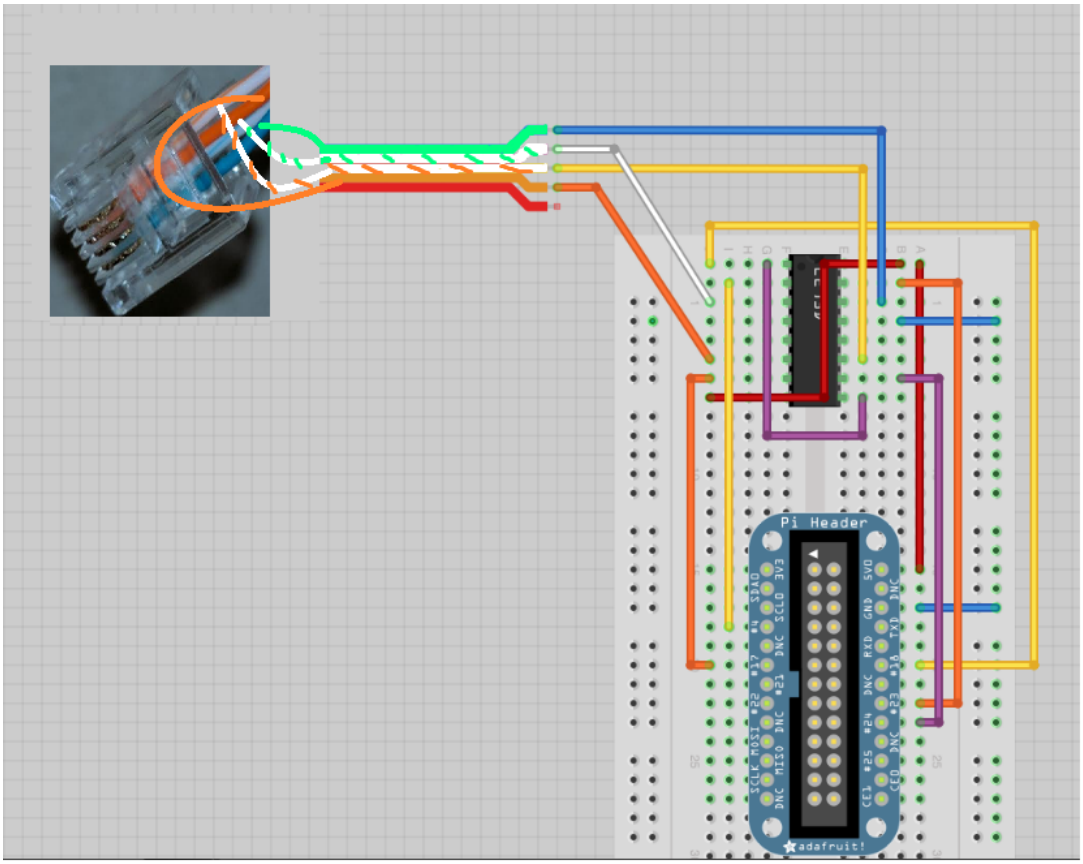
Once the Pi is connected to the host computer via USB, the internet adapter needs to be configured to share internet with the Pi's adapter (RNDIS Gad-

get). The Pi can be accessed via SSH command pi@raspberrypi.local with default password "raspberry".

2 Wiring Setup

This section we will show the wiring setup. We took an Ethernet cable and stripped open the ends. Our wiring choice at the RJ11 connector is:



Much of the wiring can be copied from Adafruit's own tutorial on connecting Stepper Motors. The tutorial can be found at https://learn.adafruit.com/adafruits-raspberry-pi-lesson-10-stepper-motors/overview. By far the most difficult process was figuring out the color coding the motor was used in reference to the above guide.