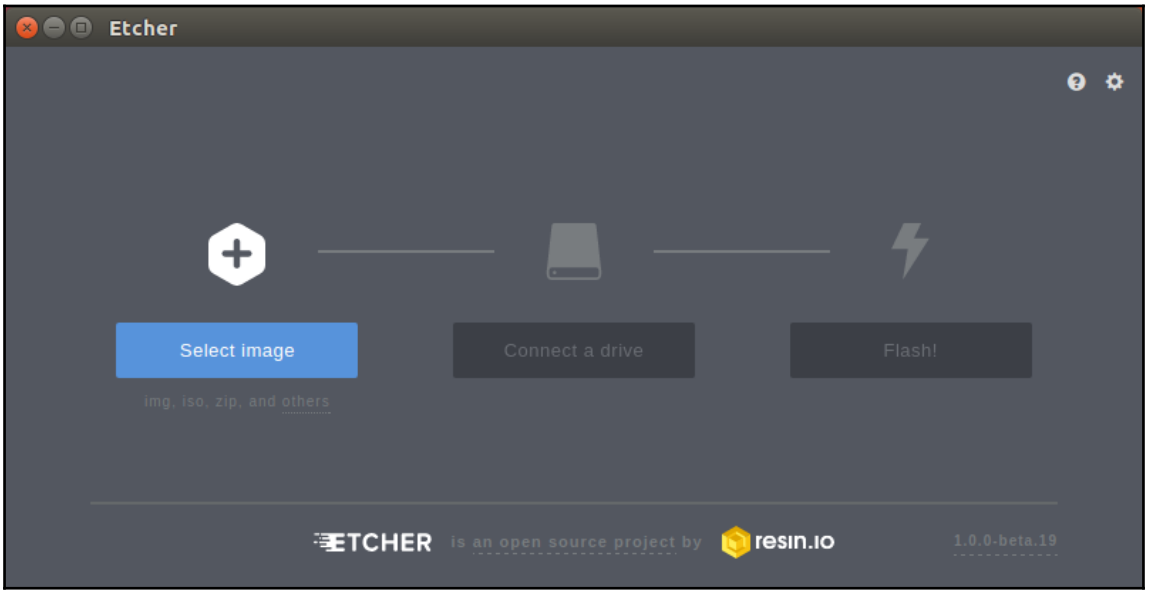
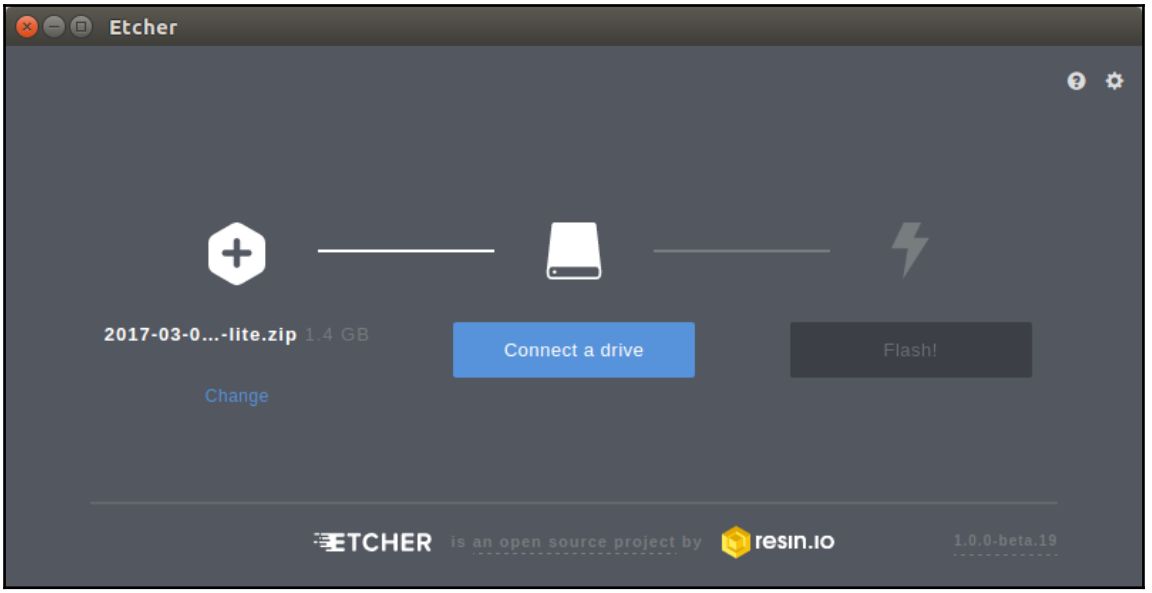
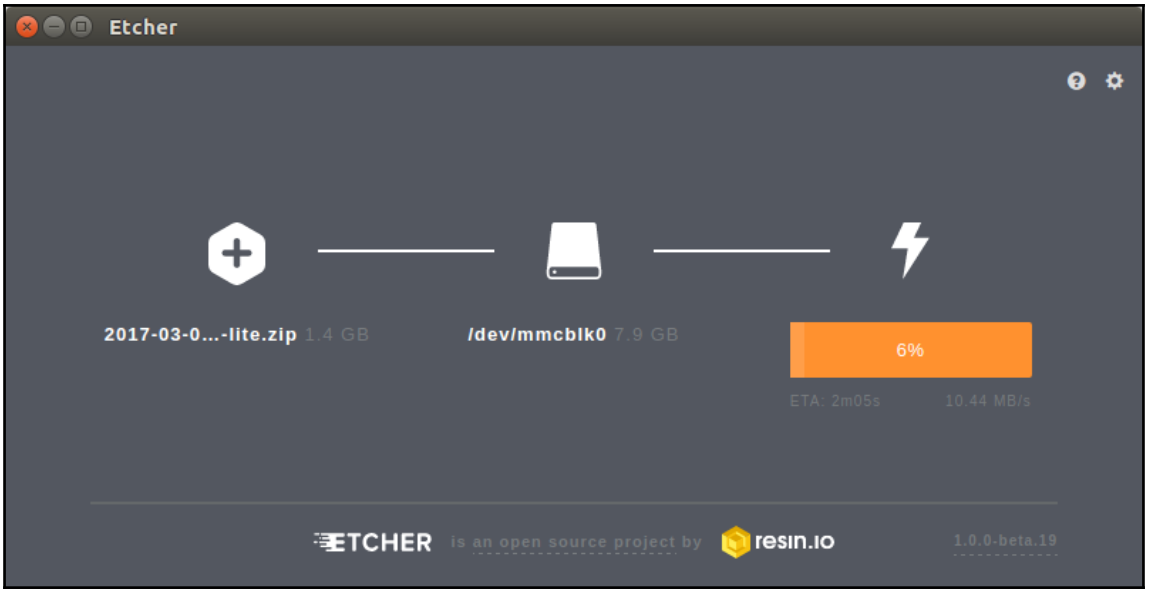
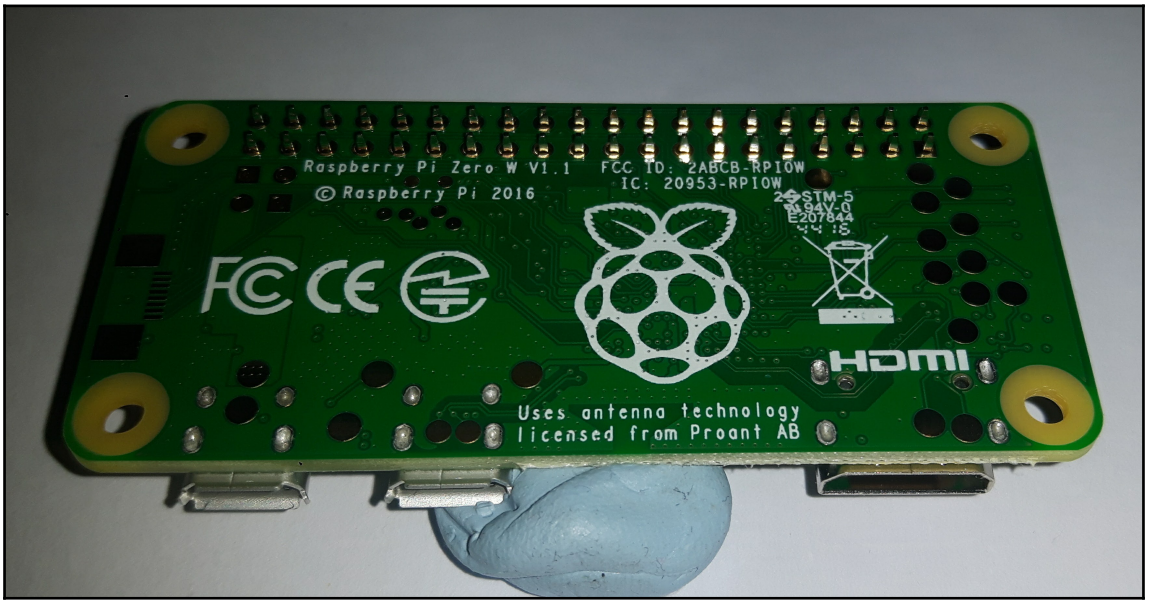
Chapter 1: About the Raspberry Pi






Etcher
2017-03-0...-lite.zip 1.4 GB
/dev/mmcblk0 7.9 GB
6%
ETA: 2m05s
10.44 MB/s
ETCHER is an open source project by resin.io
1.0.0-beta.19


Raspberry Pi Zero W V1.1
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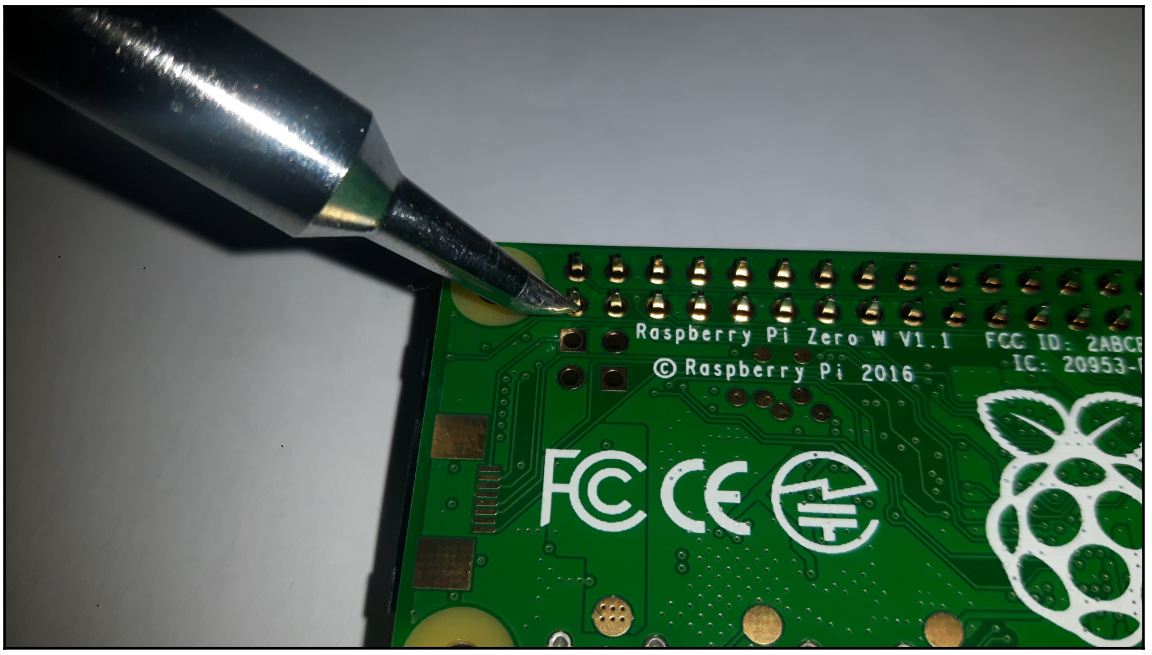
FCC ID: 2ABCB-RPIOW
IC: 20953-RPIOW
HDMI
Uses antenna technology
licensed from Proant AB


Raspberry Pi Zero W V1.1
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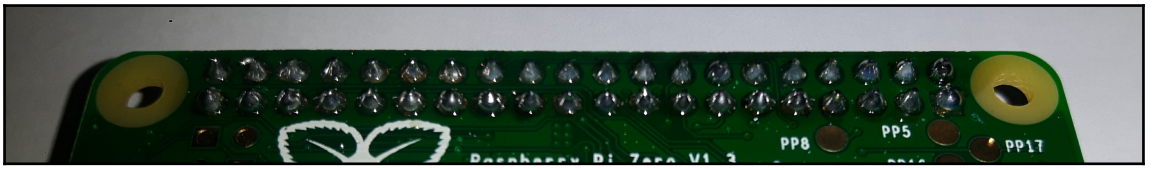
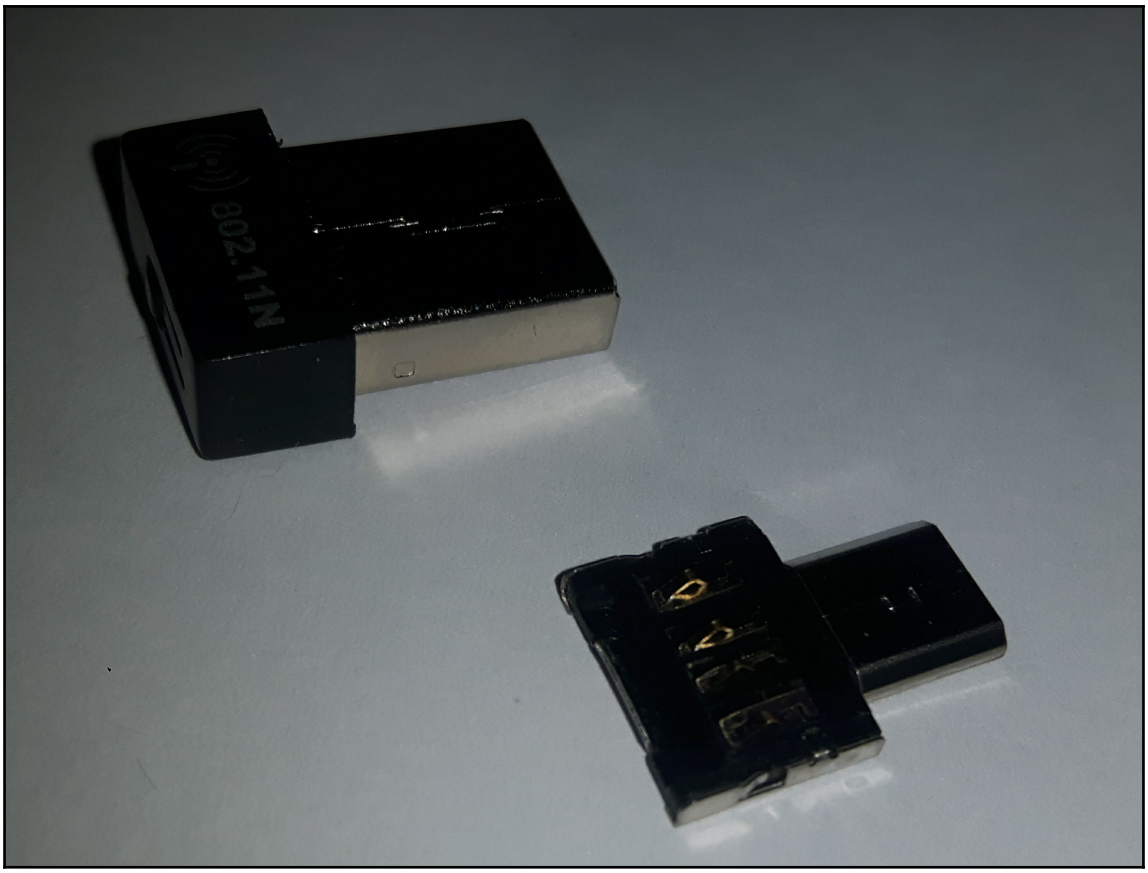
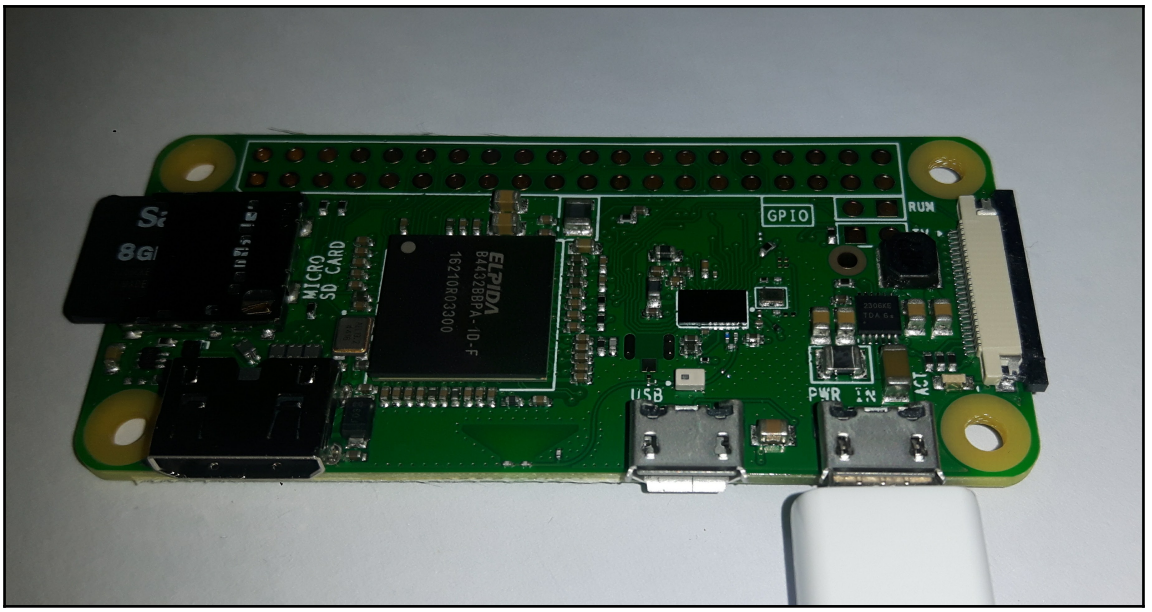

PP8
PP5
PP17


802.11N



Attached Devices

Go to Access Control to allow or block devices.

Access Control: Turned Off

Refresh

Wired Devices

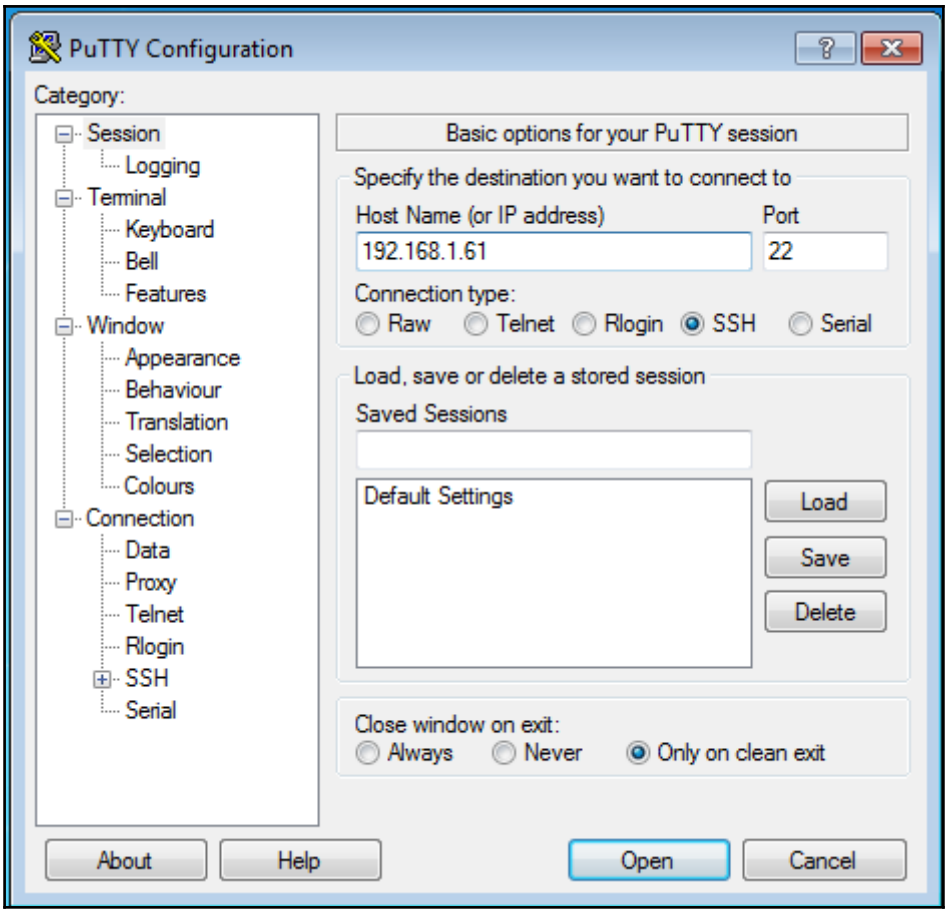
#	Device Name	IP Address	MAC Address	Connection Type
1	[redacted]	[redacted]	[redacted]	wired
2	[redacted]	[redacted]	[redacted]	wired

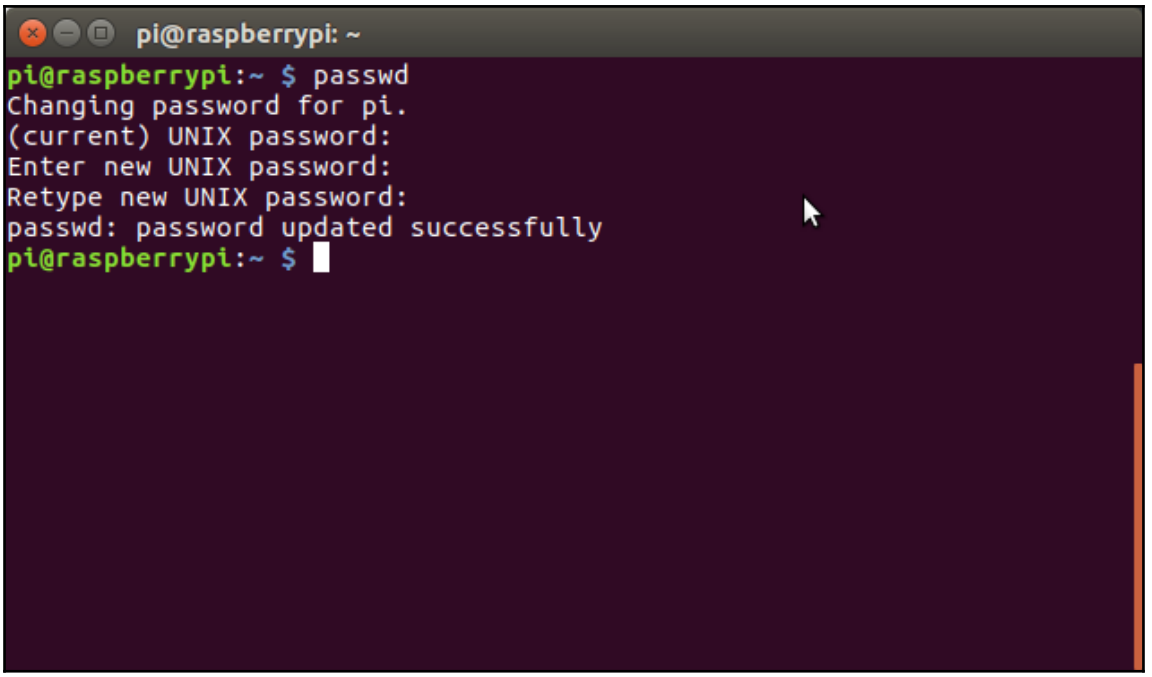
2.4GHz Wireless Devices (Wireless intruders also show up here)

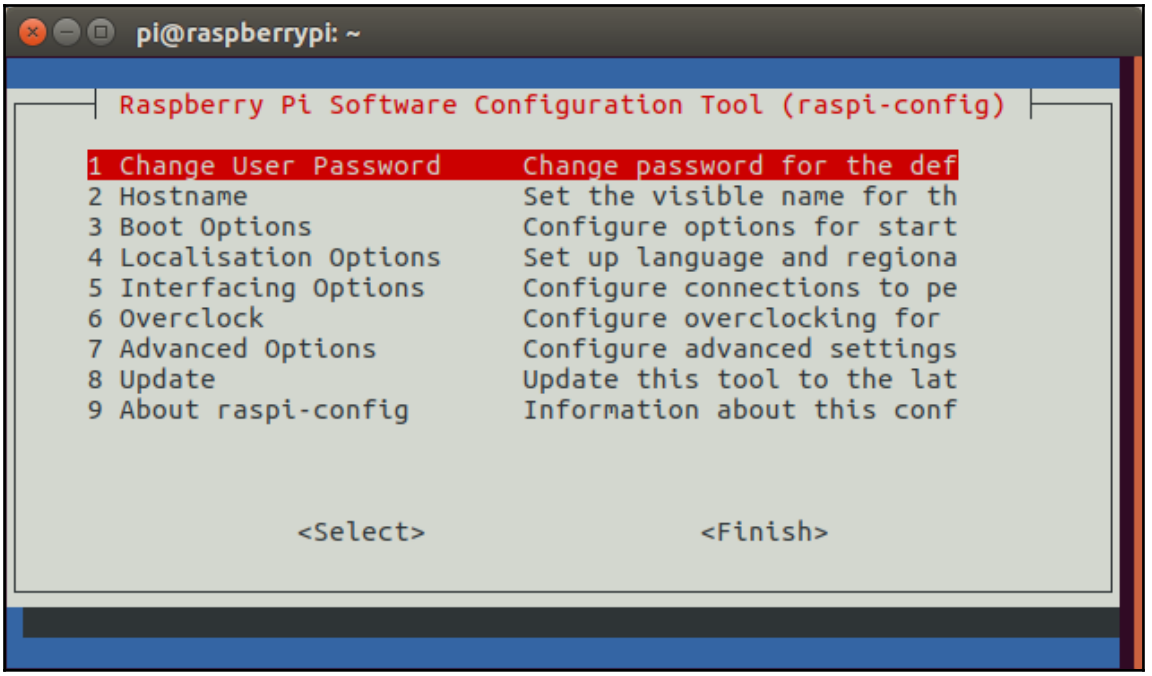
#	Device Name	IP Address	MAC Address	Connection Type
1	[redacted]	[redacted]	[redacted]	wireless [redacted]
2	[redacted]	[redacted]	[redacted]	wireless [redacted]
3	RASPBERRYPI	192.168.1.61	B8:27:EB[redacted]	wireless [redacted]
4	[redacted]	[redacted]	[redacted]	wireless [redacted]
5	[redacted]	[redacted]	[redacted]	wireless [redacted]

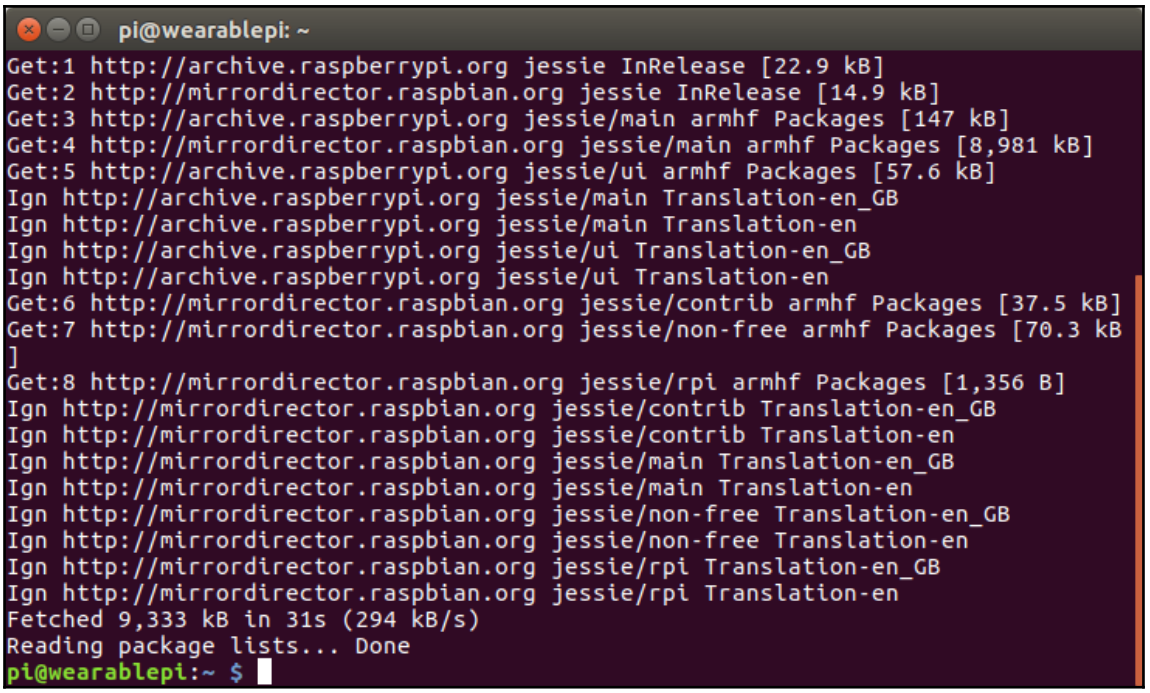
5GHz Wireless Devices (Wireless intruders also show up here)

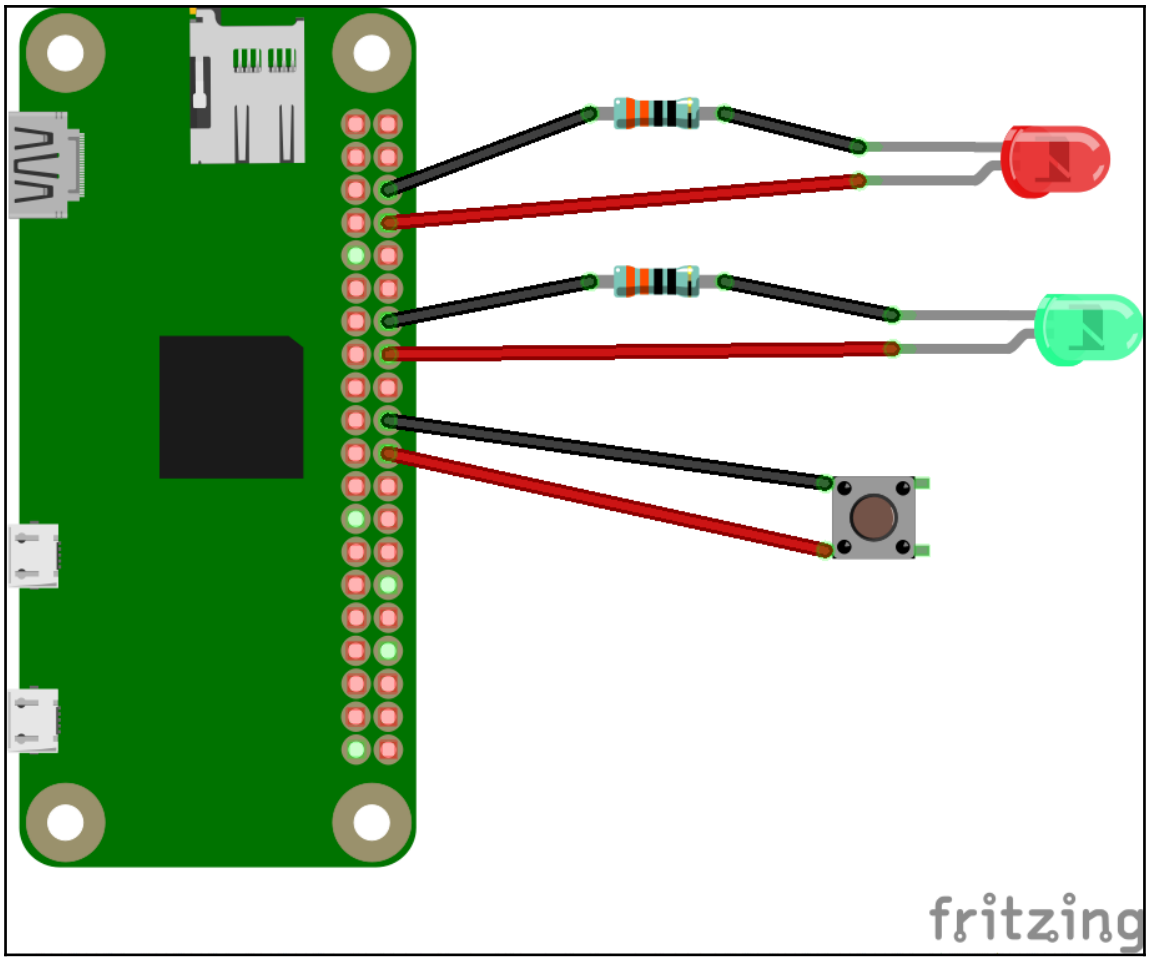
#	Device Name	IP Address	MAC Address	Connection Type
1	[redacted]	[redacted]	[redacted]	[redacted]
2	[redacted]	[redacted]	[redacted]	[redacted]


PuTTY Configuration
Category:
Session
Logging
Terminal
Keyboard
Bell
Features
Window
Appearance
Behaviour
Translation
Selection
Colours
Connection
Data
Proxy
Telnet
Rlogin
SSH
Serial
Basic options for your PuTTY session
Specify the destination you want to connect to
Host Name (or IP address)
Port
192.168.1.61
22
Connection type:
Raw
Telnet
Rlogin
SSH
Serial
Load, save or delete a stored session
Saved Sessions
Default Settings
Load
Save
Delete
Close window on exit:
Always
Never
Only on clean exit
About
Help
Open
Cancel


pi@raspberrypi: ~
pi@raspberrypi:~ $ passwd
Changing password for pi.
(current) UNIX password:
Enter new UNIX password:
Retype new UNIX password:
passwd: password updated successfully
pi@raspberrypi:~ $


pi@raspberrypi: ~
Raspberry Pi Software Configuration Tool (raspi-config)
1 Change User Password Change password for the def
2 Hostname Set the visible name for th
3 Boot Options Configure options for start
4 Localisation Options Set up language and regiona
5 Interfacing Options Configure connections to pe
6 Overclock Configure overclocking for
7 Advanced Options Configure advanced settings
8 Update Update this tool to the lat
9 About raspi-config Information about this conf
<Select>
<Finish>

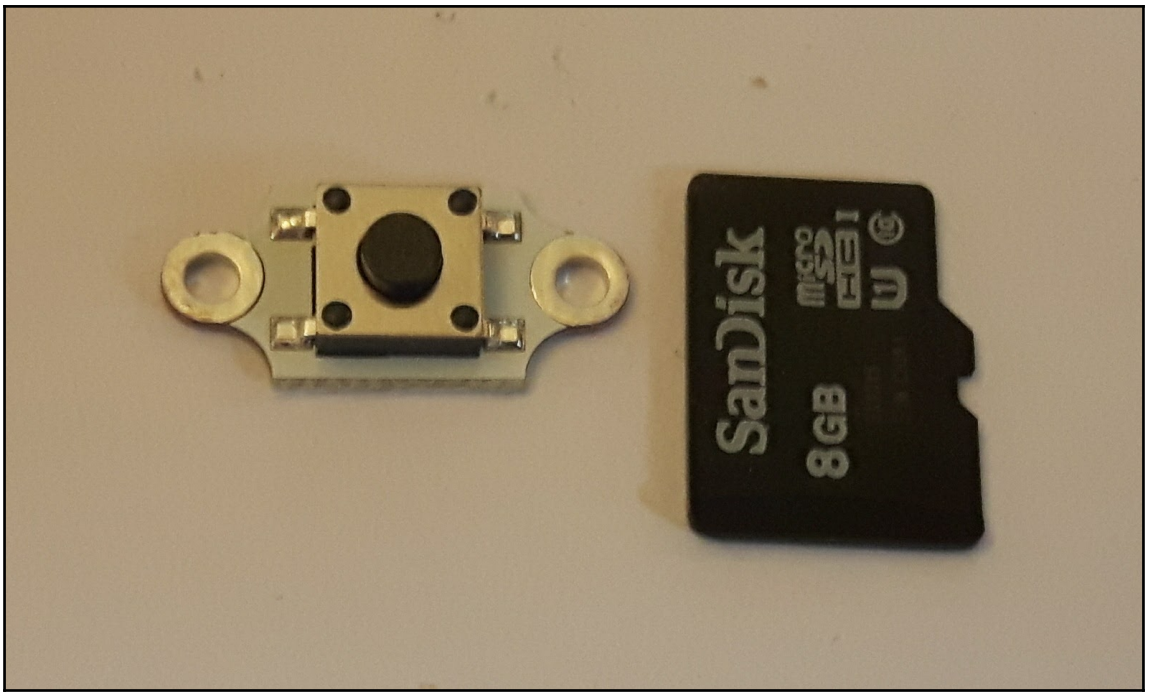

pi@wearablepi: ~
Get:1 http://archive.raspberrypi.org jessie InRelease [22.9 kB]
Get:2 http://mirrordirector.raspbian.org jessie InRelease [14.9 kB]
Get:3 http://archive.raspberrypi.org jessie/main armhf Packages [147 kB]
Get:4 http://mirrordirector.raspbian.org jessie/main armhf Packages [8,981 kB]
Get:5 http://archive.raspberrypi.org jessie/ui armhf Packages [57.6 kB]
Ign http://archive.raspberrypi.org jessie/main Translation-en_GB
Ign http://archive.raspberrypi.org jessie/main Translation-en
Ign http://archive.raspberrypi.org jessie/ui Translation-en_GB
Ign http://archive.raspberrypi.org jessie/ui Translation-en
Get:6 http://mirrordirector.raspbian.org jessie/contrib armhf Packages [37.5 kB]
Get:7 http://mirrordirector.raspbian.org jessie/non-free armhf Packages [70.3 kB
]
Get:8 http://mirrordirector.raspbian.org jessie/rpi armhf Packages [1,356 B]
Ign http://mirrordirector.raspbian.org jessie/contrib Translation-en_GB
Ign http://mirrordirector.raspbian.org jessie/contrib Translation-en
Ign http://mirrordirector.raspbian.org jessie/main Translation-en_GB
Ign http://mirrordirector.raspbian.org jessie/main Translation-en
Ign http://mirrordirector.raspbian.org jessie/non-free Translation-en_GB
Ign http://mirrordirector.raspbian.org jessie/non-free Translation-en
Ign http://mirrordirector.raspbian.org jessie/rpi Translation-en_GB
Ign http://mirrordirector.raspbian.org jessie/rpi Translation-en
Fetched 9,333 kB in 31s (294 kB/s)
Reading package lists... Done
pi@wearablepi:~ $

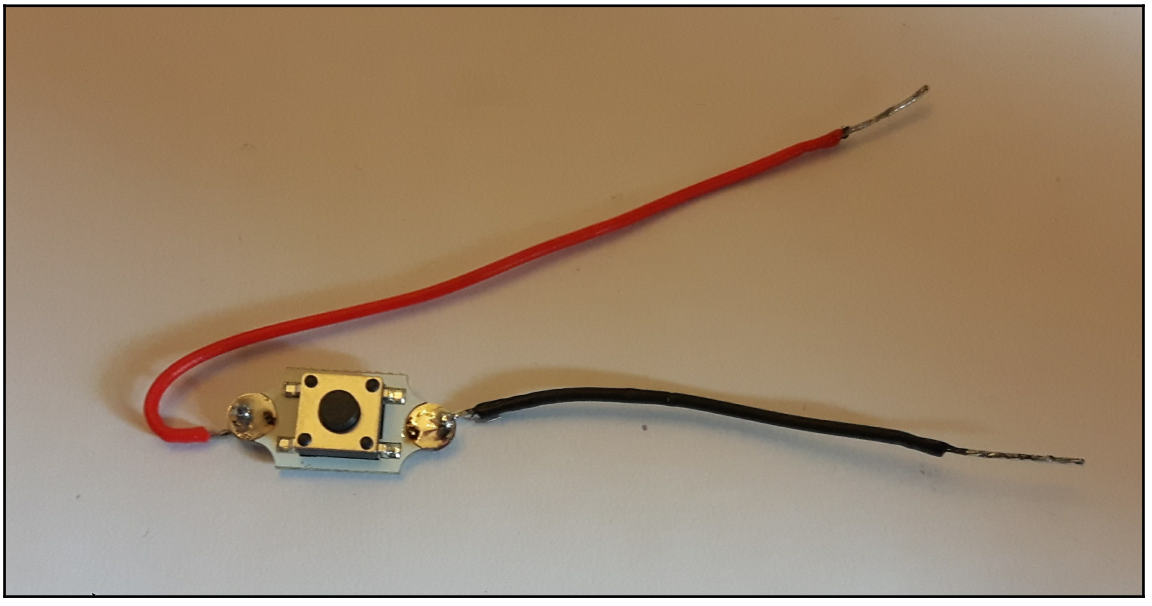

fritzing

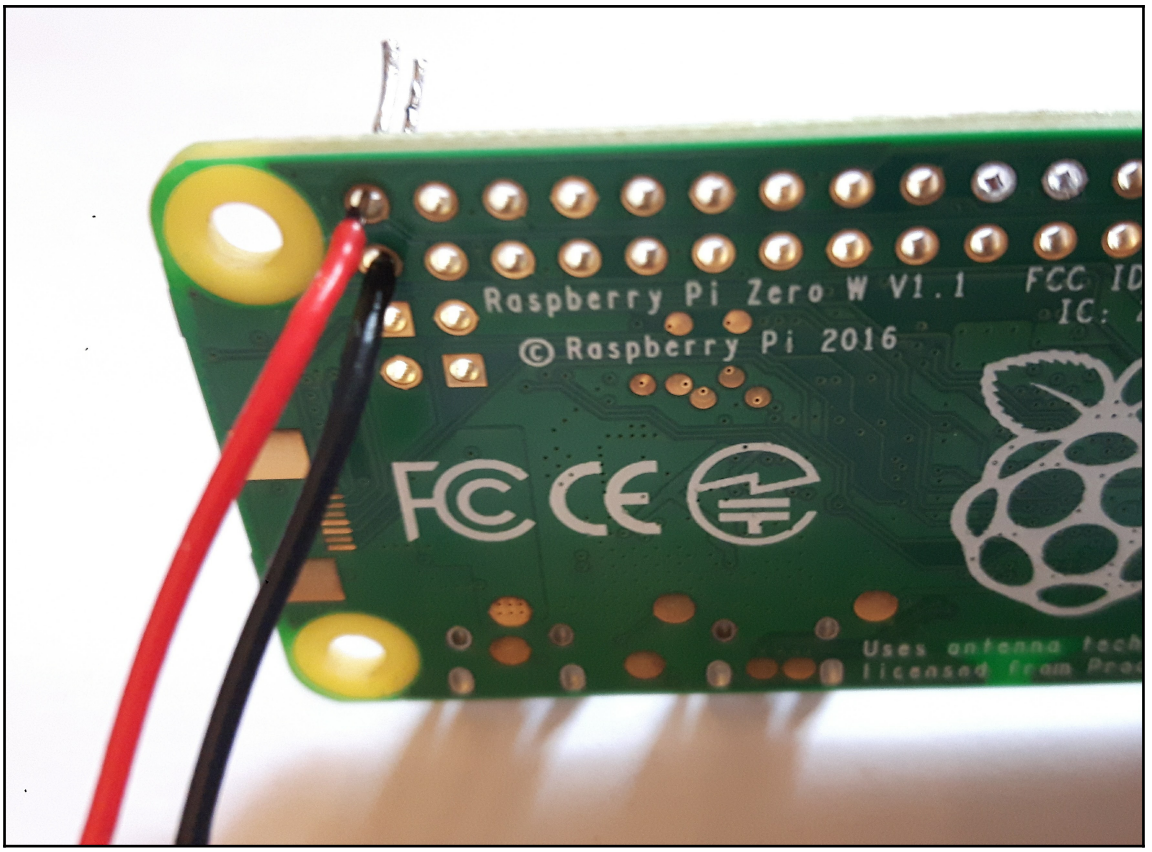
Chapter 2: Scrolling LED Badge

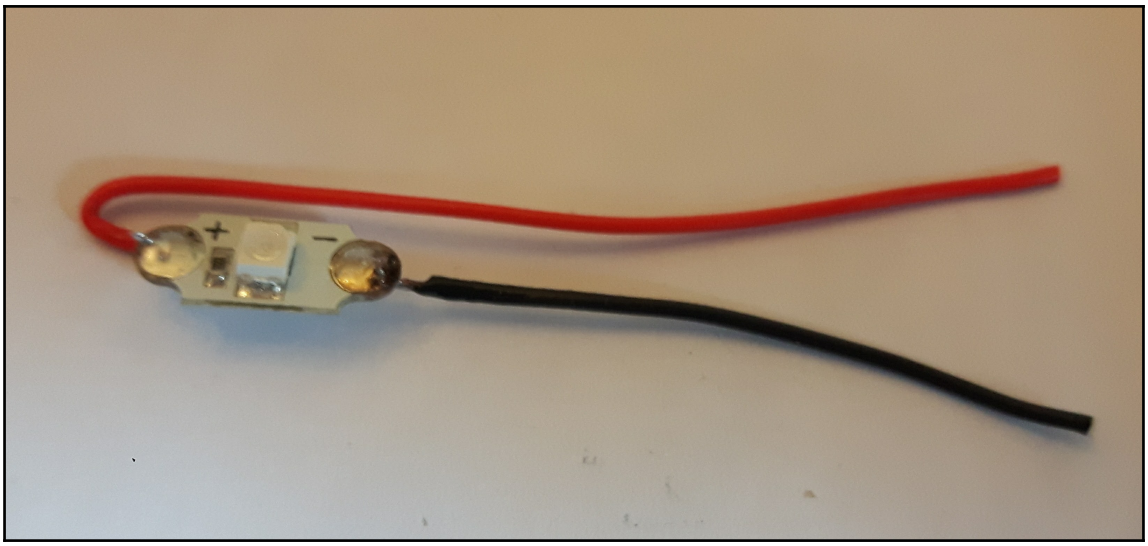
```
pi@wearablepi:~ $ sudo i2cdetect -y 1
     0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00:          -- -- -- -- -- -- -- -- -- -- -- -- --
10: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
20: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
30: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
40: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
50: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
60: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
70: -- -- -- -- 74 -- -- --
pi@wearablepi:~ $
```

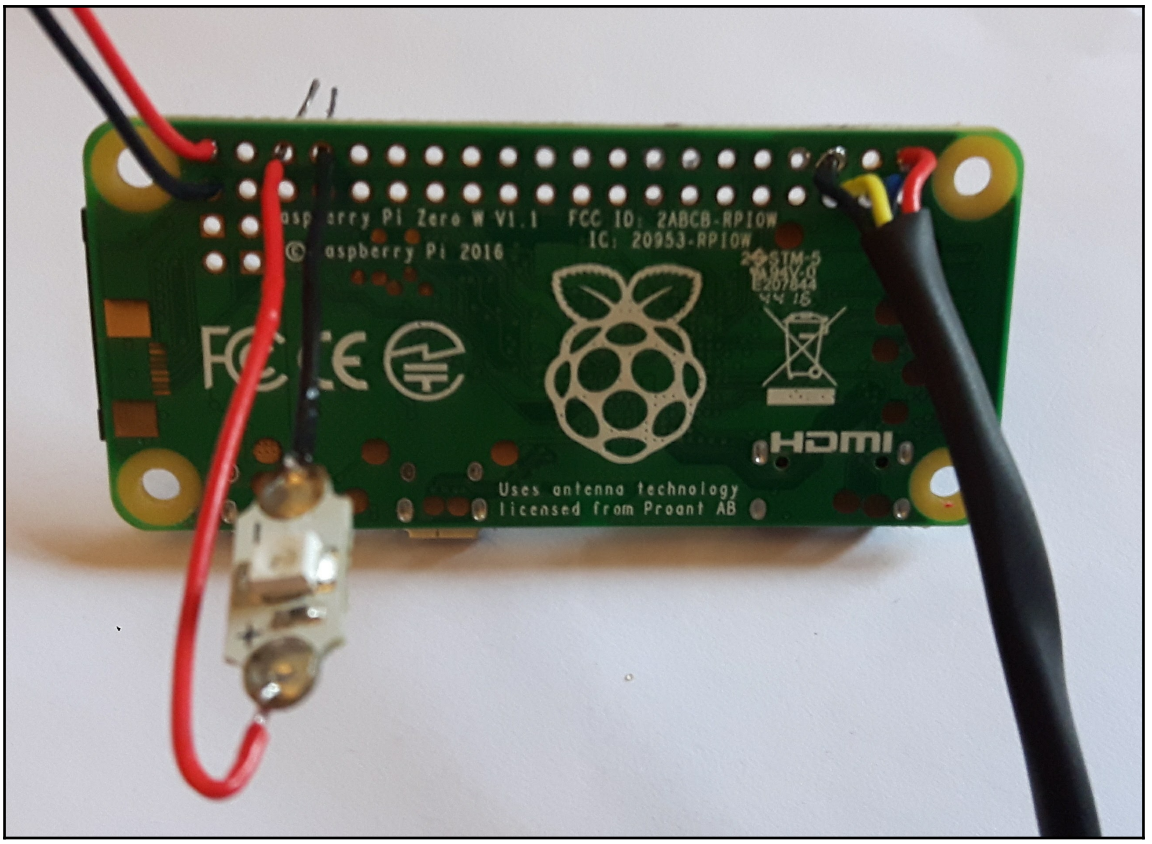
```
pi@wearablepi: ~
pi@wearablepi:~ $ sudo systemctl status scrollBadge.service -l
● scrollBadge.service - Scroll Badge Service
   Loaded: loaded (/lib/systemd/system/scrollBadge.service; enabled)
   Active: active (running) since Mon 2017-04-10 21:17:43 UTC; 40s ago
 Main PID: 633 (scrollBadge.py)
   CGroup: /system.slice/scrollBadge.service
           └─633 /usr/bin/python3 /home/pi/WearableTech/Chapter2/scrollBadge.py

Apr 10 21:17:43 wearablepi systemd[1]: Starting Scroll Badge Service...
Apr 10 21:17:43 wearablepi systemd[1]: Started Scroll Badge Service.
pi@wearablepi:~ $
```


SanDisk
8GB




Raspberry Pi Zero W V1.1
© Raspberry Pi 2016




FCC ID: 2ABCB-RPIOW
IC: 20953-RPIOW
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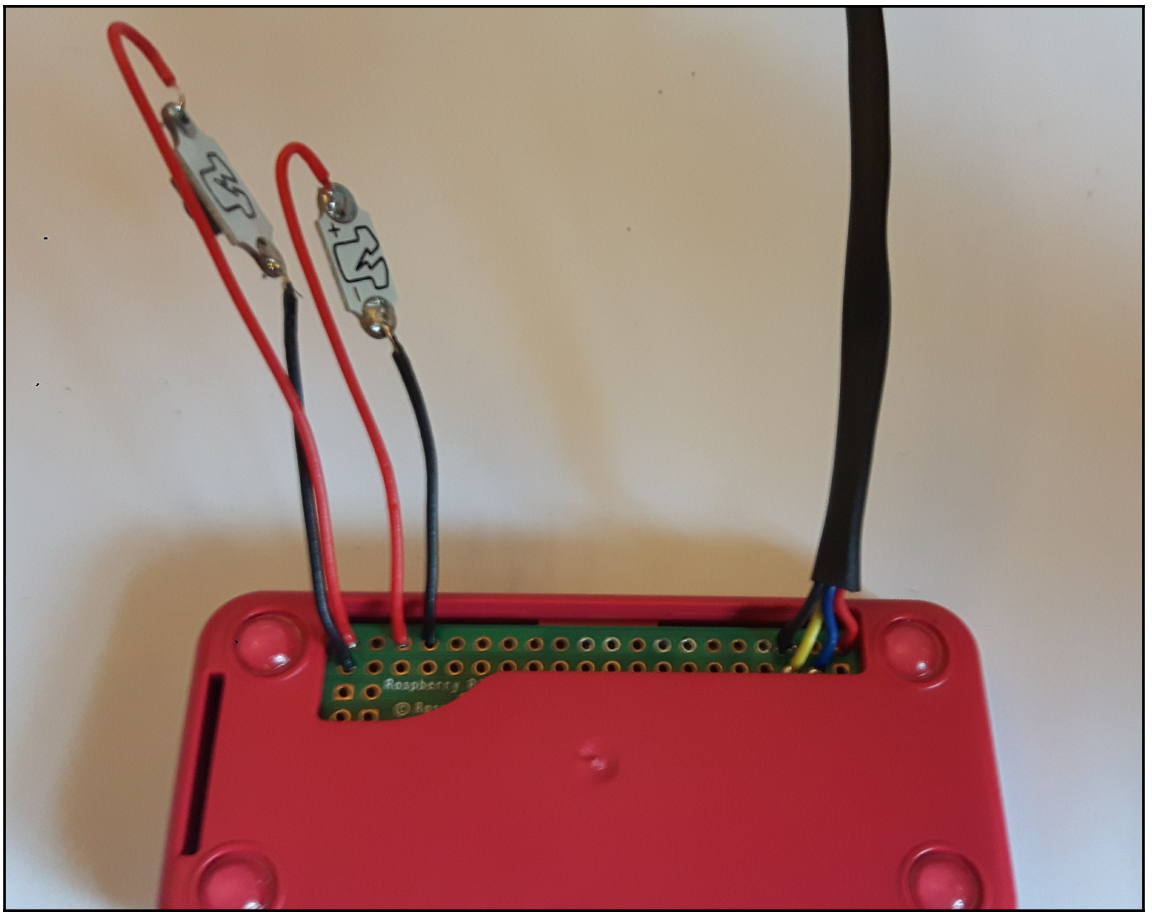
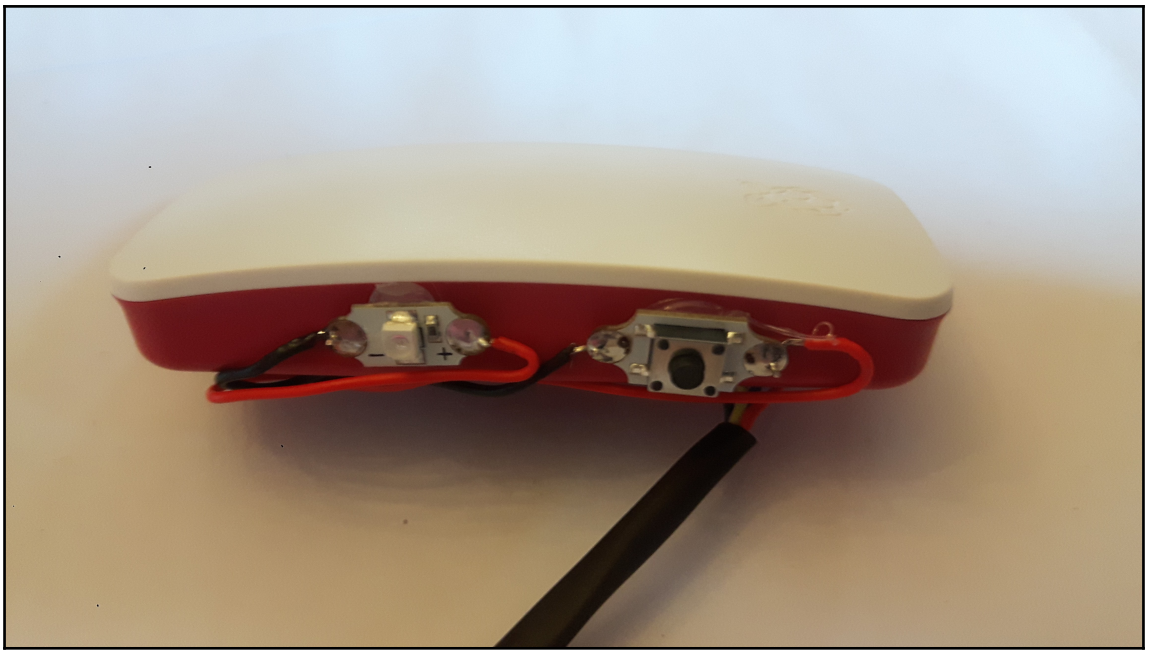
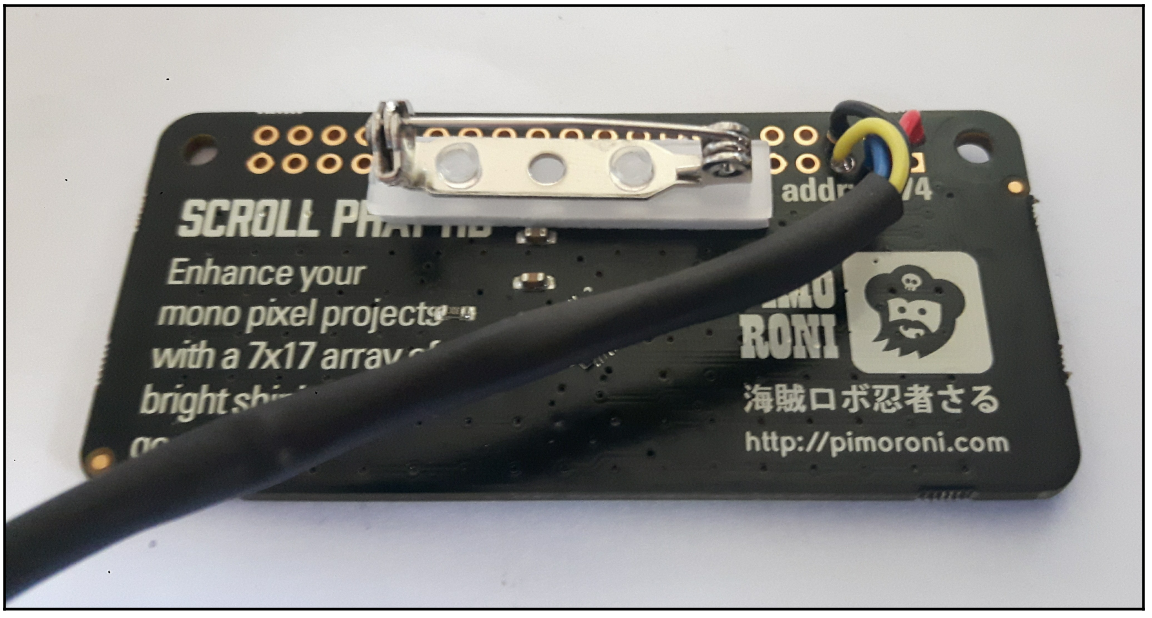
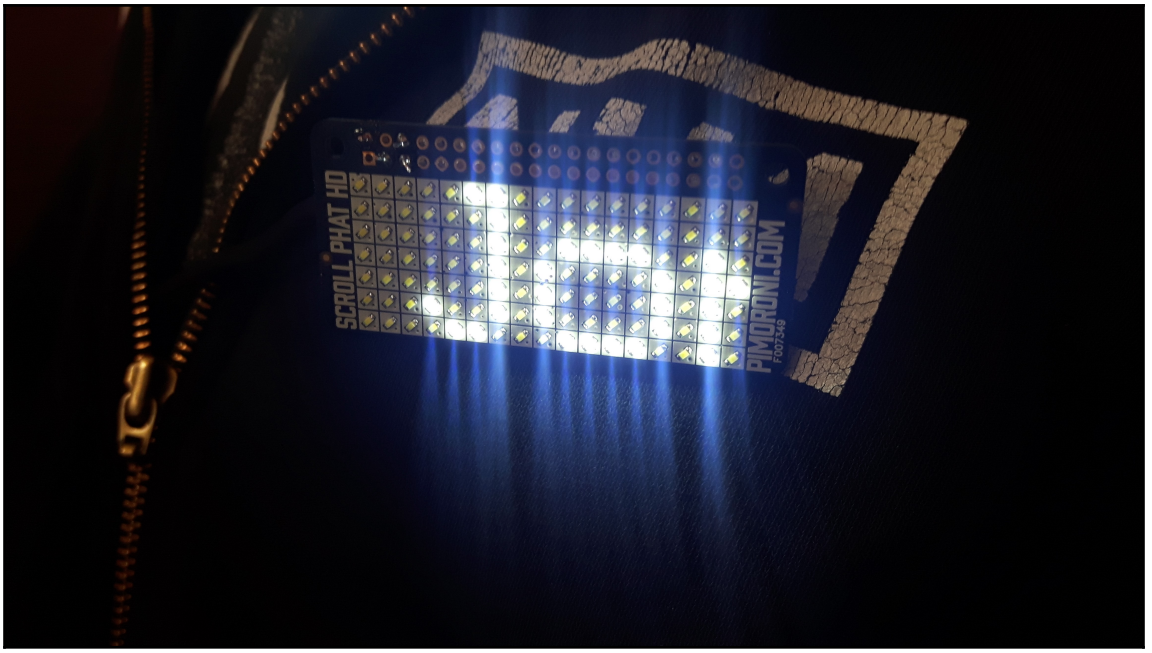
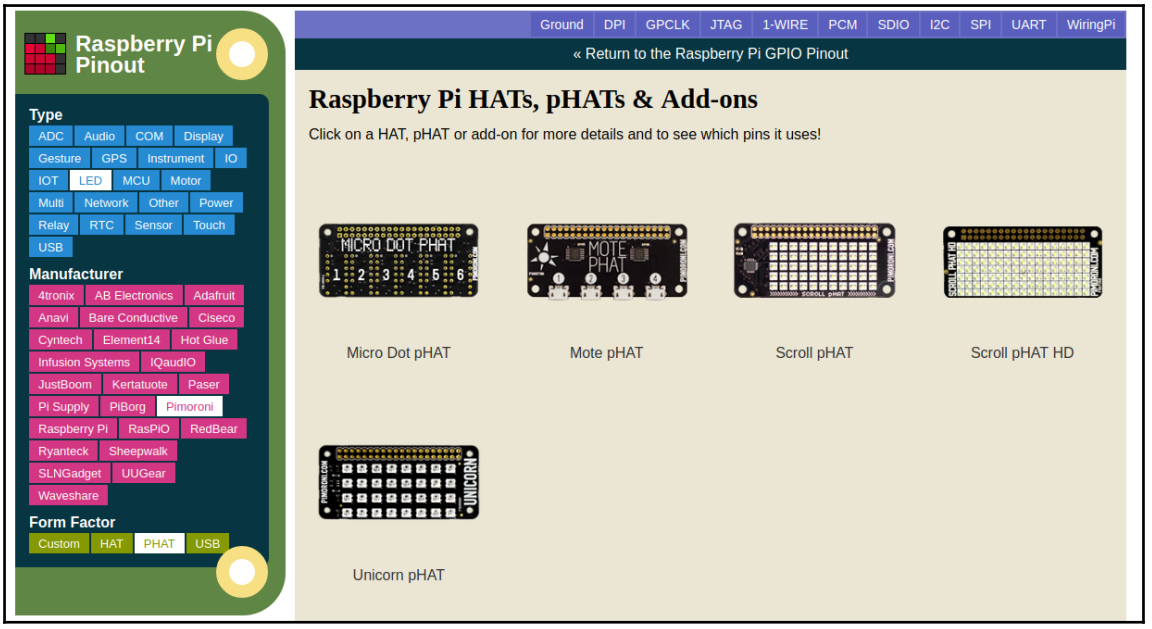
HDMI
Uses antenna technology
licensed from Proant AB

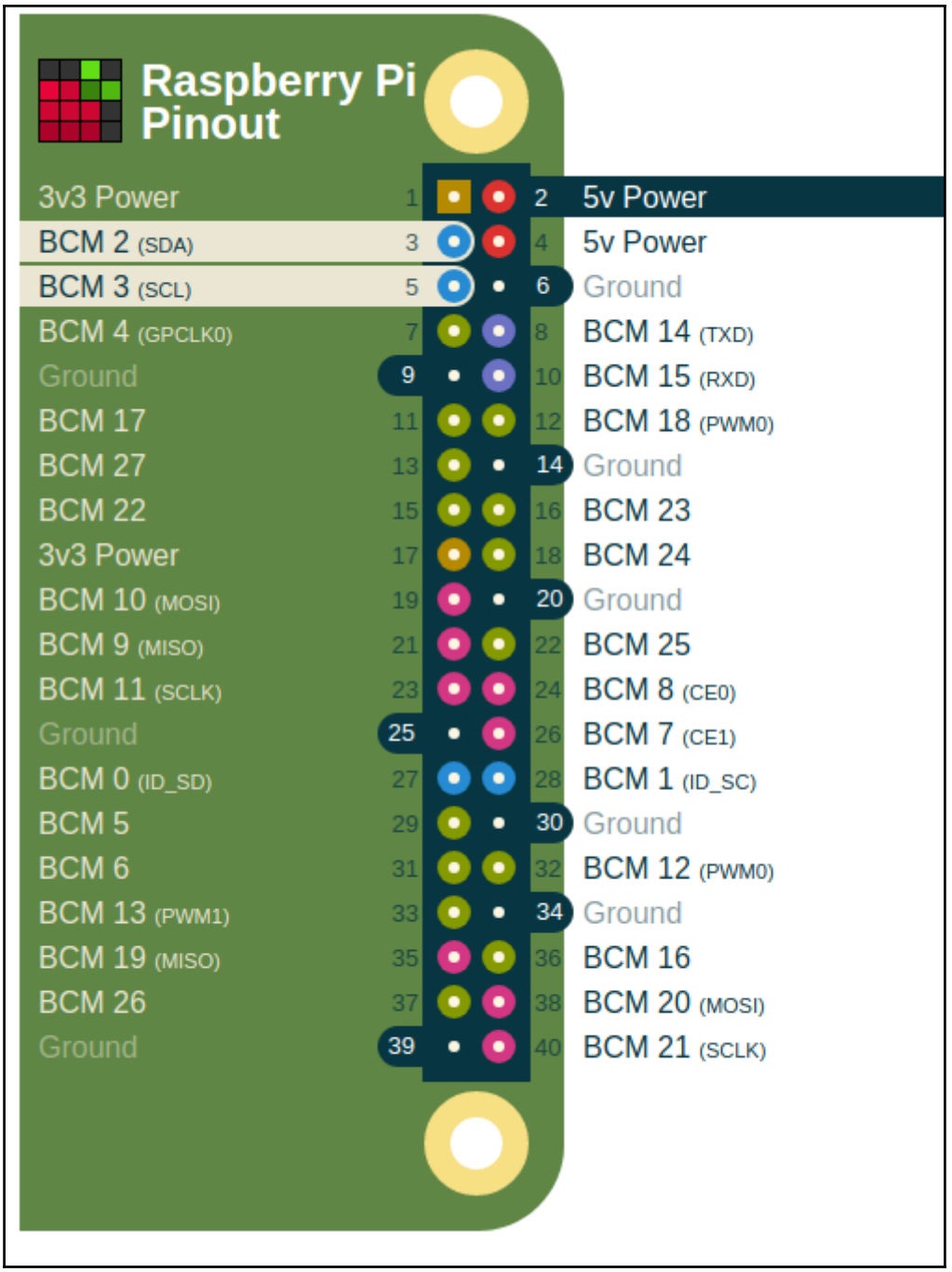


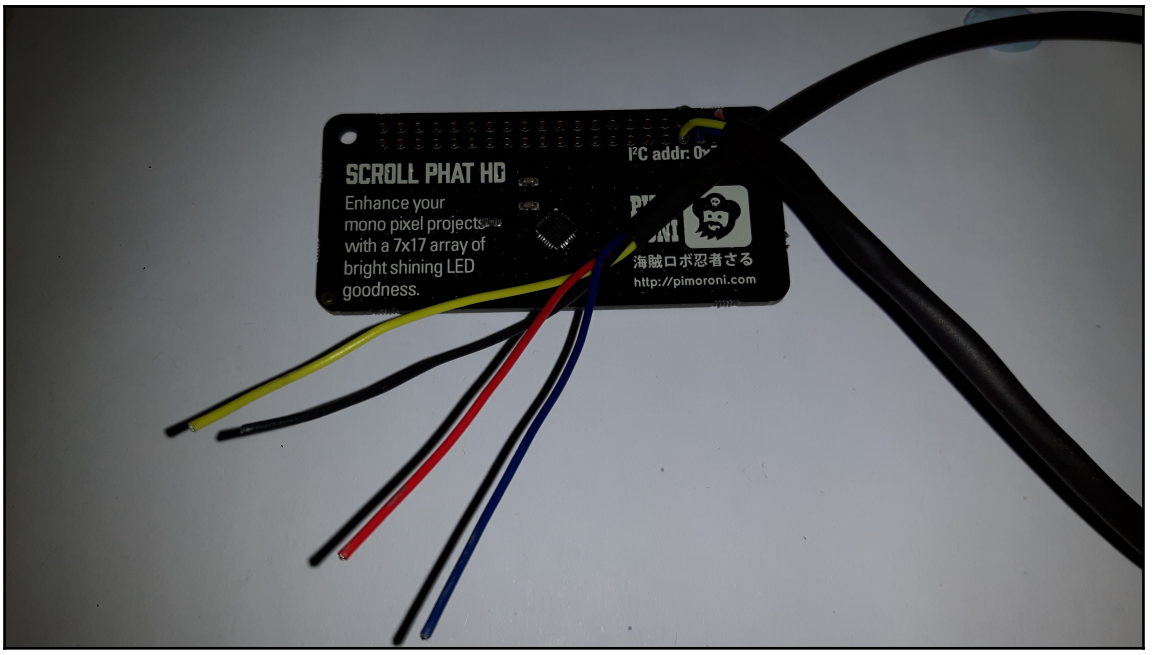


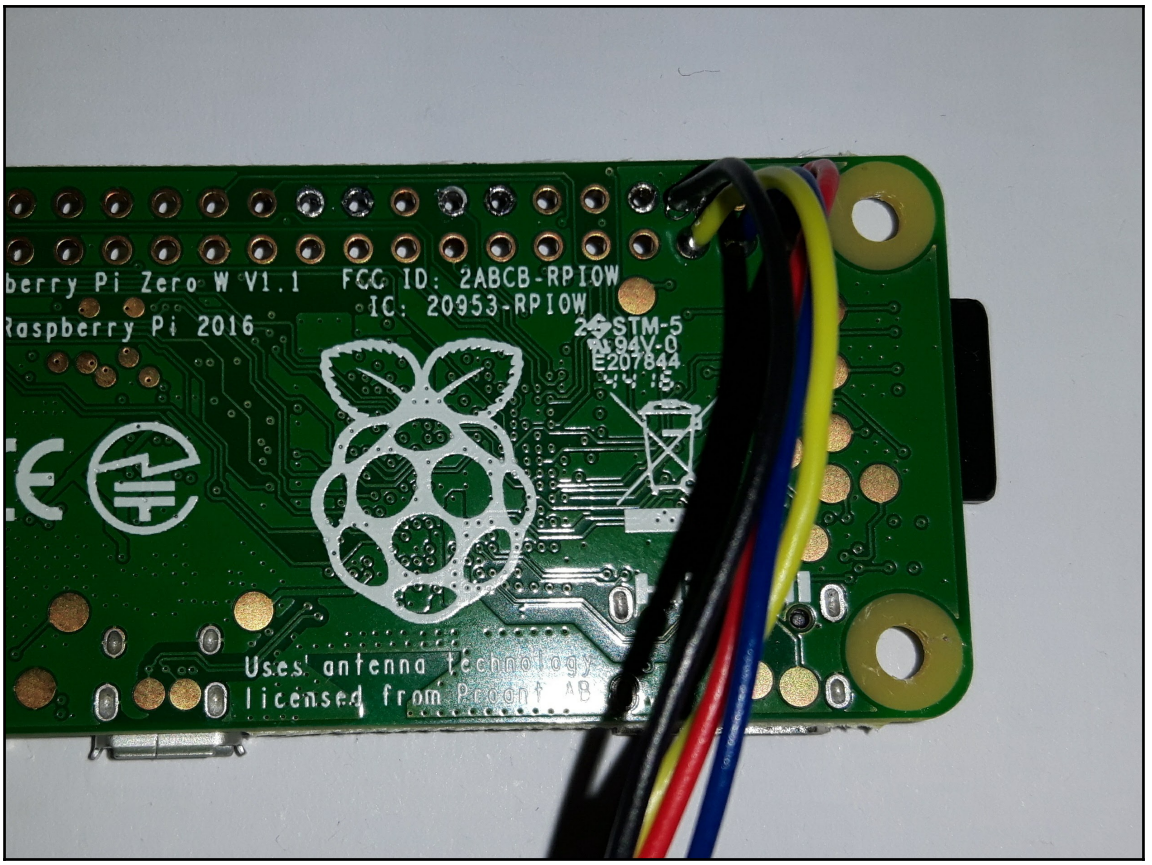

Enhance your
mono pixel projects
with a 7x17 array
bright
RONI
海賊ロボ忍者さる
http://pimoroni.com


SCROLL PHAT HD
PIMORONI.COM


Raspberry Pi Pinout
Type
ADC
Audio
COM
Display
Gesture
GPS
Instrument
IO
IOT
LED
MCU
Motor
Multi
Network
Other
Power
Relay
RTC
Sensor
Touch
USB
Manufacturer
4tronix
AB Electronics
Adafruit
Anavi
Bare Conductive
Ciseco
Cyntech
Element14
Hot Glue
Infusion Systems
IQaudIO
JustBoom
Kertatuote
Paser
Pi Supply
PiBorg
Pimoroni
Raspberry Pi
RasPiO
RedBear
Ryanteck
Sheepwalk
SLNGadget
UUGear
Waveshare
Form Factor
Custom
HAT
PHAT
USB
Ground
DPI
GPCLK
JTAG
1-WIRE
PCM
SDIO
I2C
SPI
UART
WiringPi
« Return to the Raspberry Pi GPIO Pinout
Raspberry Pi HATs, pHATs & Add-ons
Click on a HAT, pHAT or add-on for more details and to see which pins it uses!
MICRO DOT PHAT
MOTE PHAT
UNICORN
Micro Dot pHAT
Mote pHAT
Scroll pHAT
Scroll pHAT HD
Unicorn pHAT


Raspberry Pi
Pinout
3v3 Power 1 2 5v Power
BCM 2 (SDA) 3 4 5v Power
BCM 3 (SCL) 5 6 Ground
BCM 4 (GPCLK0) 7 8 BCM 14 (TXD)
Ground 9 10 BCM 15 (RXD)
BCM 17 11 12 BCM 18 (PWM0)
BCM 27 13 14 Ground
BCM 22 15 16 BCM 23
3v3 Power 17 18 BCM 24
BCM 10 (MOSI) 19 20 Ground
BCM 9 (MISO) 21 22 BCM 25
BCM 11 (SCLK) 23 24 BCM 8 (CE0)
Ground 25 26 BCM 7 (CE1)
BCM 0 (ID_SD) 27 28 BCM 1 (ID_SC)
BCM 5 29 30 Ground
BCM 6 31 32 BCM 12 (PWM0)
BCM 13 (PWM1) 33 34 Ground
BCM 19 (MISO) 35 36 BCM 16
BCM 26 37 38 BCM 20 (MOSI)
Ground 39 40 BCM 21 (SCLK)


SCROLL PHAT HD
Enhance your mono pixel projects with a 7x17 array of bright shining LED goodness.
I²C addr: 0x
海賊ロボ忍者さる
http://pimoroni.com


berry Pi Zero W V1.1
FCC ID: 2ABCB-RPIOW
IC: 20953-RPIOW
Raspberry Pi 2016
STM-5
94V-0
E207844
Uses antenna technology
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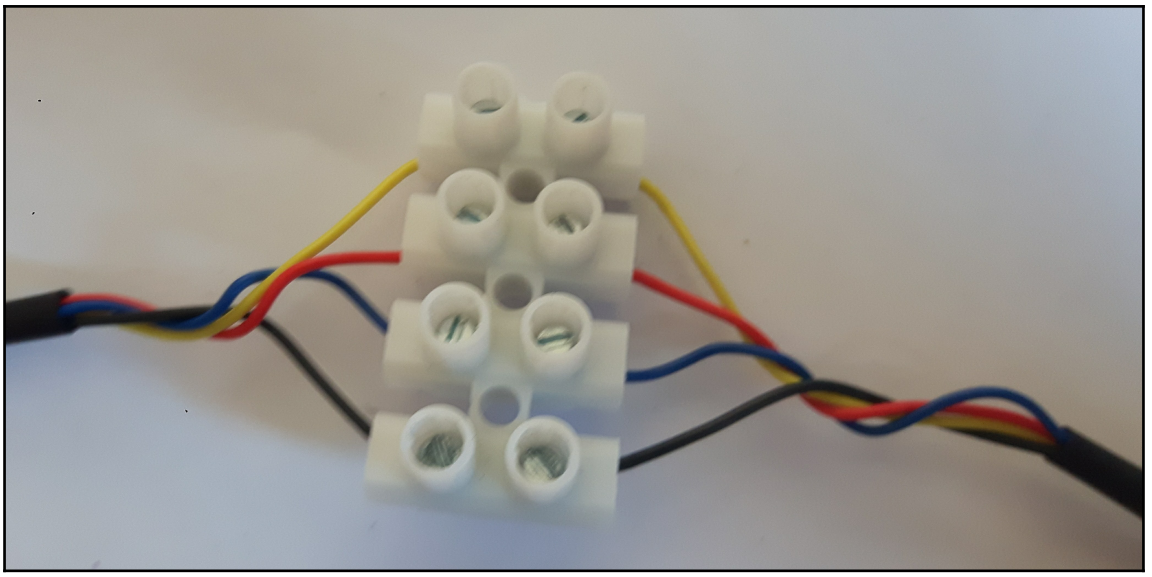
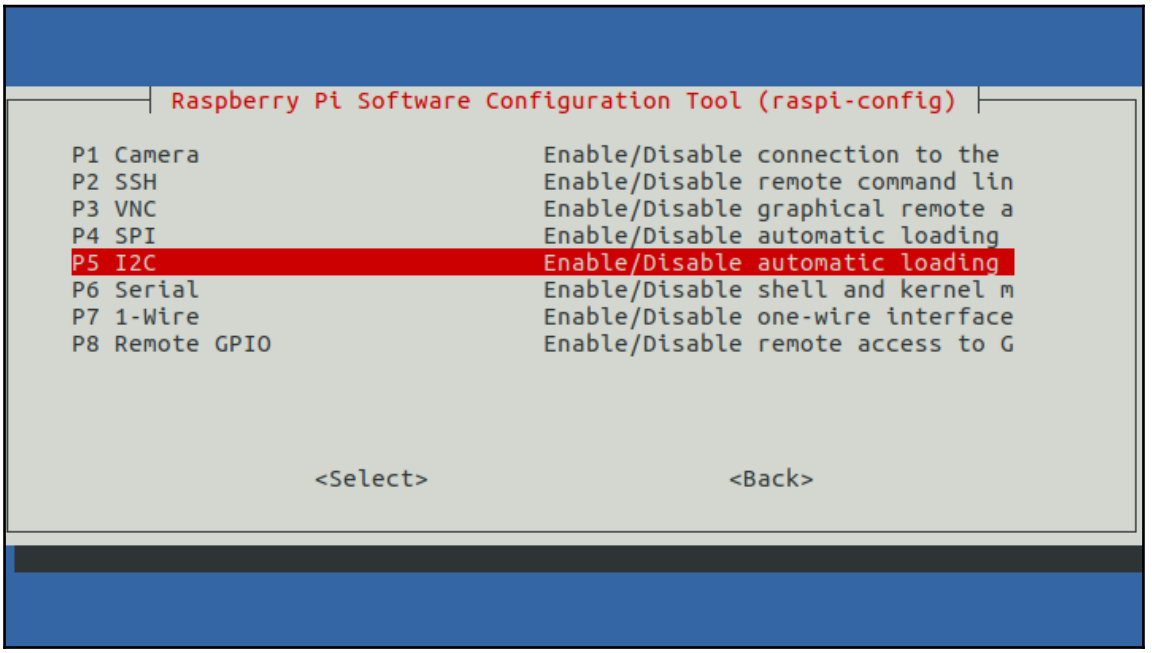
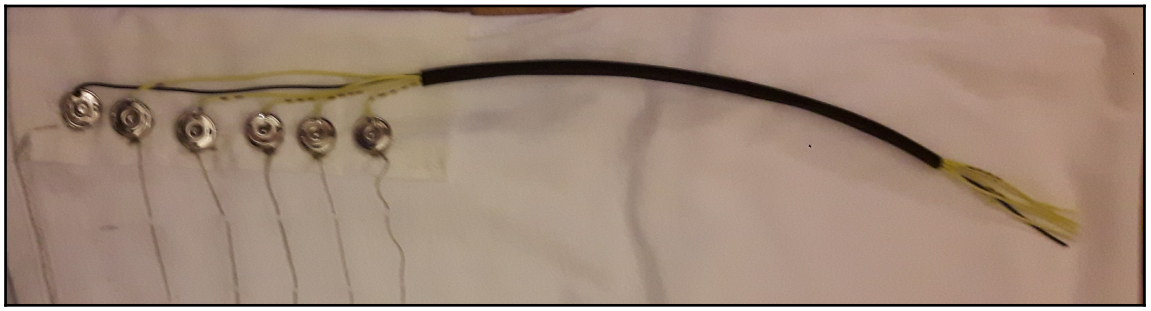
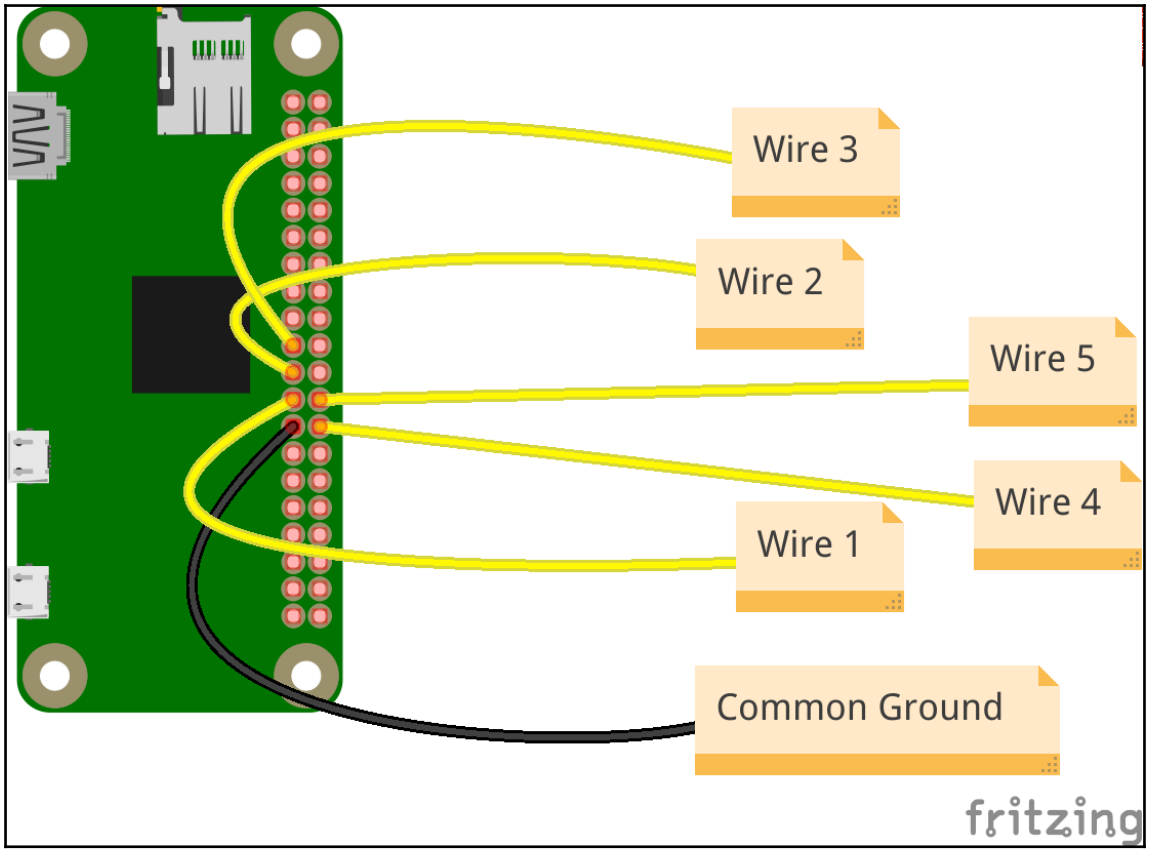
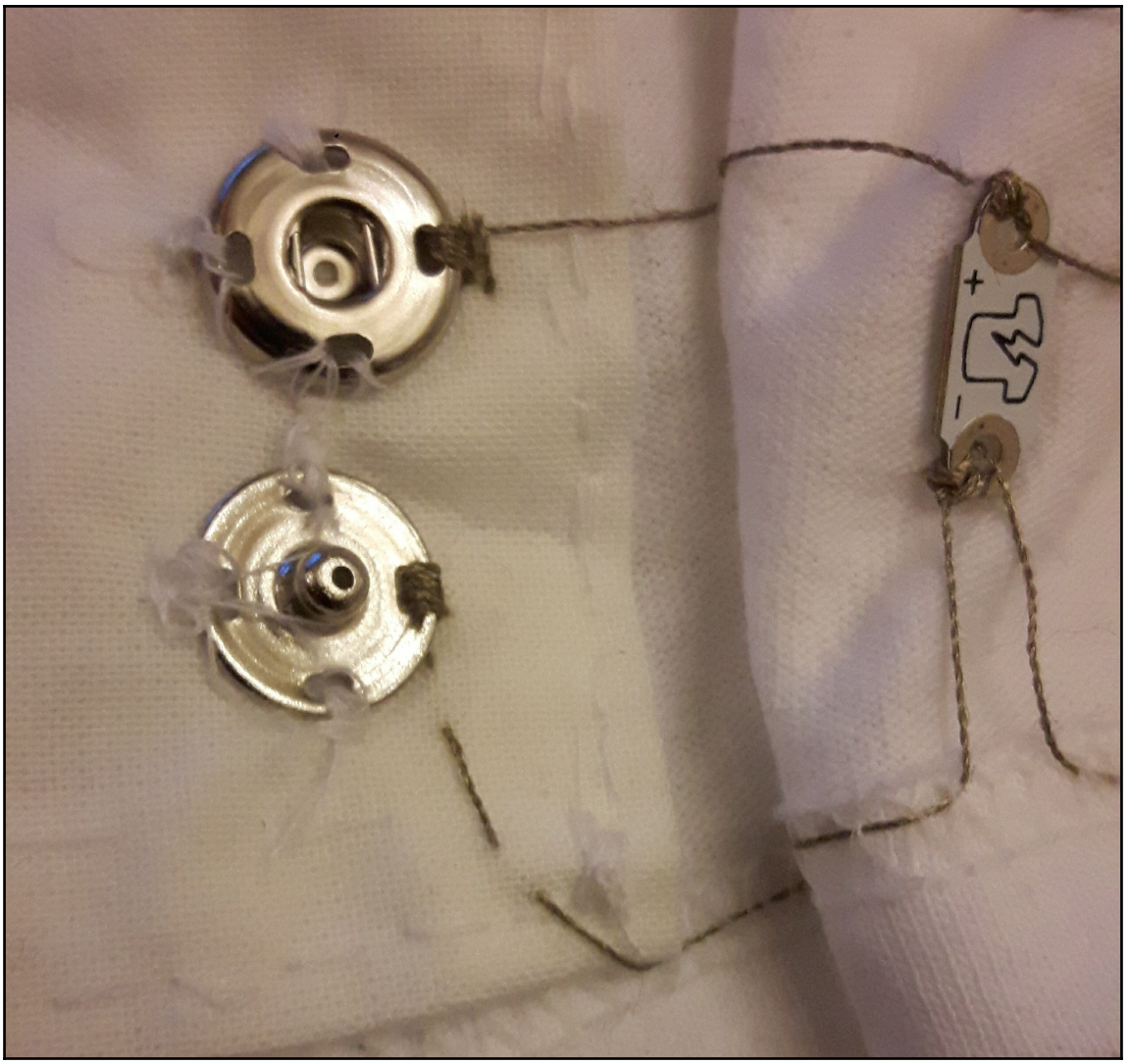


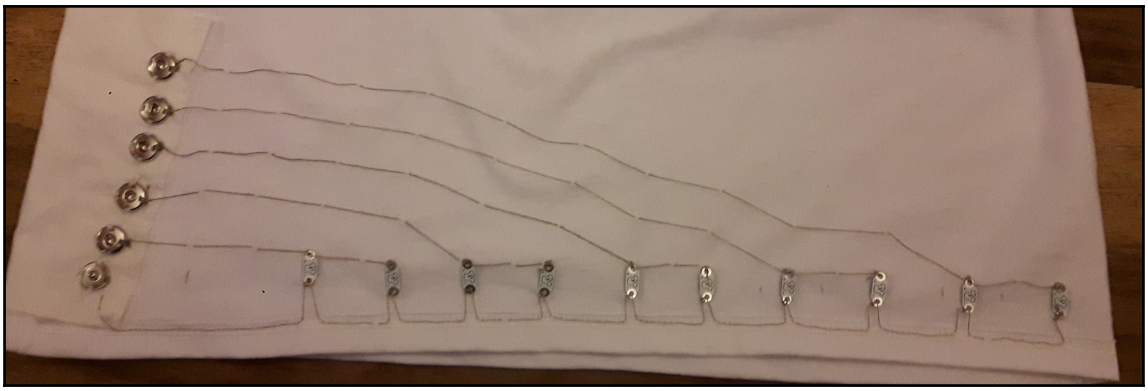

Raspberry Pi Software Configuration Tool (raspi-config)
P1 Camera Enable/Disable connection to the
P2 SSH Enable/Disable remote command lin
P3 VNC Enable/Disable graphical remote a
P4 SPI Enable/Disable automatic loading
P5 I2C Enable/Disable automatic loading
P6 Serial Enable/Disable shell and kernel m
P7 1-Wire Enable/Disable one-wire interface
P8 Remote GPIO Enable/Disable remote access to G
<Select>
<Back>

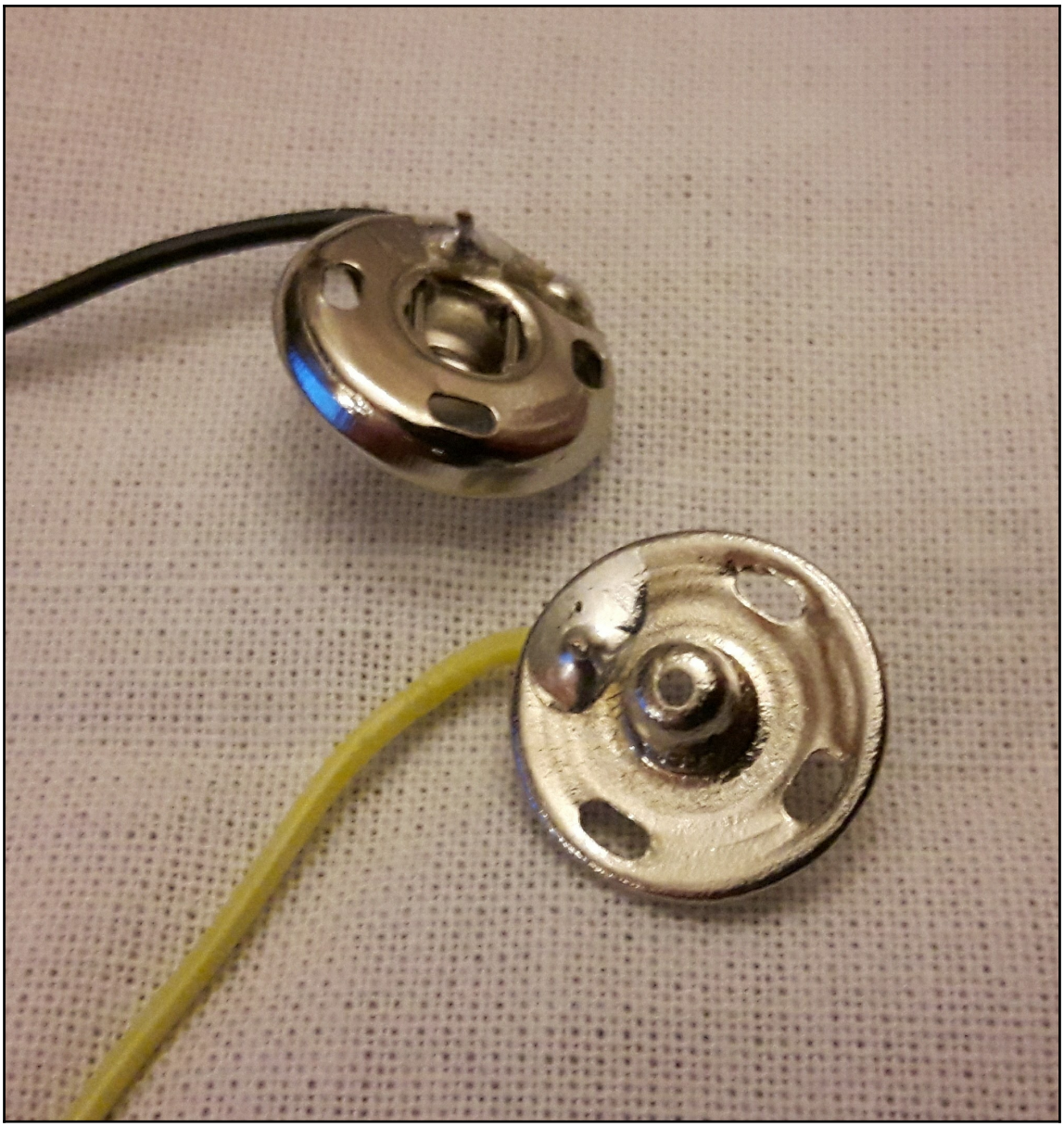
Chapter 3: Sewable LEDs in Clothing



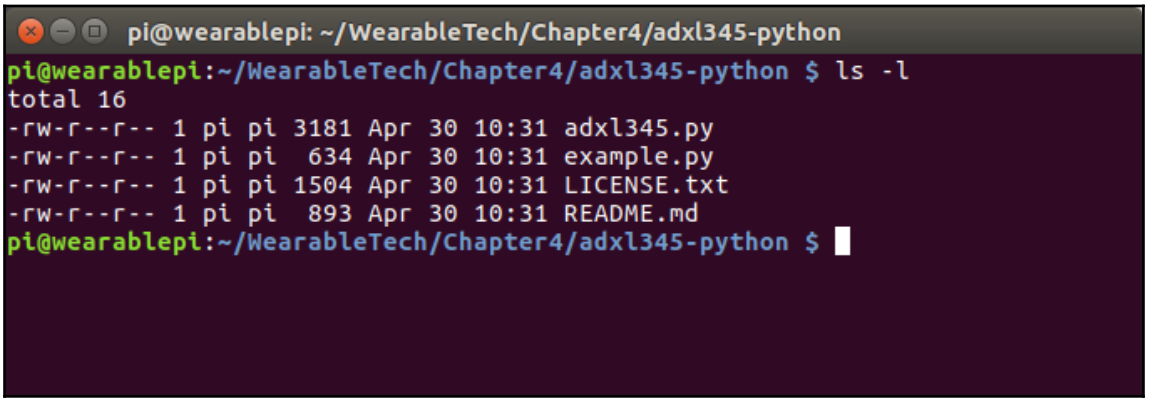


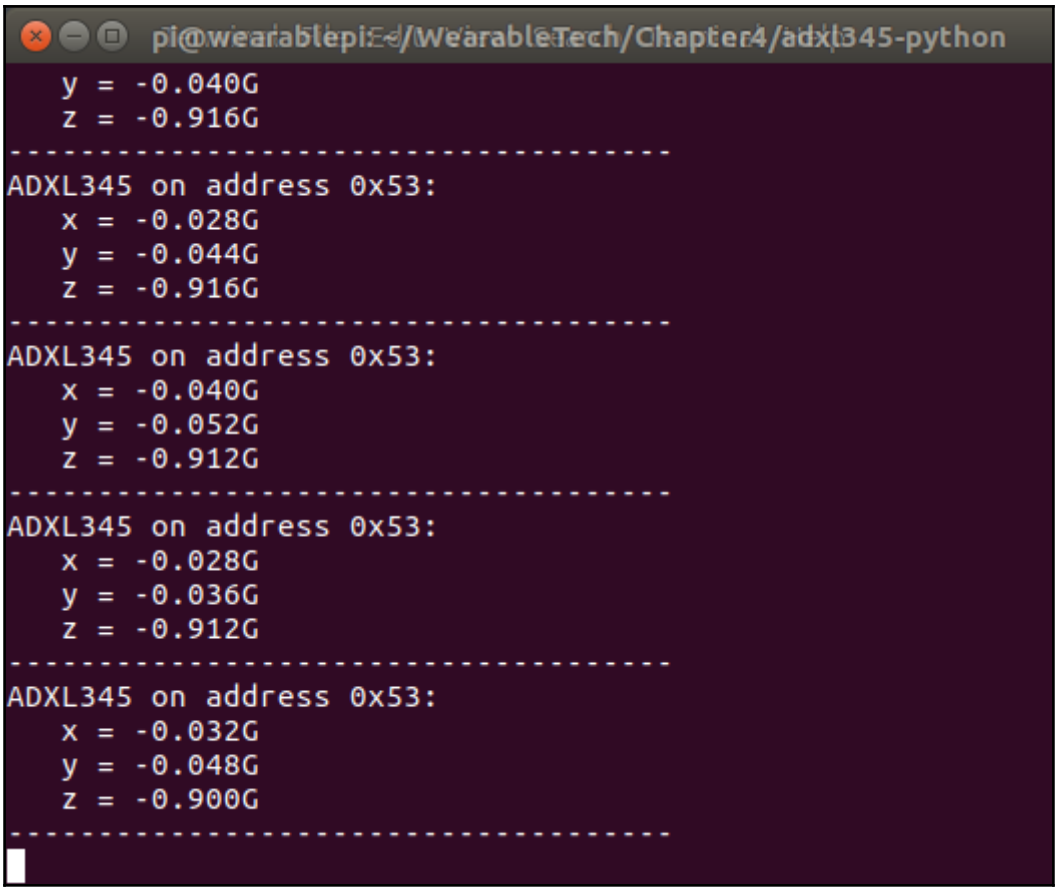


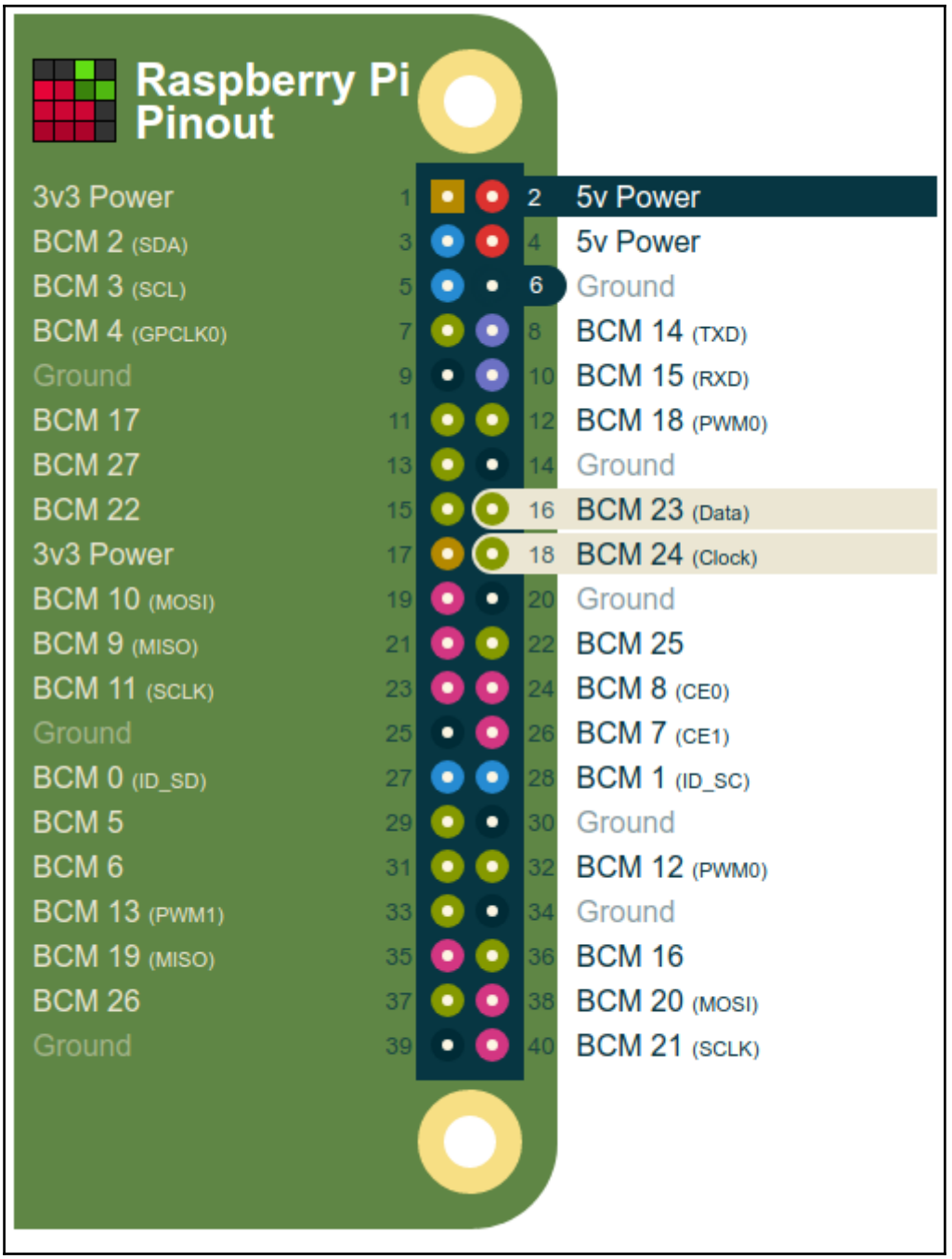


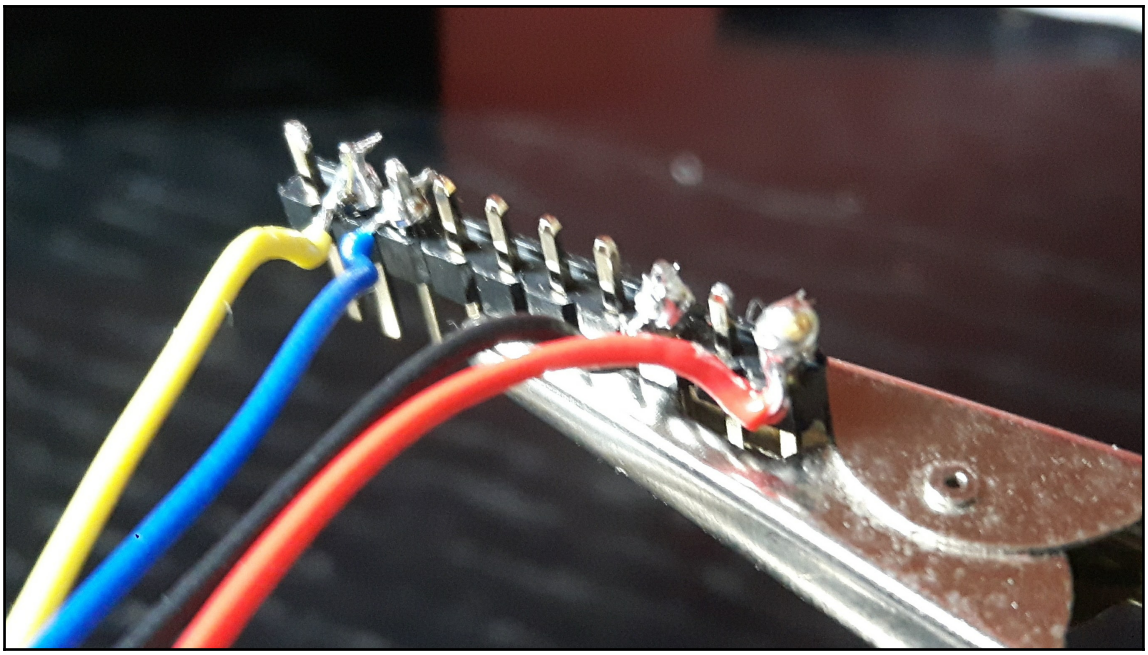


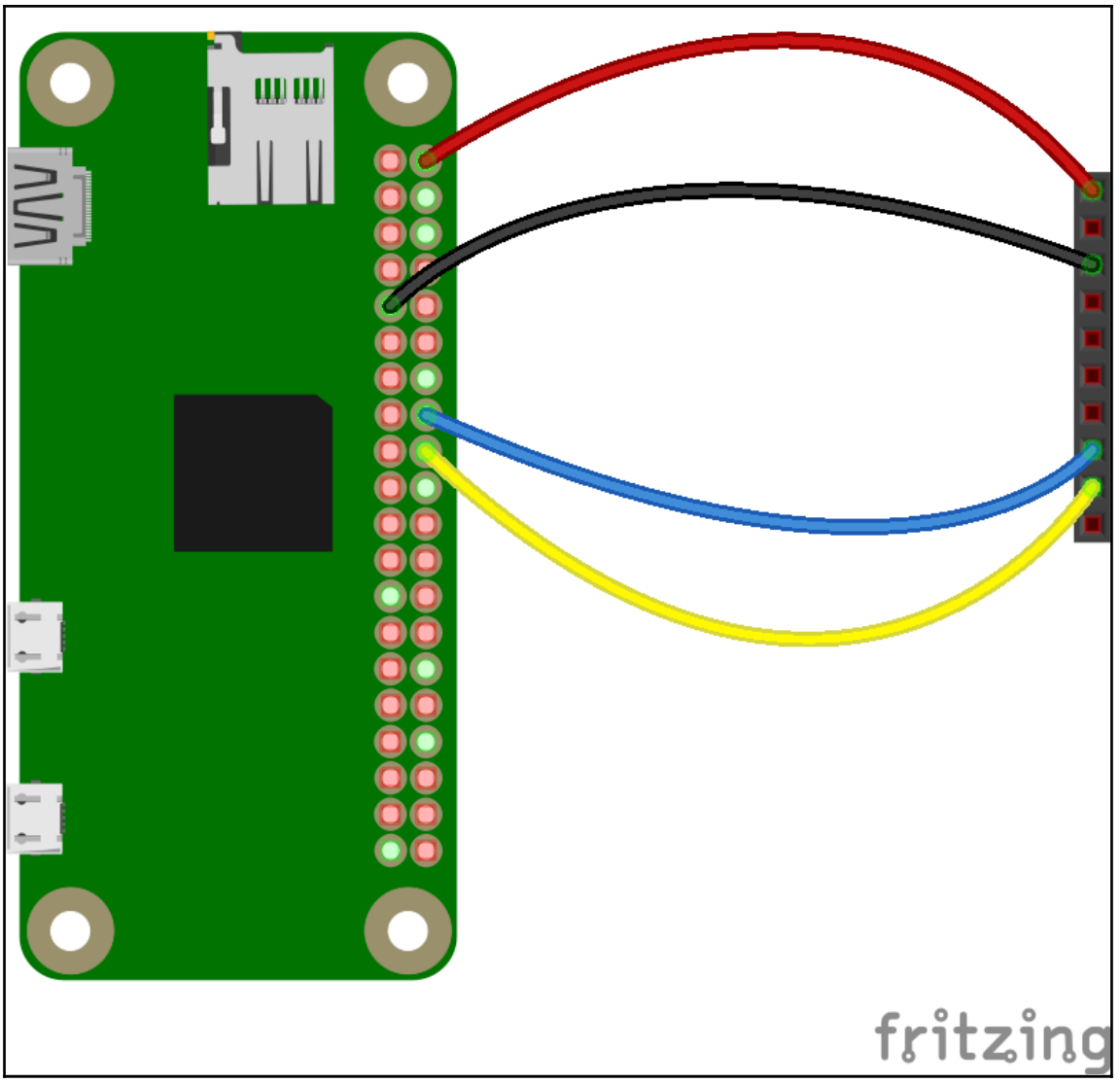
Chapter 4: A Motion-Reactive LED Cap

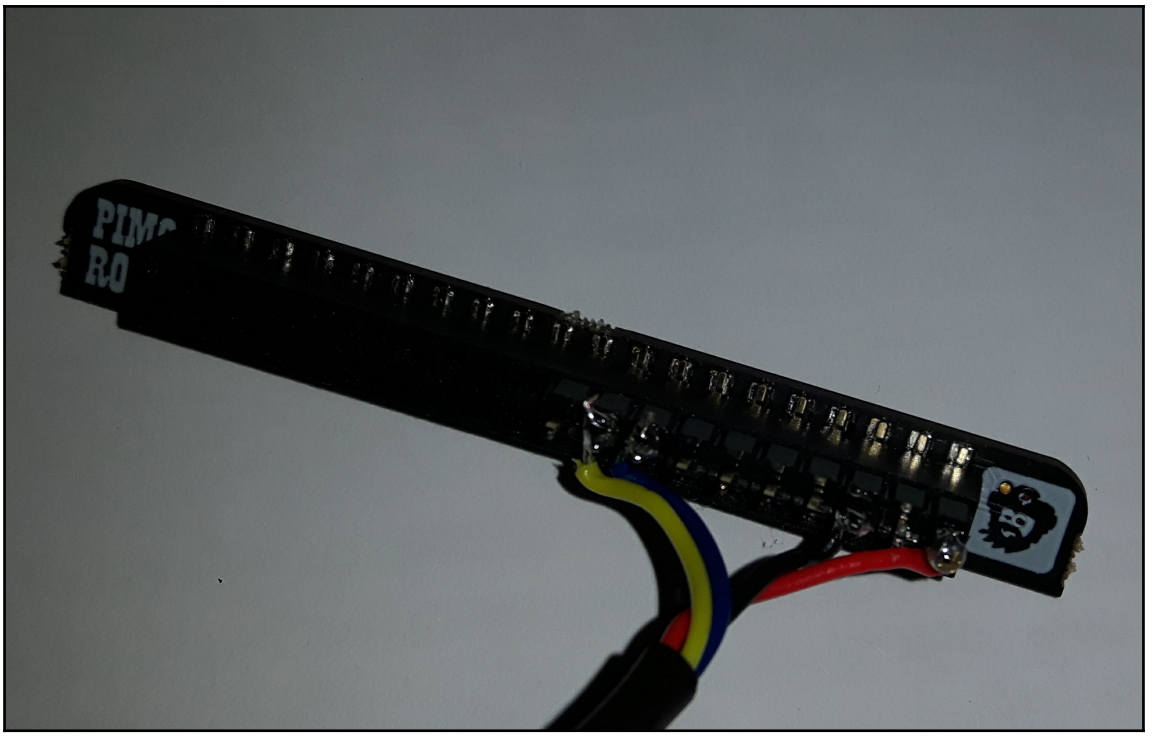


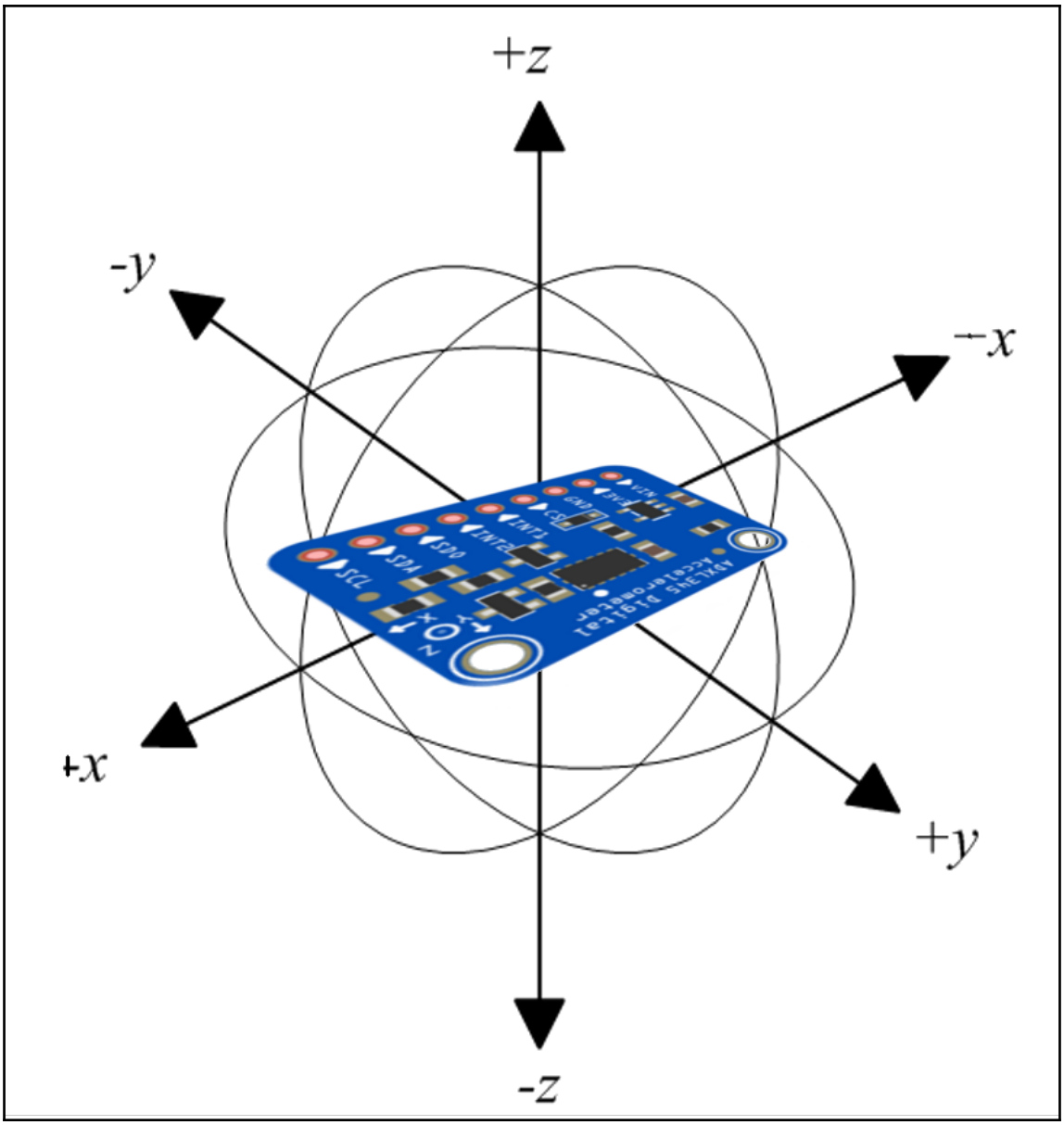

pi@wearablepi: ~/WearableTech/Chapter4/adxl345-python
y = -0.040G
z = -0.916G
ADXL345 on address 0x53:
x = -0.028G
y = -0.044G
z = -0.916G
ADXL345 on address 0x53:
x = -0.040G
y = -0.052G
z = -0.912G
ADXL345 on address 0x53:
x = -0.028G
y = -0.036G
z = -0.912G
ADXL345 on address 0x53:
x = -0.032G
y = -0.048G
z = -0.900G

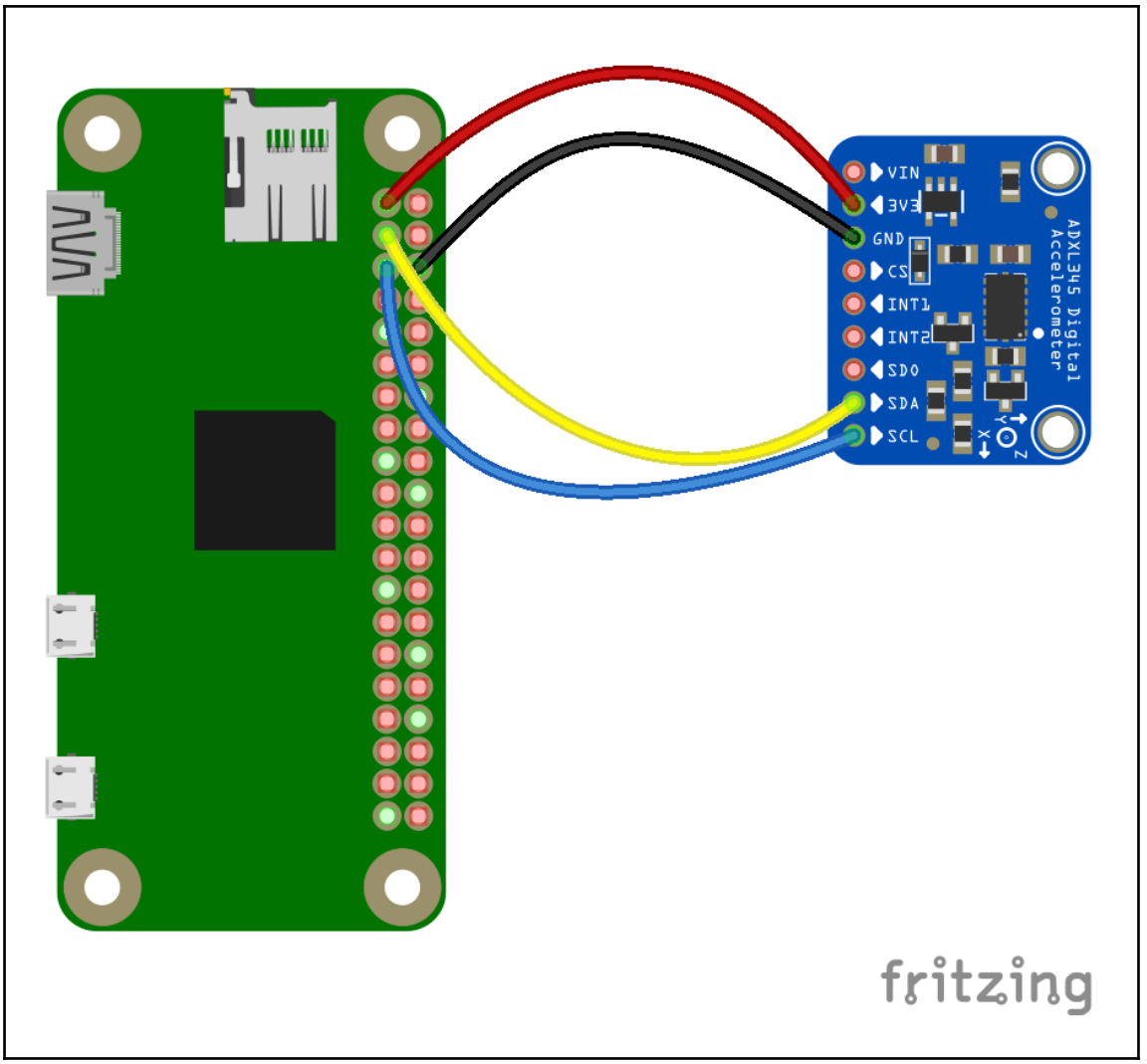

Raspberry Pi
Pinout
3v3 Power 1
2 5v Power
BCM 2 (SDA) 3
4 5v Power
BCM 3 (SCL) 5
6 Ground
BCM 4 (GPCLK0) 7
8 BCM 14 (TXD)
Ground 9
10 BCM 15 (RXD)
BCM 17 11
12 BCM 18 (PWM0)
BCM 27 13
14 Ground
BCM 22 15
16 BCM 23 (Data)
3v3 Power 17
18 BCM 24 (Clock)
BCM 10 (MOSI) 19
20 Ground
BCM 9 (MISO) 21
22 BCM 25
BCM 11 (SCLK) 23
24 BCM 8 (CE0)
Ground 25
26 BCM 7 (CE1)
BCM 0 (ID_SD) 27
28 BCM 1 (ID_SC)
BCM 5 29
30 Ground
BCM 6 31
32 BCM 12 (PWM0)
BCM 13 (PWM1) 33
34 Ground
BCM 19 (MISO) 35
36 BCM 16
BCM 26 37
38 BCM 20 (MOSI)
Ground 39
40 BCM 21 (SCLK)

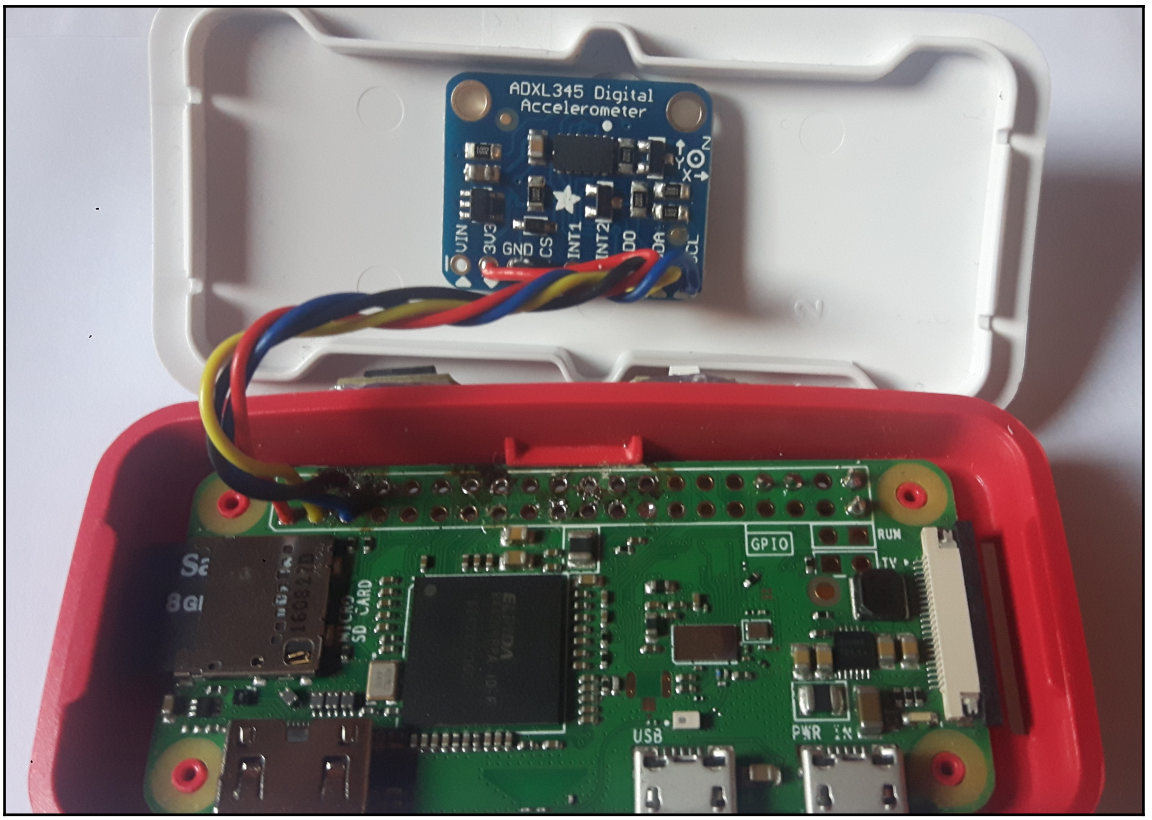



fritzing



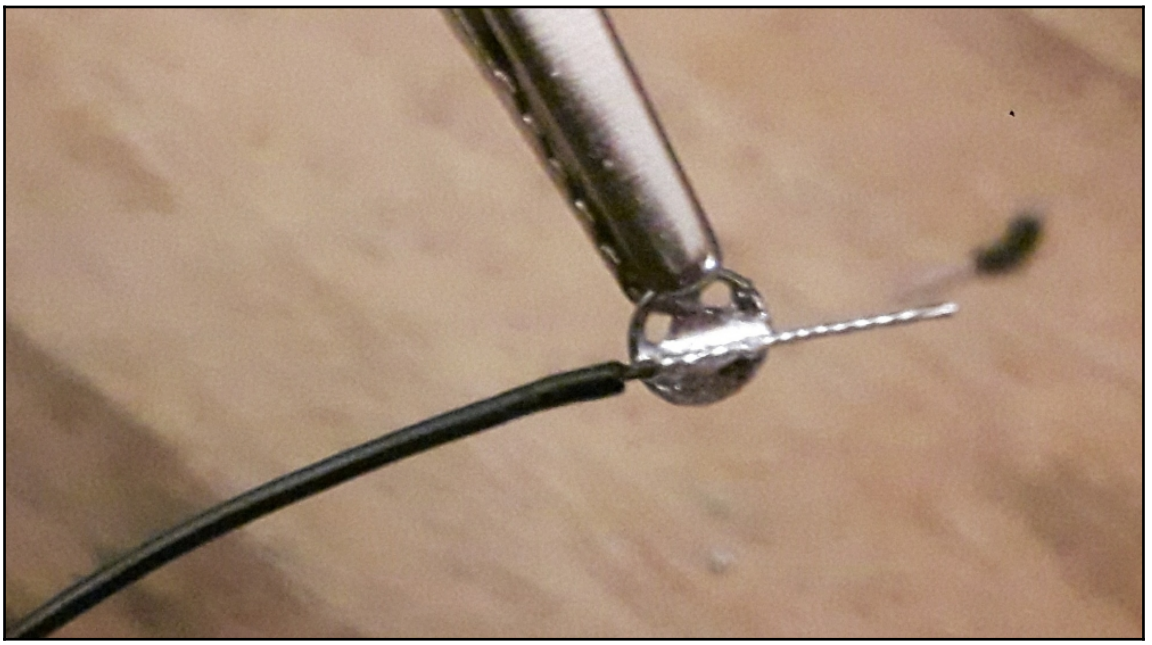

+z
-y
-x
+x
+y
-z

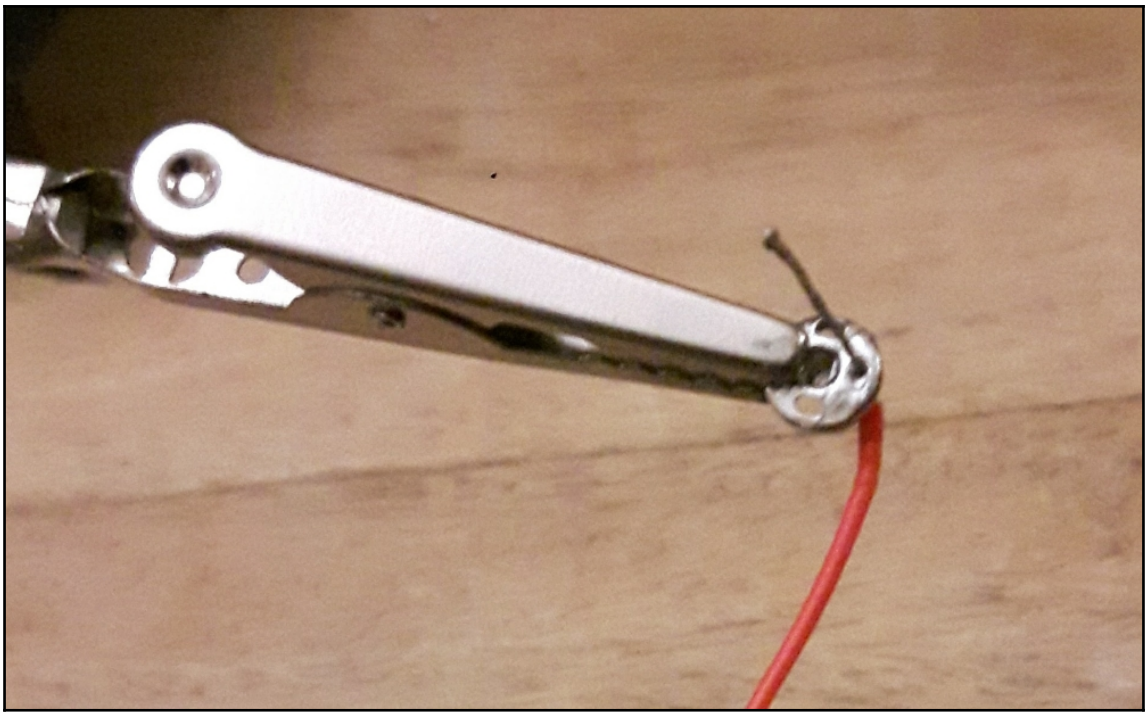

VIN
3V3
GND
CS
INT1
INT2
SDO
SDA
SCL
ADXL345 Digital
Accelerometer
fritzing

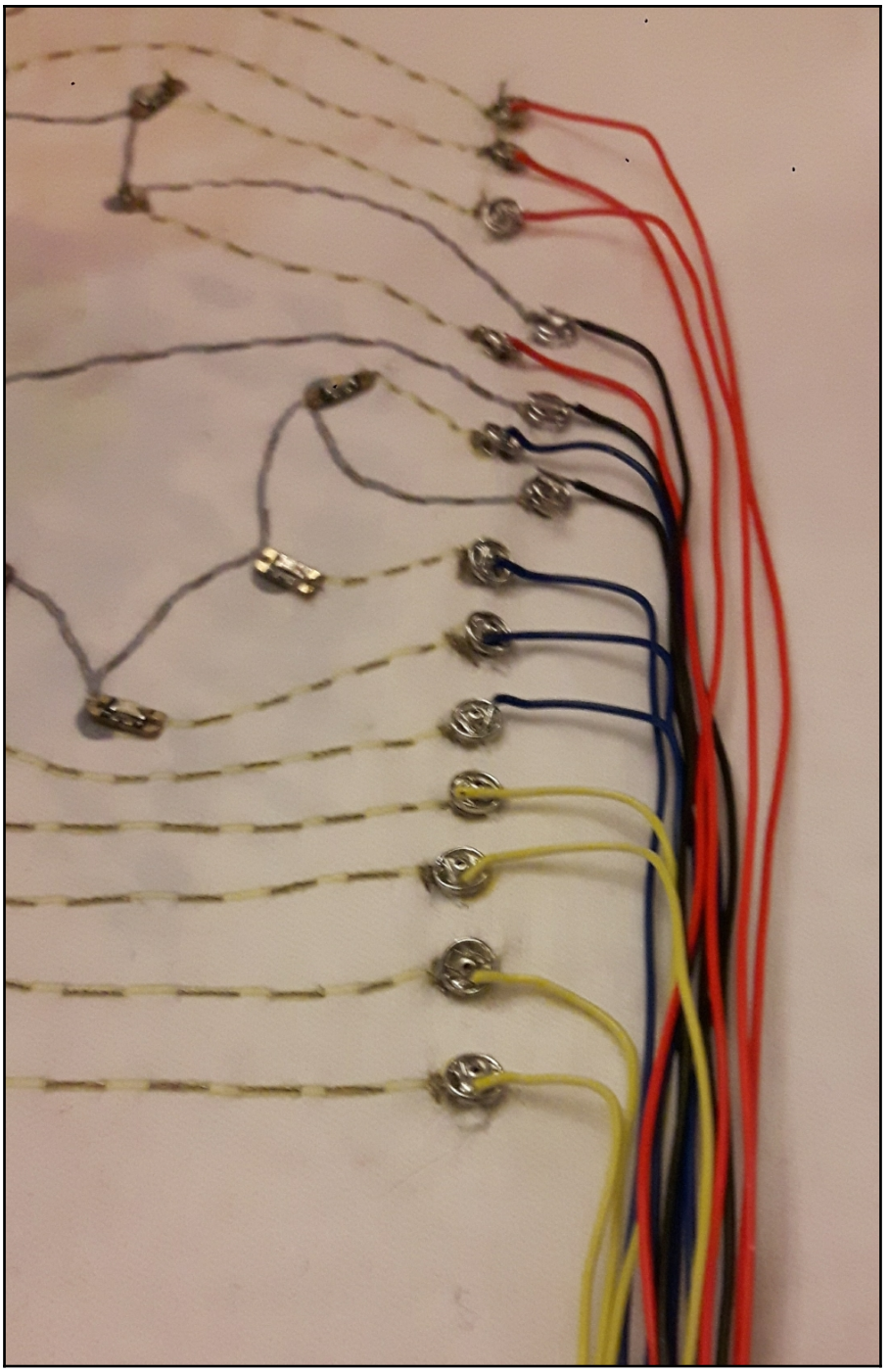


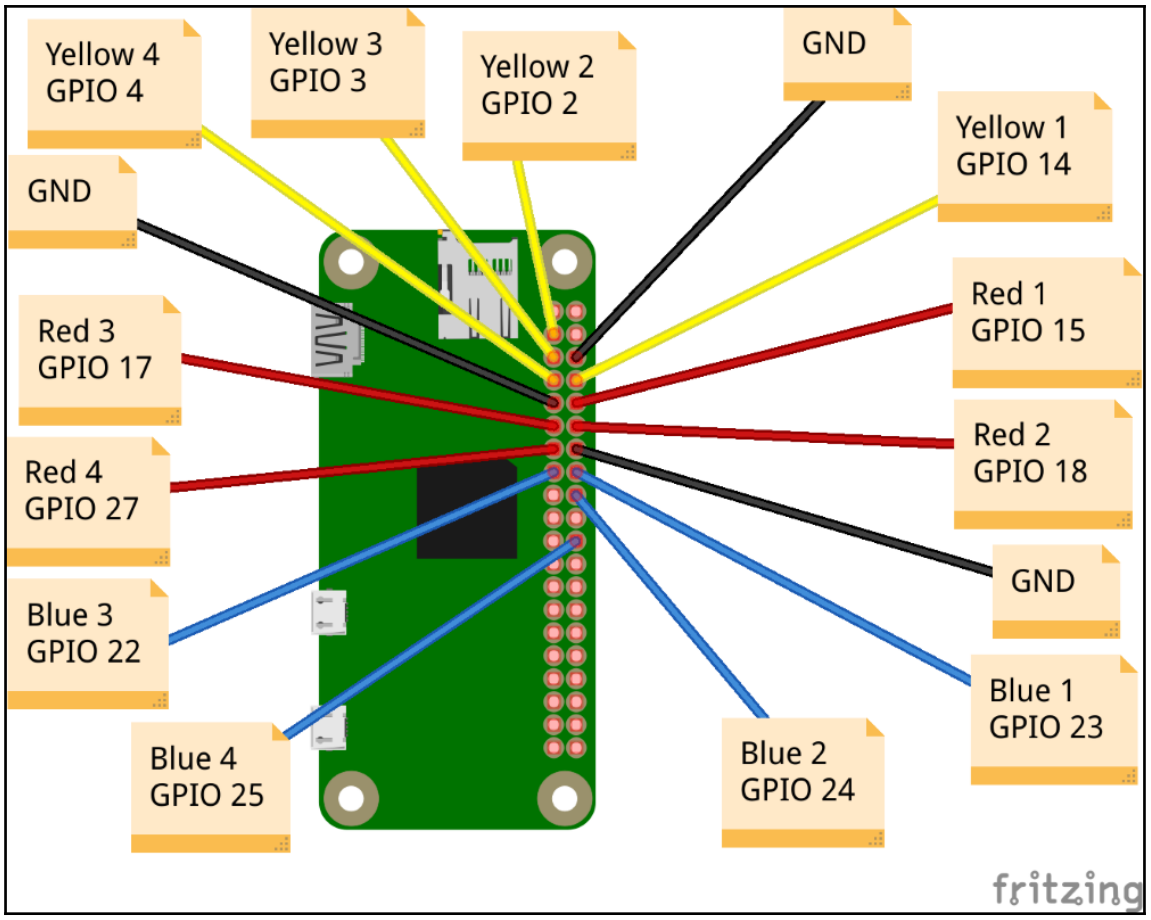

```
Terminal File Edit View Search Terminal Help
pi@wearablepi:~/WearableTech/Chapter4 $ sudo i2cdetect -y 1
     0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00:          -- -- -- -- -- -- -- -- -- -- -- -- --
10: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
20: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
30: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
40: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
50: -- -- -- 53 -- -- -- -- -- -- -- -- -- -- -- --
60: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
70: -- -- -- -- -- -- -- --
pi@wearablepi:~/WearableTech/Chapter4 $
```

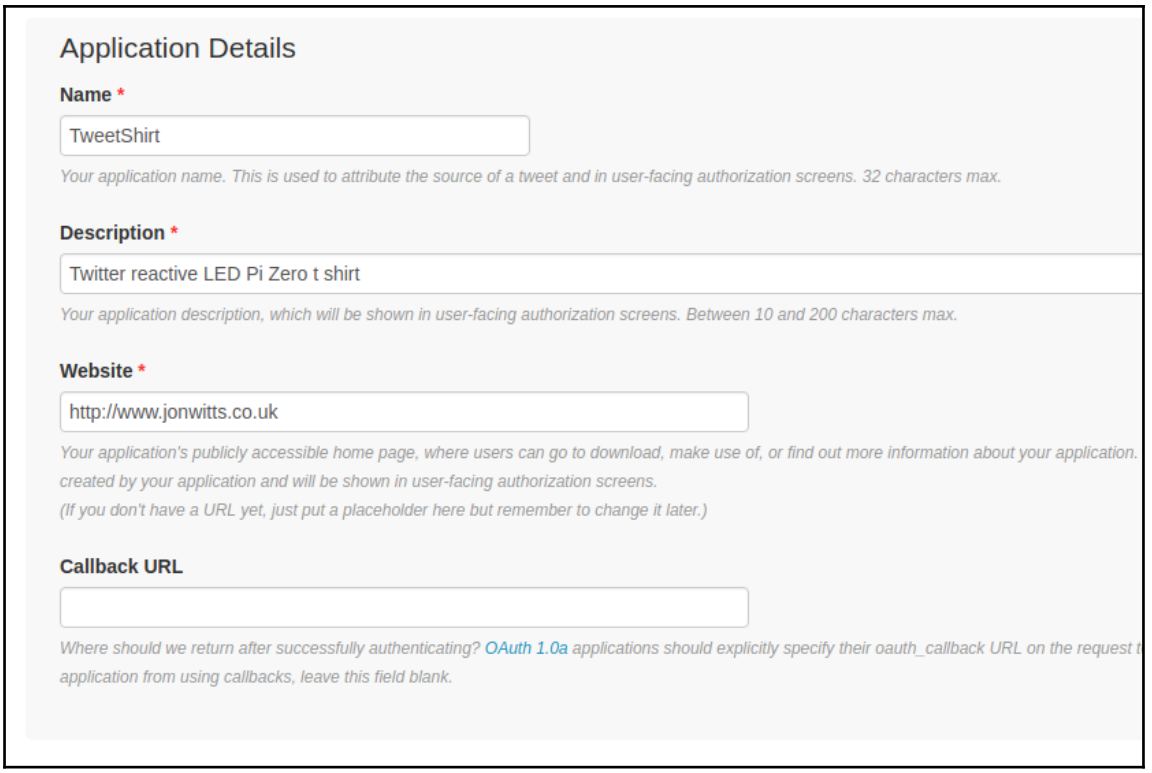
Chapter 5: A Tweet-Activated LED T-Shirt

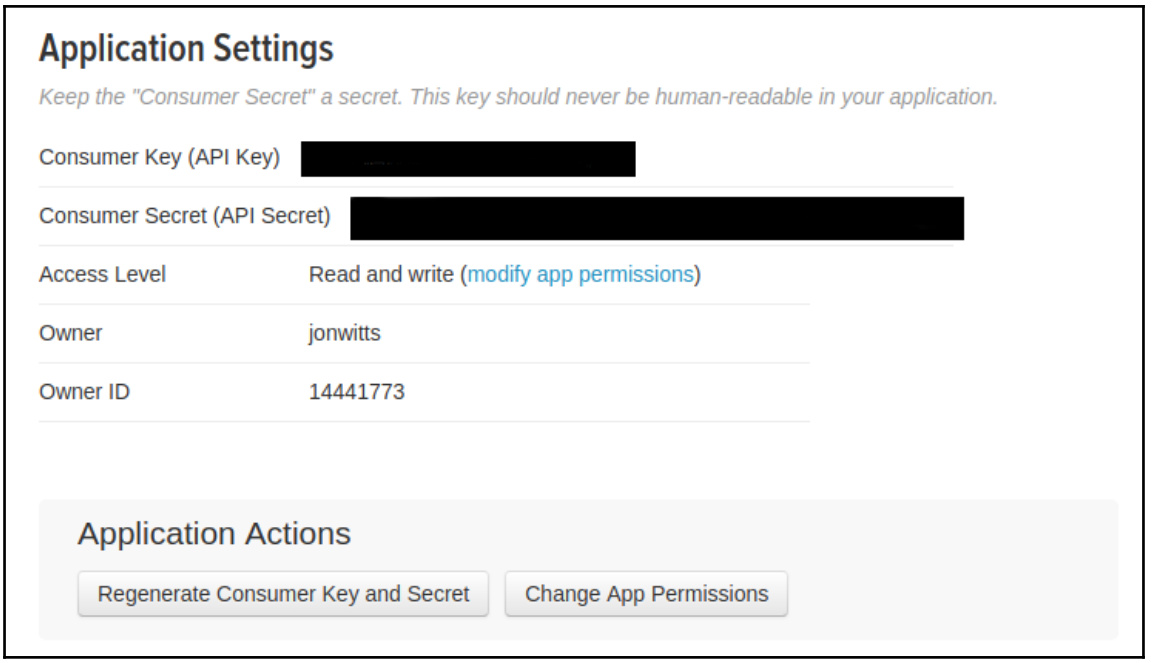


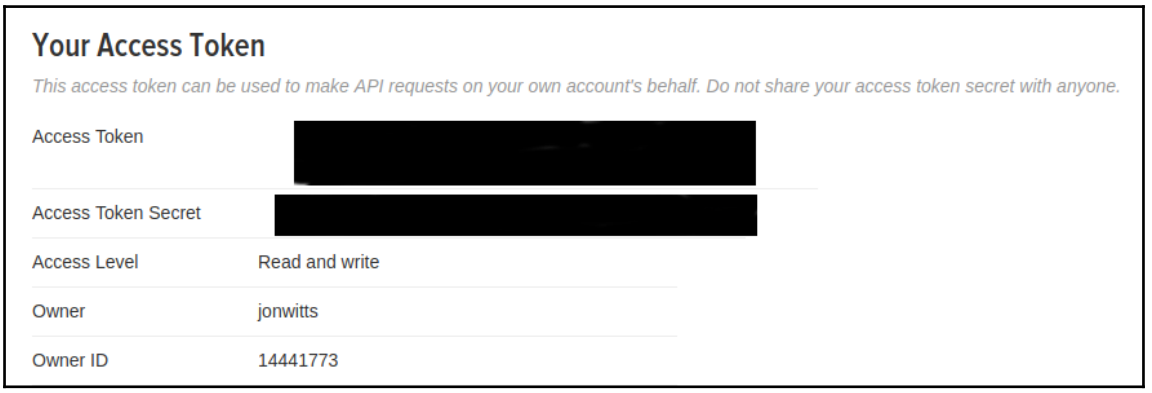




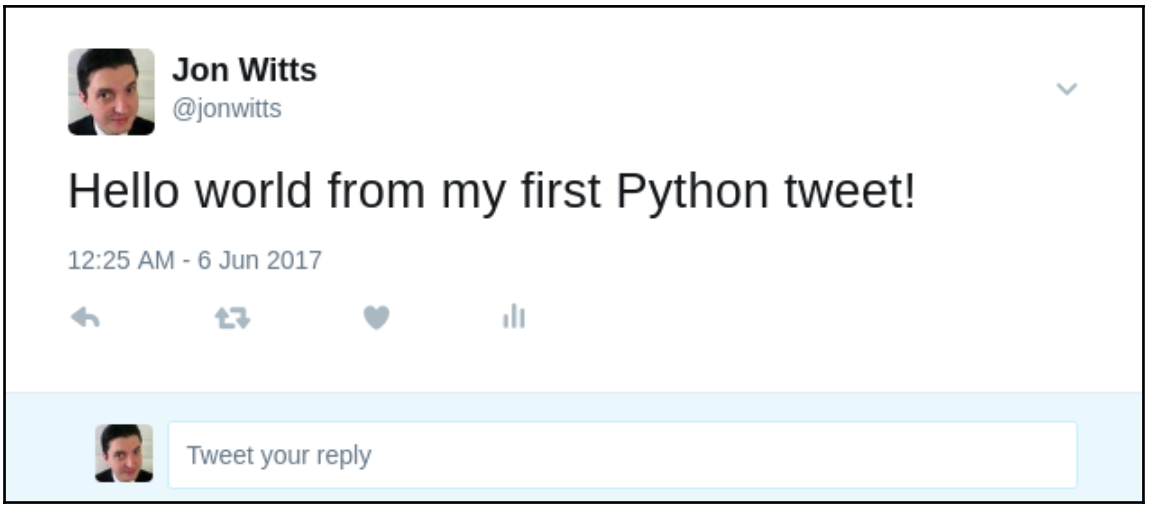

Yellow 4
GPIO 4
Yellow 3
GPIO 3
Yellow 2
GPIO 2
GND
Yellow 1
GPIO 14
GND
Red 3
GPIO 17
Red 1
GPIO 15
Red 4
GPIO 27
Red 2
GPIO 18
GND
Blue 3
GPIO 22
Blue 1
GPIO 23
Blue 4
GPIO 25
Blue 2
GPIO 24
fritzing

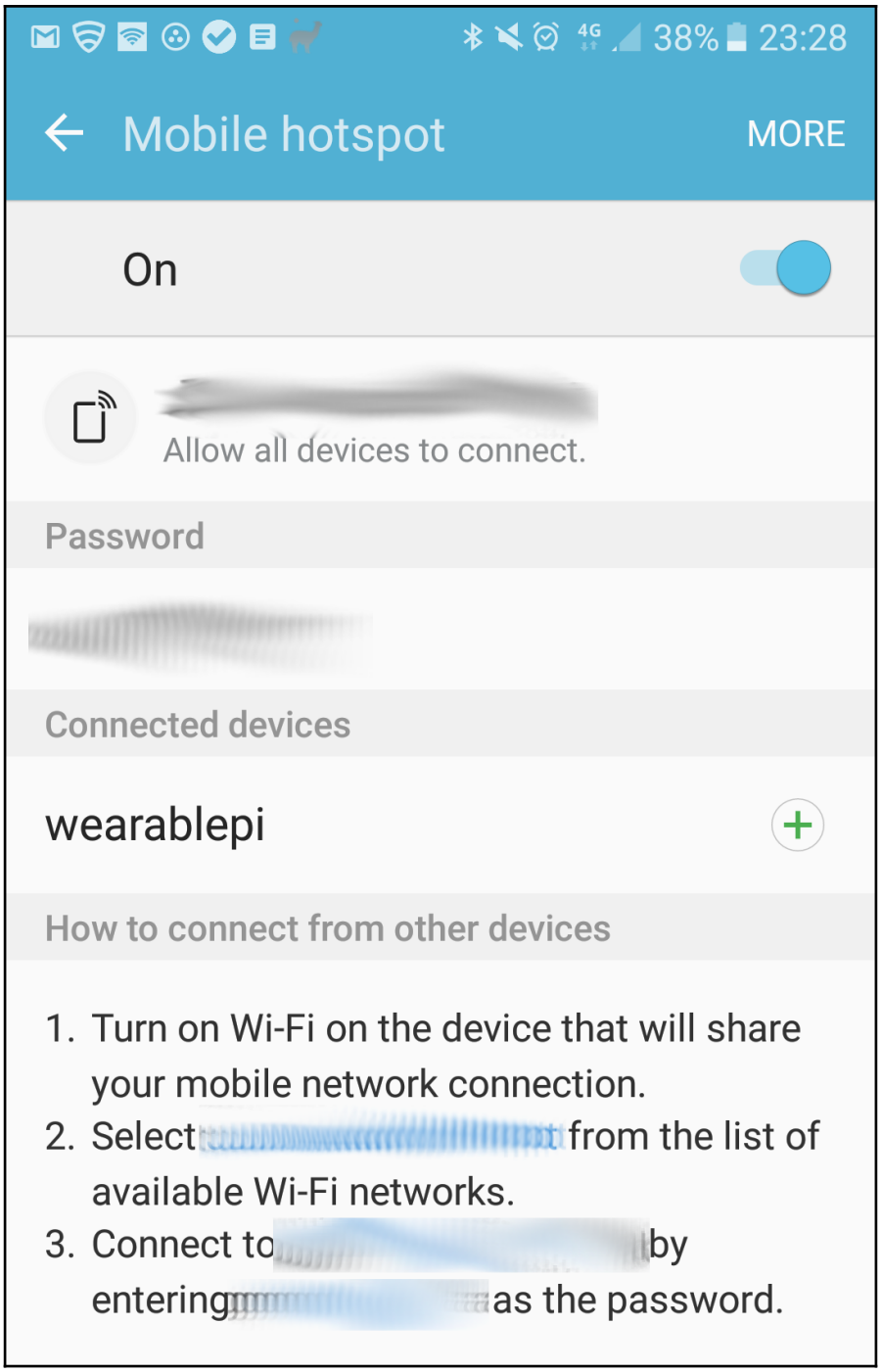

Application Details
Name *
TweetShirt
Your application name. This is used to attribute the source of a tweet and in user-facing authorization screens. 32 characters max.
Description *
Twitter reactive LED Pi Zero t shirt
Your application description, which will be shown in user-facing authorization screens. Between 10 and 200 characters max.
Website *
http://www.jonwitts.co.uk
Your application's publicly accessible home page, where users can go to download, make use of, or find out more information about your application.
created by your application and will be shown in user-facing authorization screens.
(If you don't have a URL yet, just put a placeholder here but remember to change it later.)
Callback URL
Where should we return after successfully authenticating? OAuth 1.0a applications should explicitly specify their oauth_callback URL on the request t
application from using callbacks, leave this field blank.





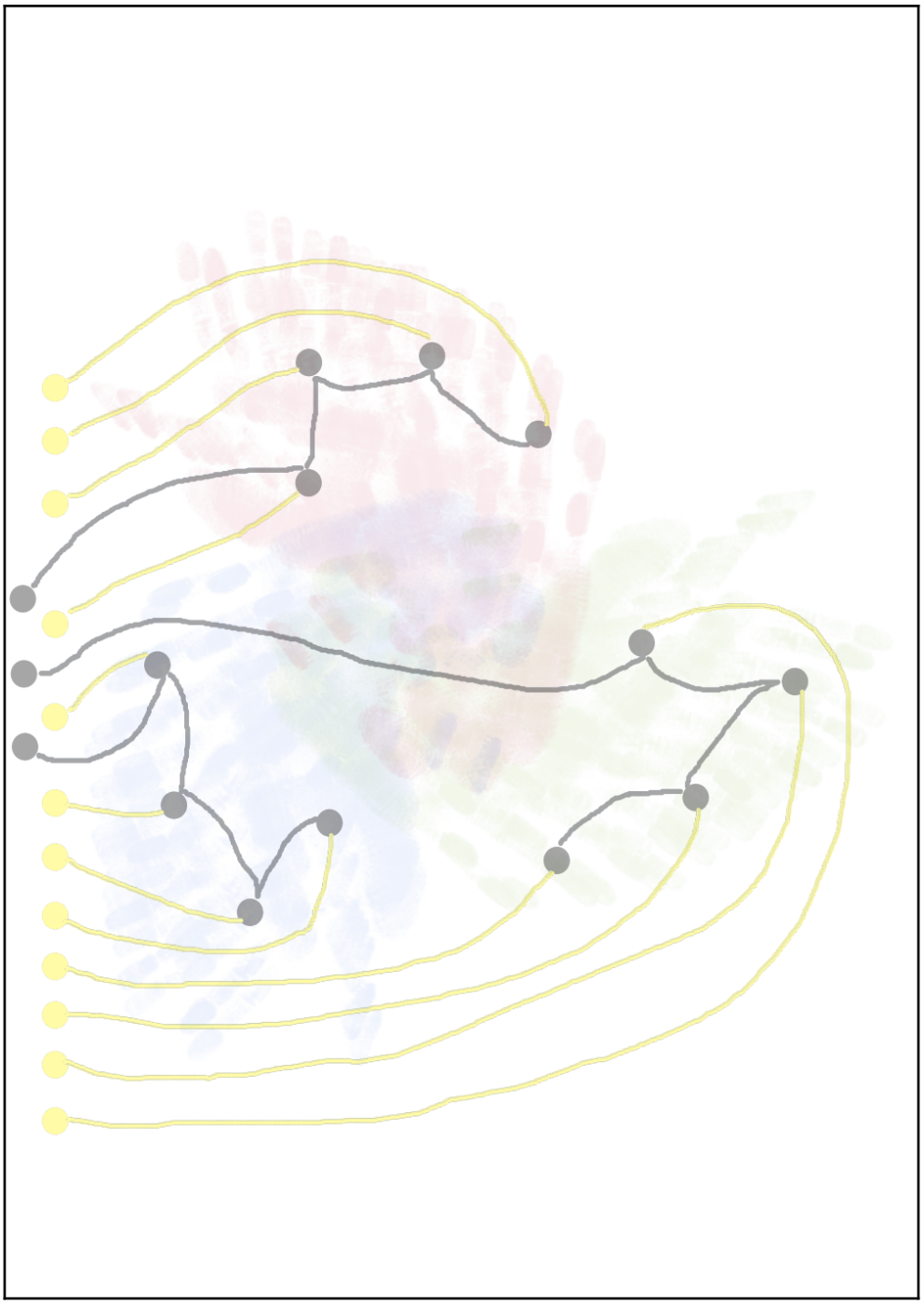

```
pi@wearablepi:~/WearableTech/Chapter5 $ ./helloTweet.py
Tweeted: Hello world from my first Python tweet!
pi@wearablepi:~/WearableTech/Chapter5 $
```

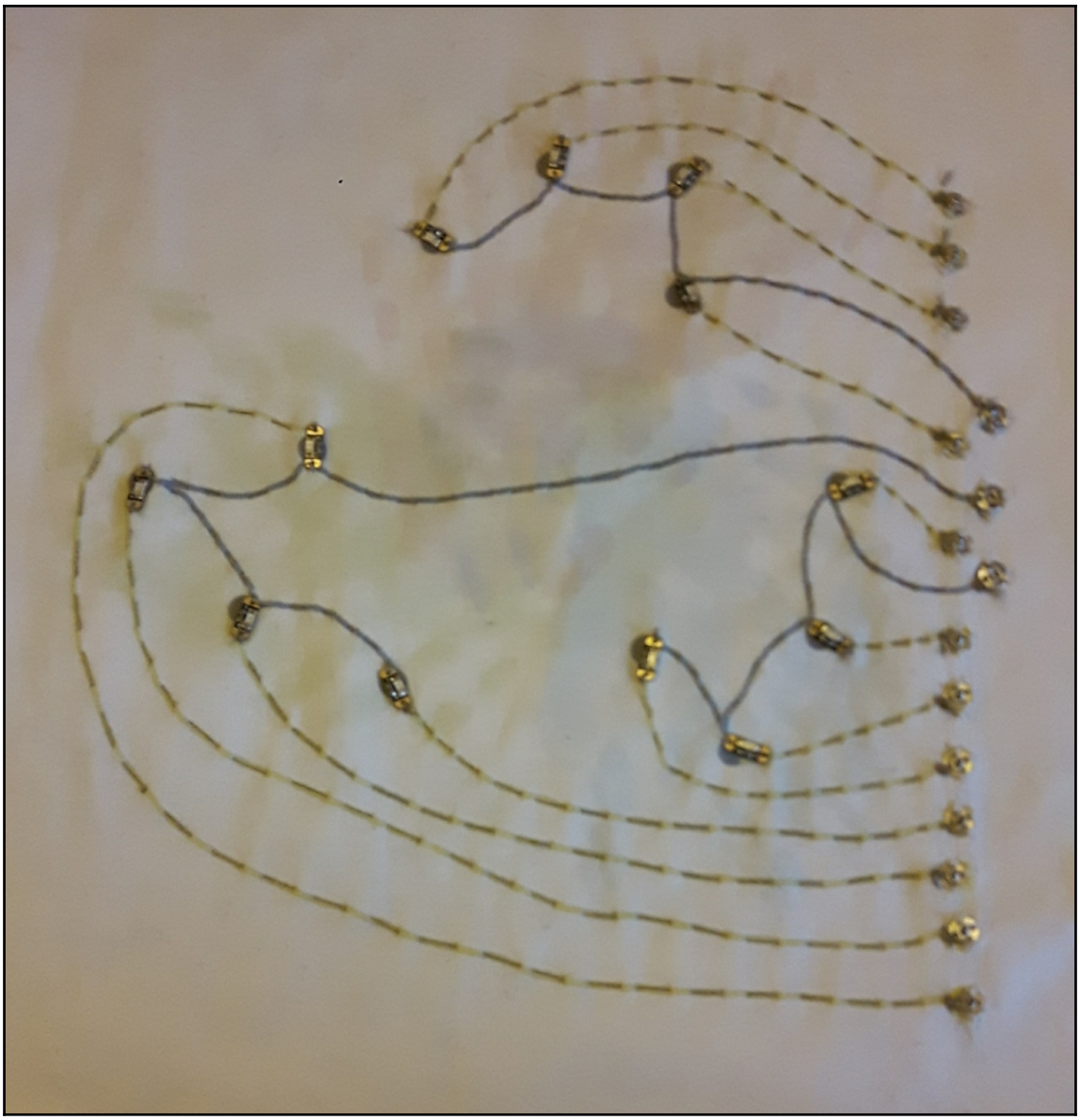

Jon Witts
@jonwitts
Hello world from my first Python tweet!
12:25 AM - 6 Jun 2017
Tweet your reply


38% 23:28
Mobile hotspot
MORE
On
Allow all devices to connect.
Password
Connected devices
wearablepi
How to connect from other devices
1. Turn on Wi-Fi on the device that will share your mobile network connection.
2. Select from the list of available Wi-Fi networks.
3. Connect to by entering as the password.

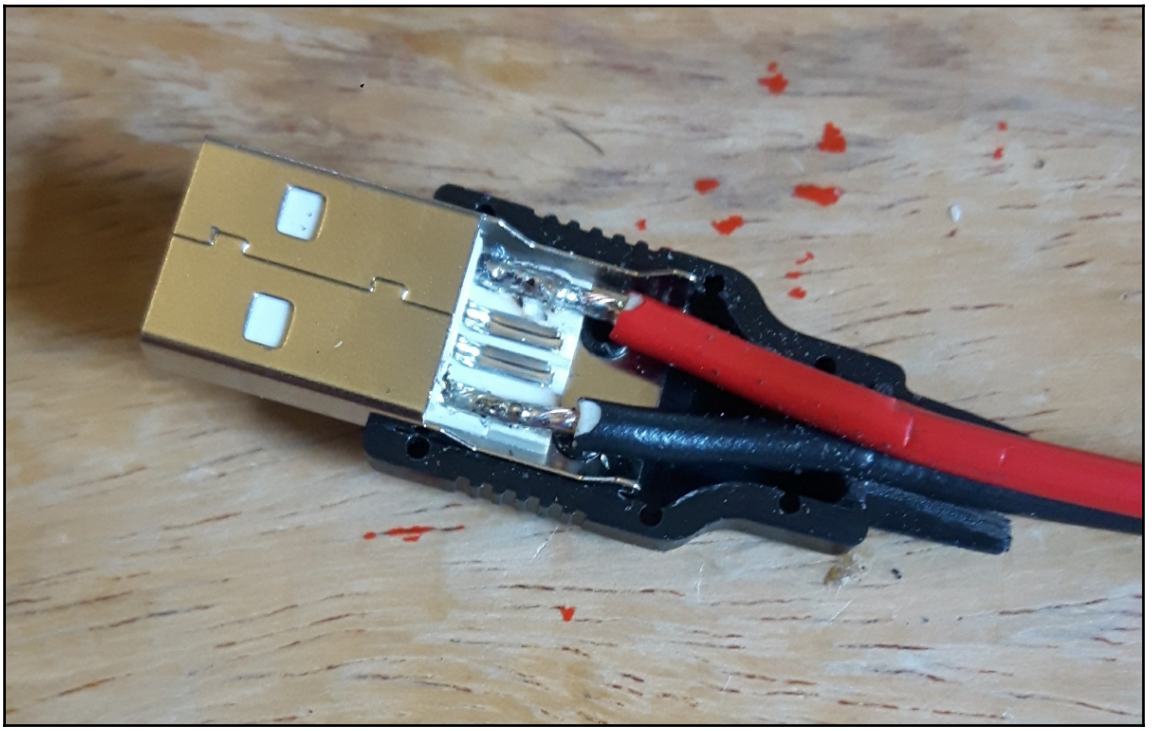

#SparkleRed
#SparkleGreen
#SparkleBlue
#MultiSparkle

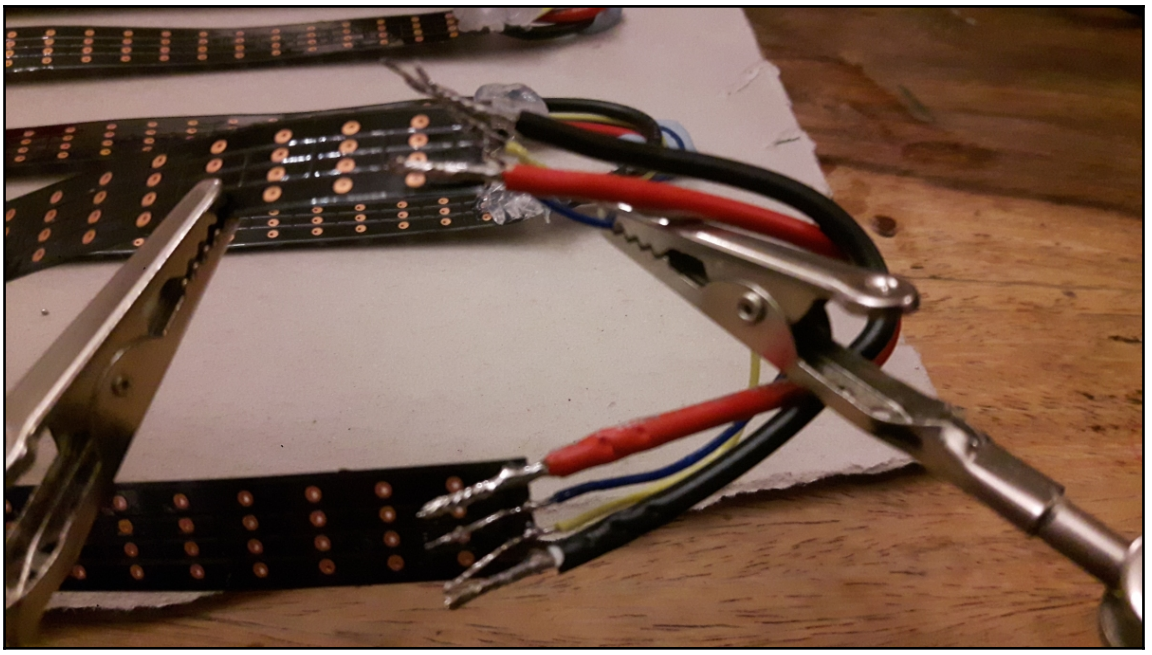
#SparkleRed
#SparkleGreen
#SparkleBlue
#MultiSparkle

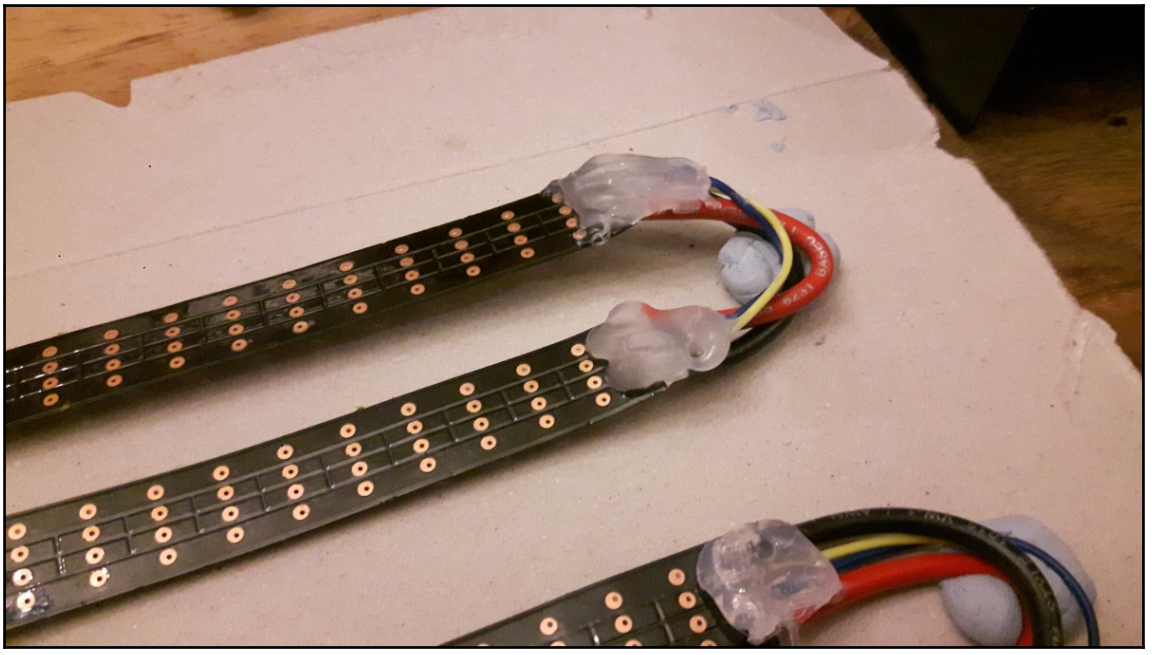


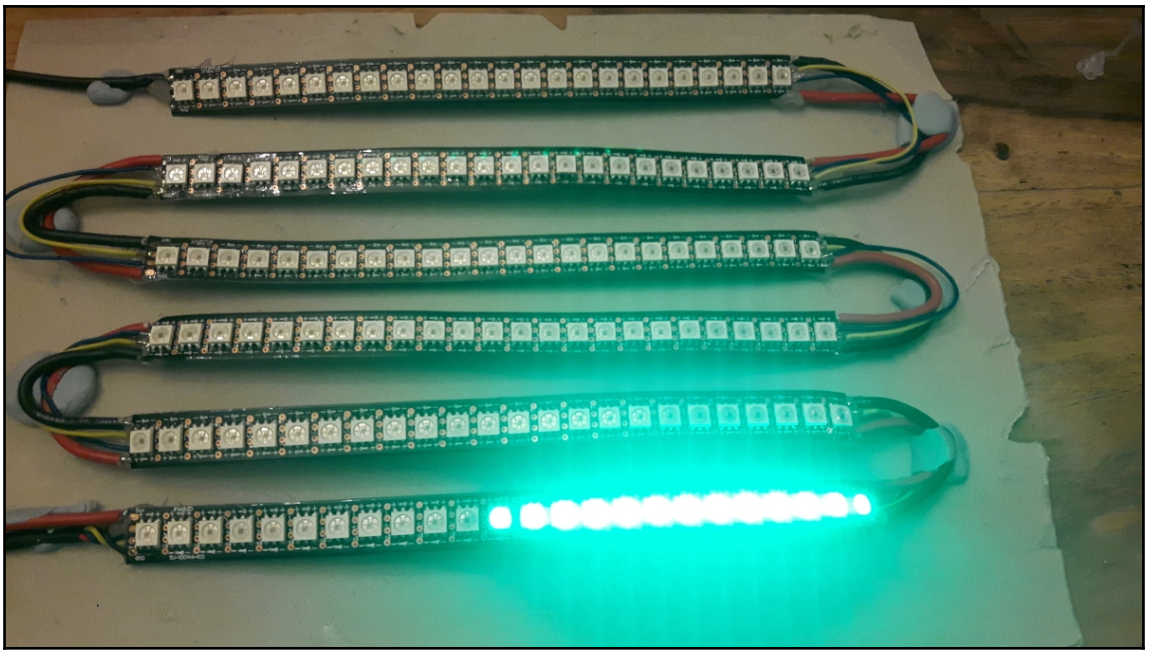


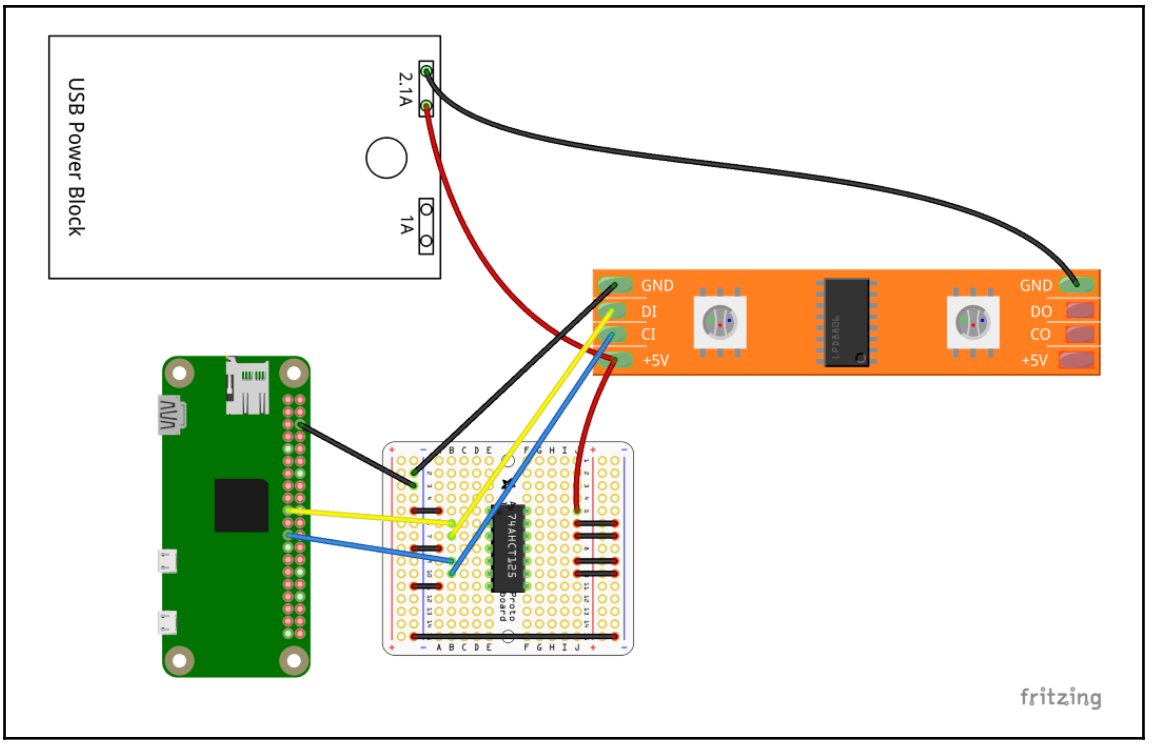
Chapter 6: An LED Laptop Bag

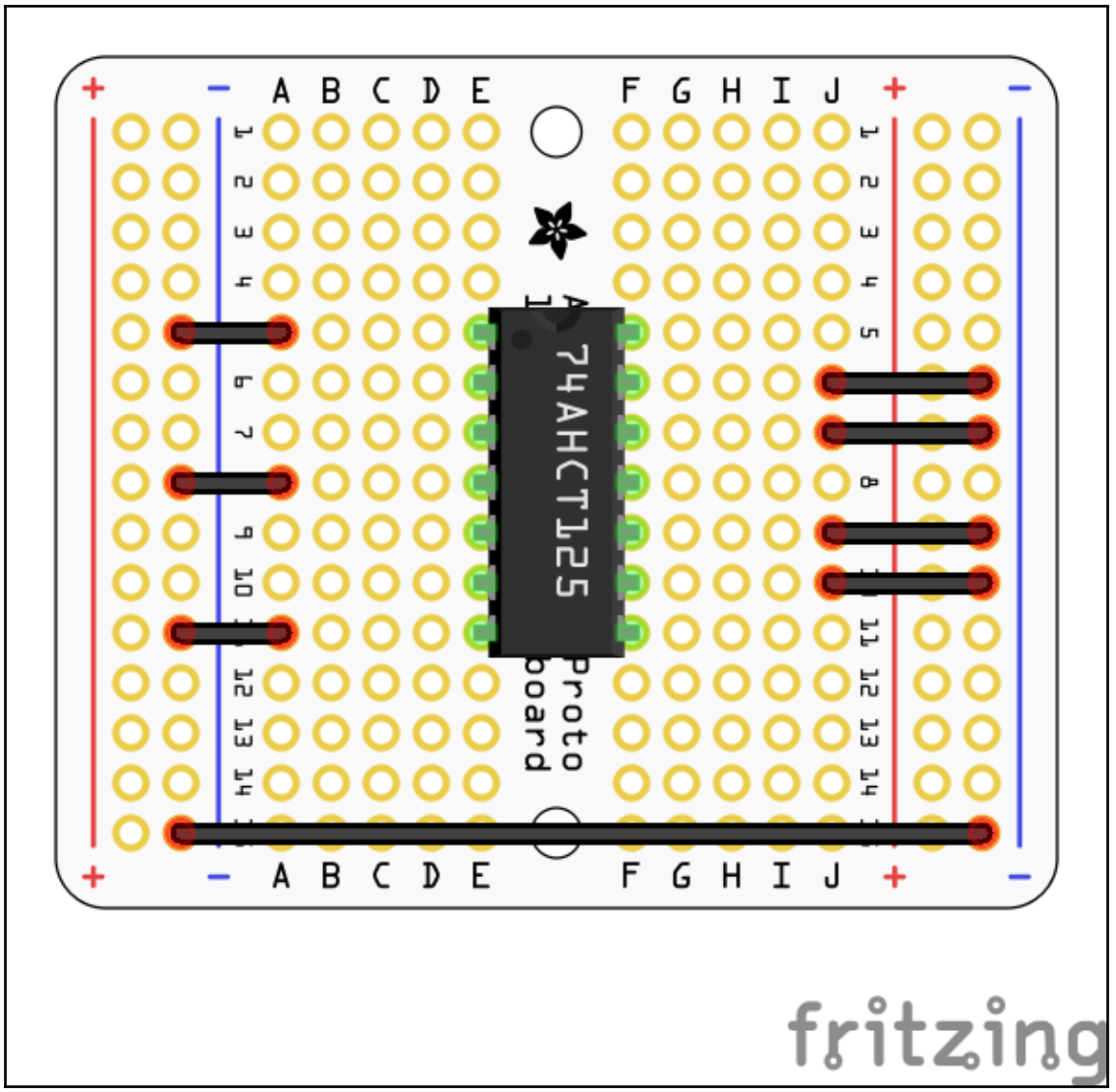


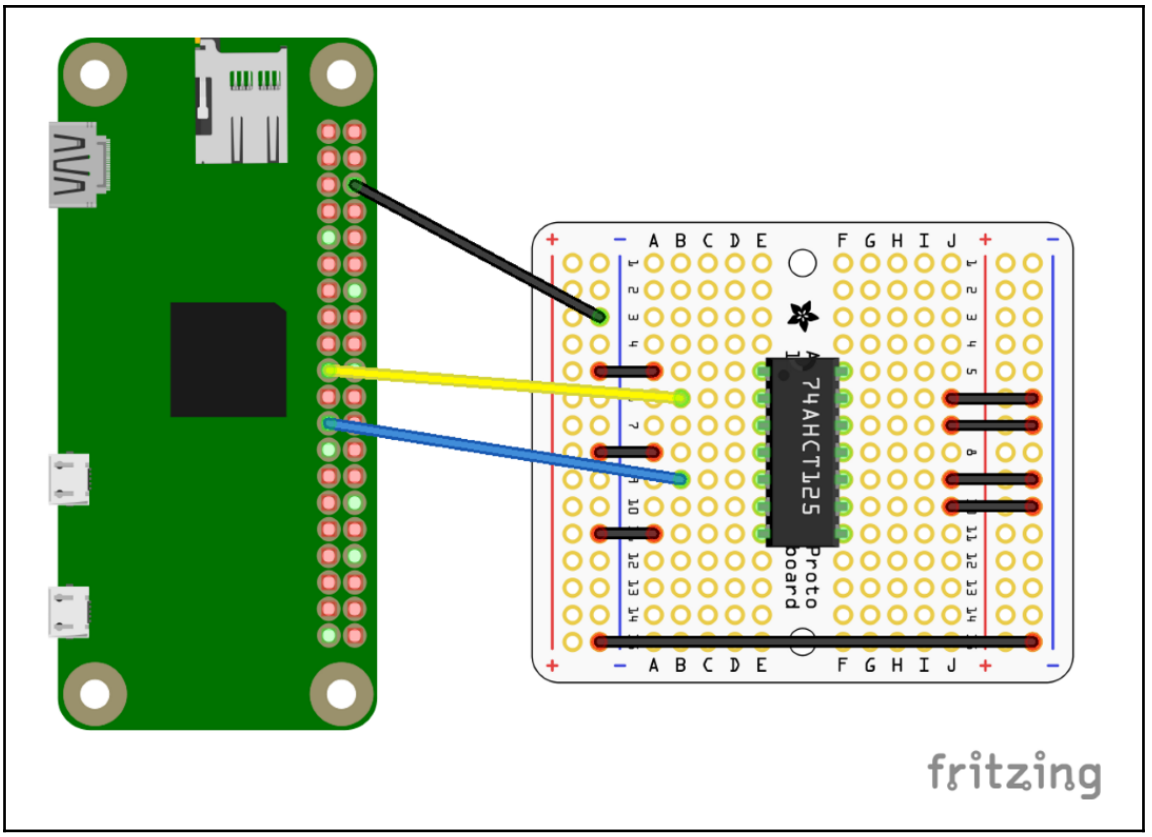


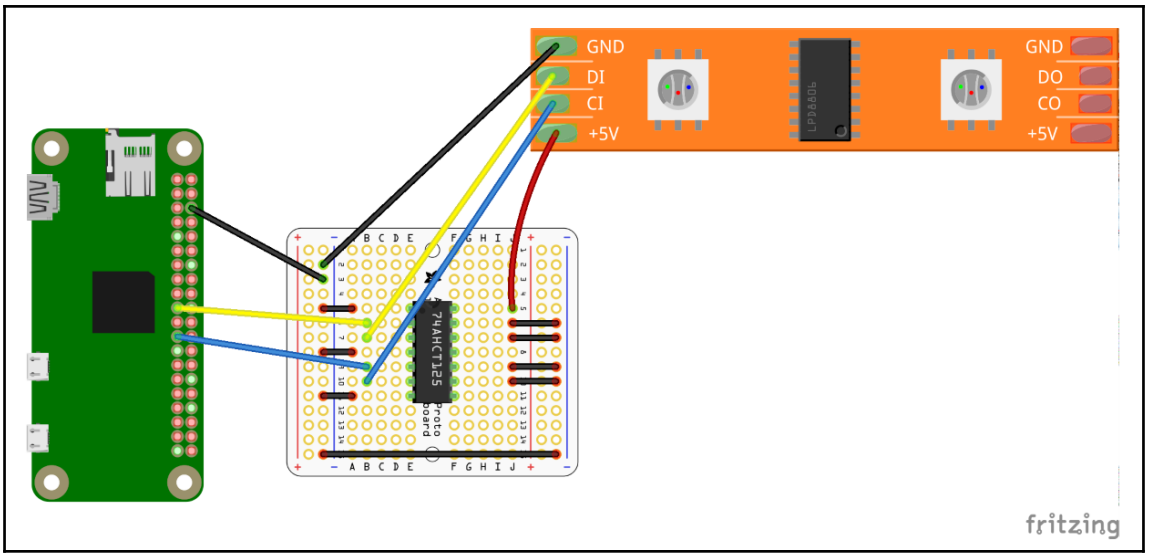




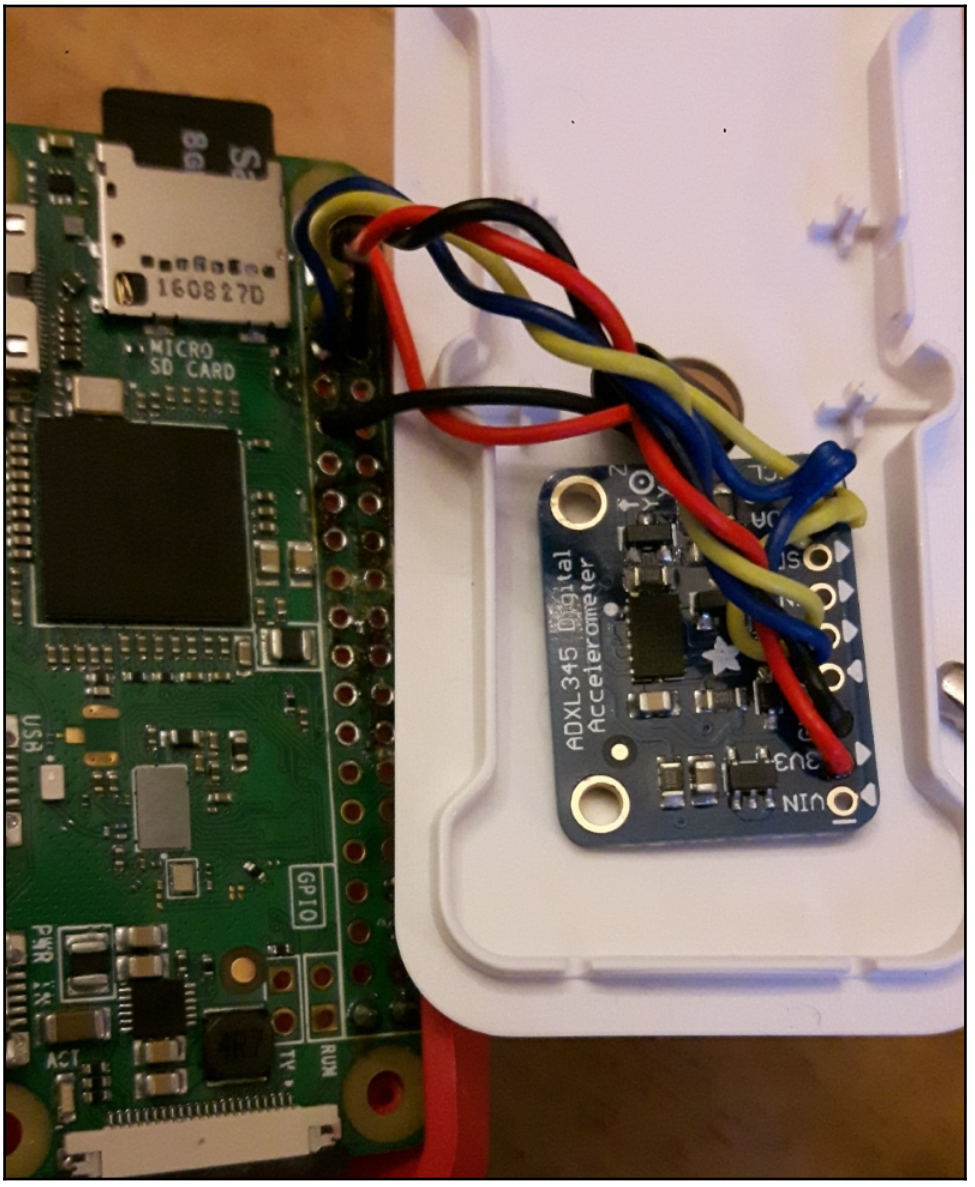

USB Power Block
2.1A
1A
GND
DI
CI
+5V
GND
DO
CO
+5V
74AHCT125
fritzing


A B C D E
F G H I J
74AHCT125
Proto
board
fritzing

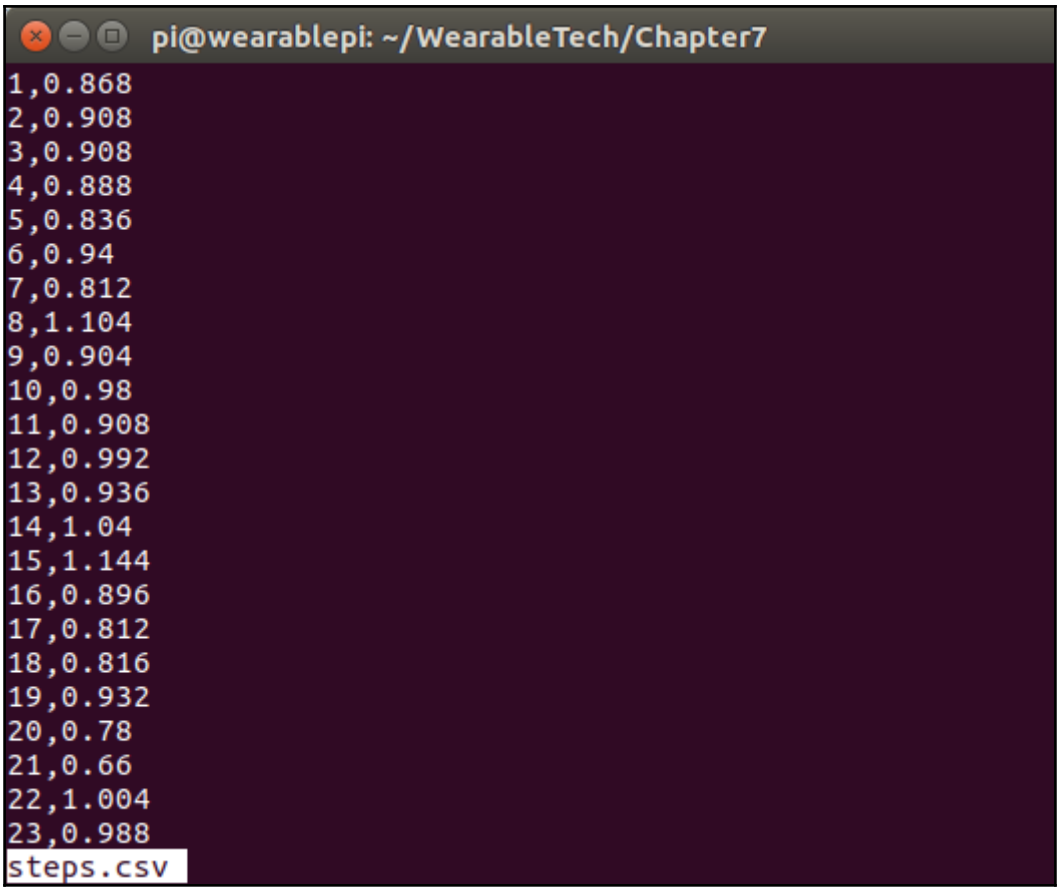

74AHCT125
fritzing

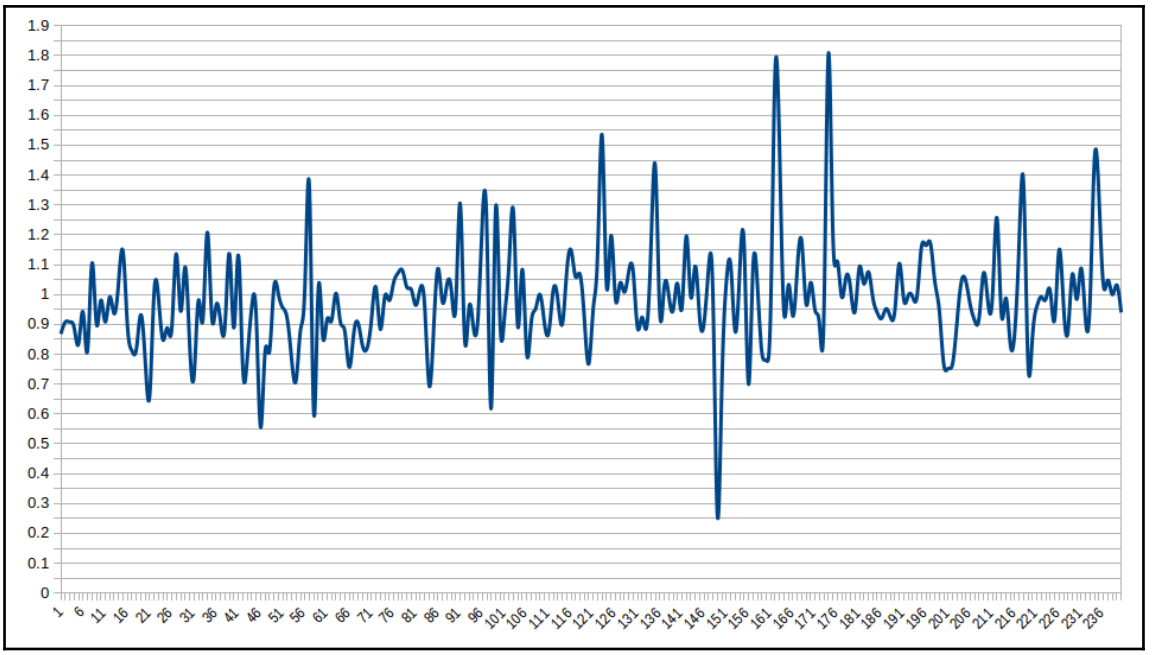

GND
DI
CI
+5V
GND
DO
CO
+5V
74AHCT125
fritzing

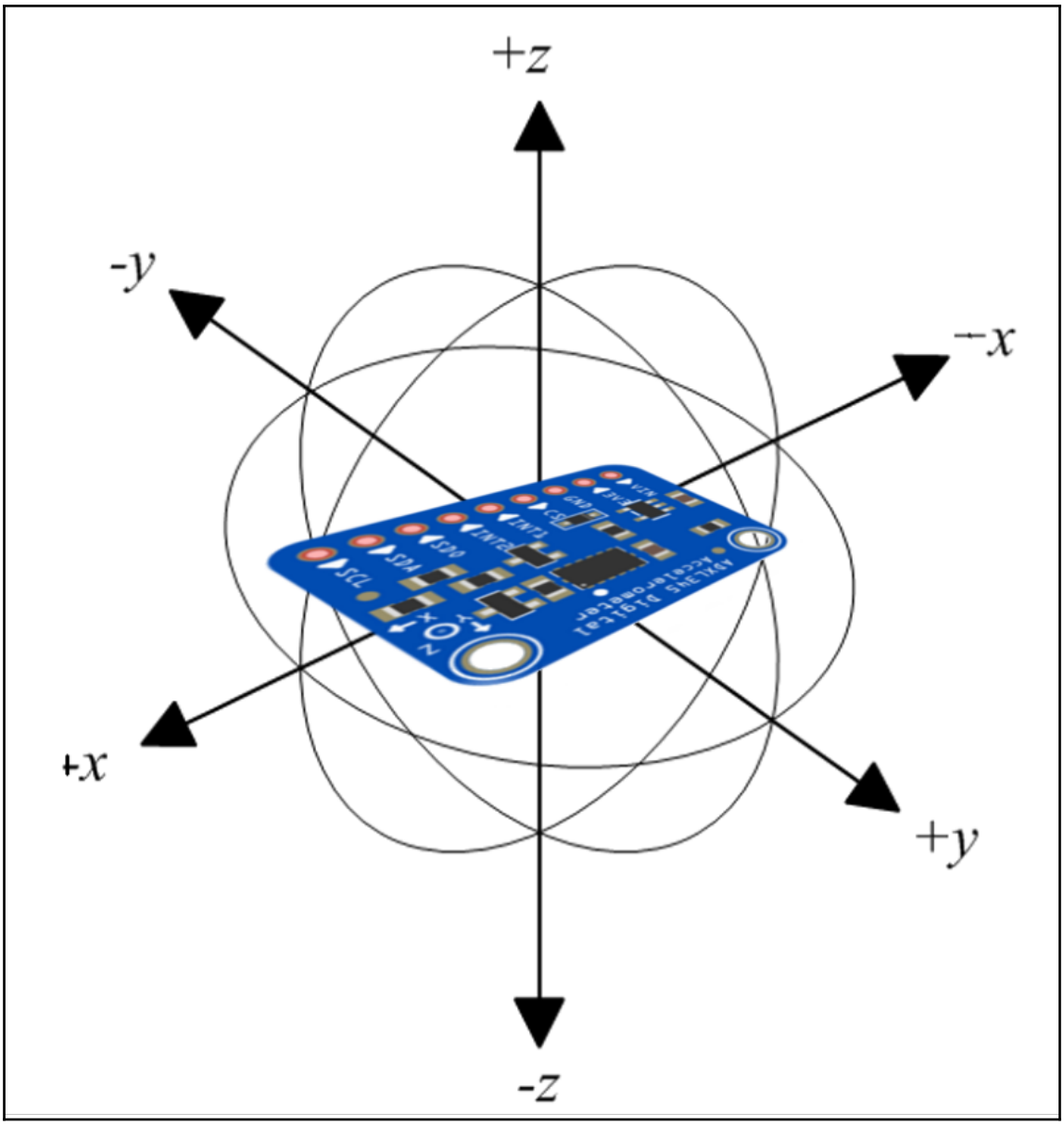
Chapter 7: Creating Your Own Pedometer

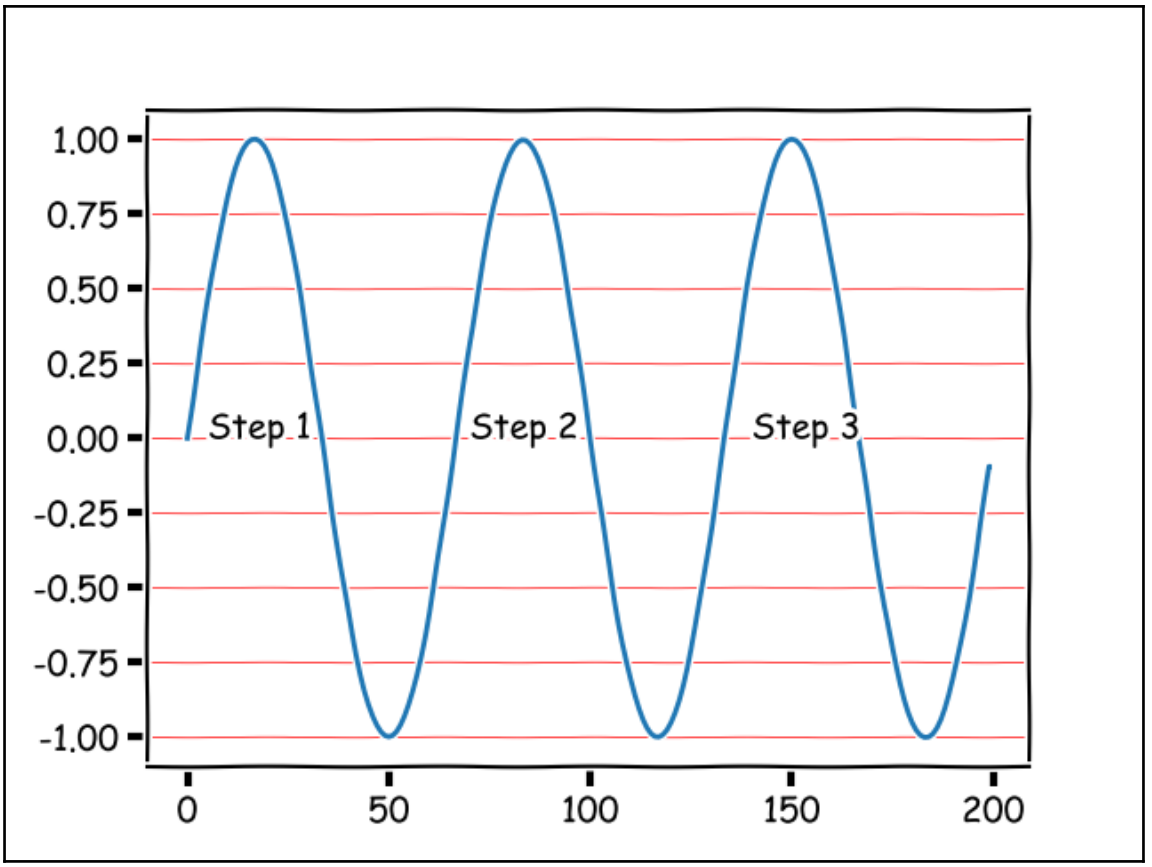


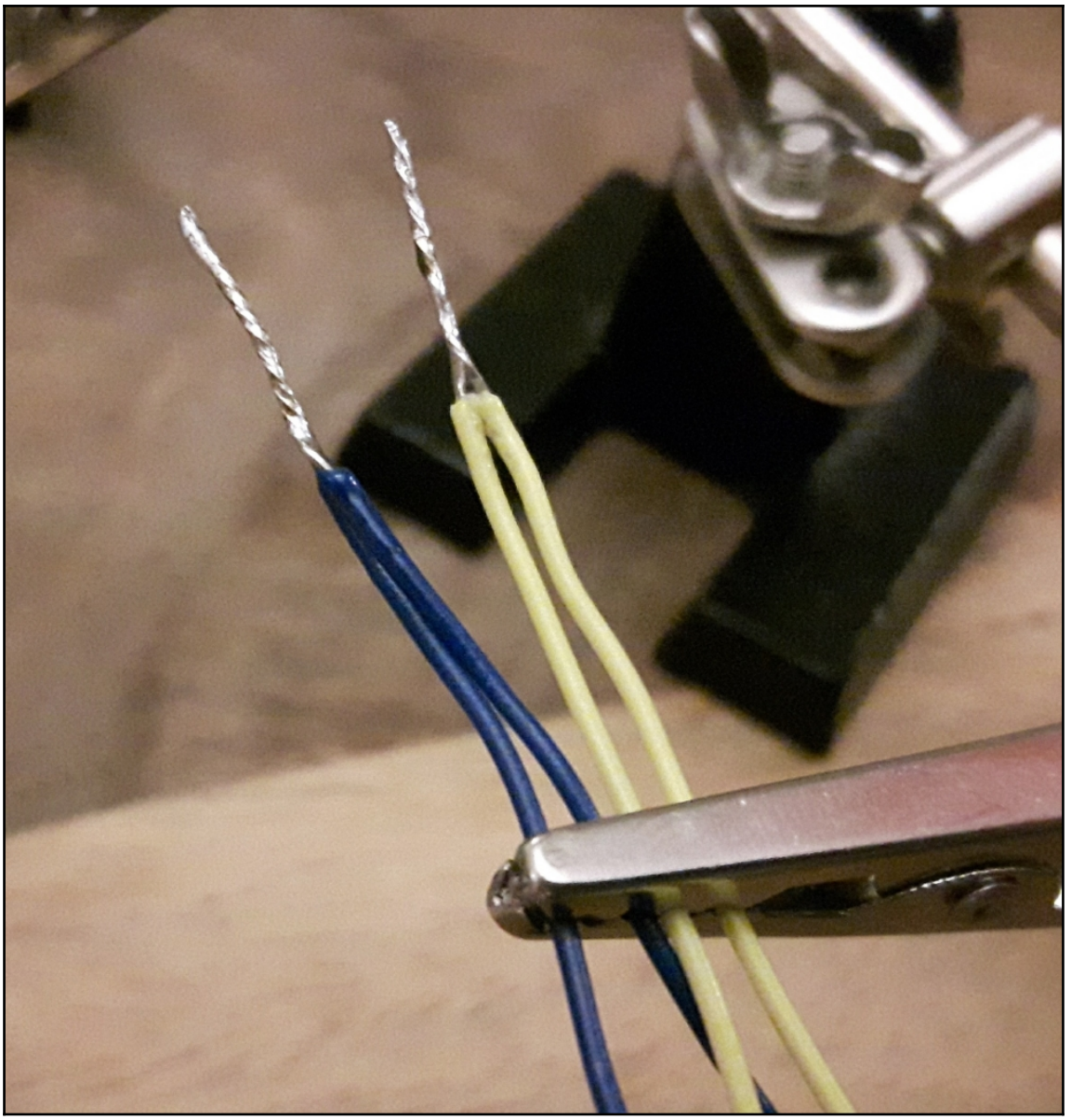
```
pi@wearablepi:~ $ sudo i2cdetect -y 1
     0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00:          -- -- -- -- -- -- -- -- -- -- -- -- --
10: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
20: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
30: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
40: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
50: -- -- -- 53 -- -- -- -- -- -- -- -- -- -- -- --
60: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
70: -- -- -- -- 74 -- -- --
pi@wearablepi:~ $
```

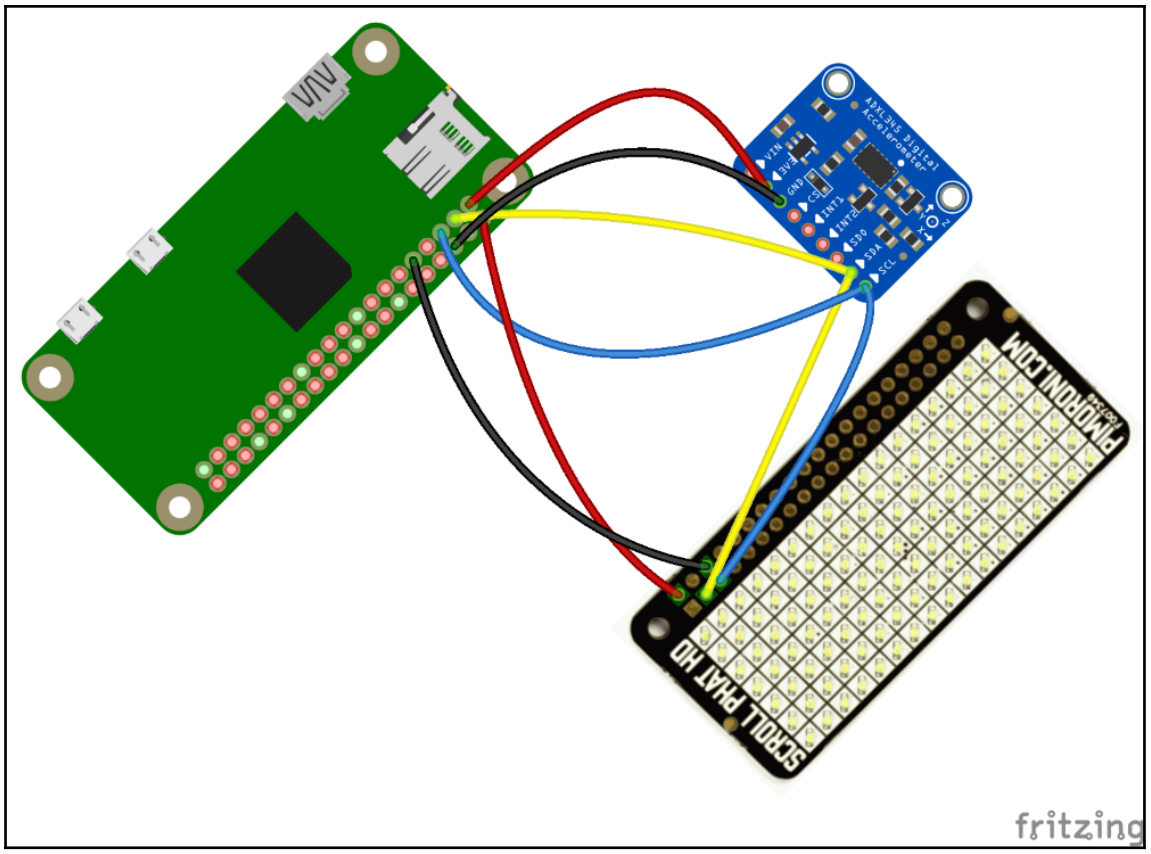

pi@wearablepi: ~/WearableTech/Chapter7
1,0.868
2,0.908
3,0.908
4,0.888
5,0.836
6,0.94
7,0.812
8,1.104
9,0.904
10,0.98
11,0.908
12,0.992
13,0.936
14,1.04
15,1.144
16,0.896
17,0.812
18,0.816
19,0.932
20,0.78
21,0.66
22,1.004
23,0.988
steps.csv


1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1 6 11 16 21 26 31 36 41 46 51 56 61 66 71 76 81 86 91 96 101 106 111 116 121 126 131 136 141 146 151 156 161 166 171 176 181 186 191 196 201 206 211 216 221 226 231 236

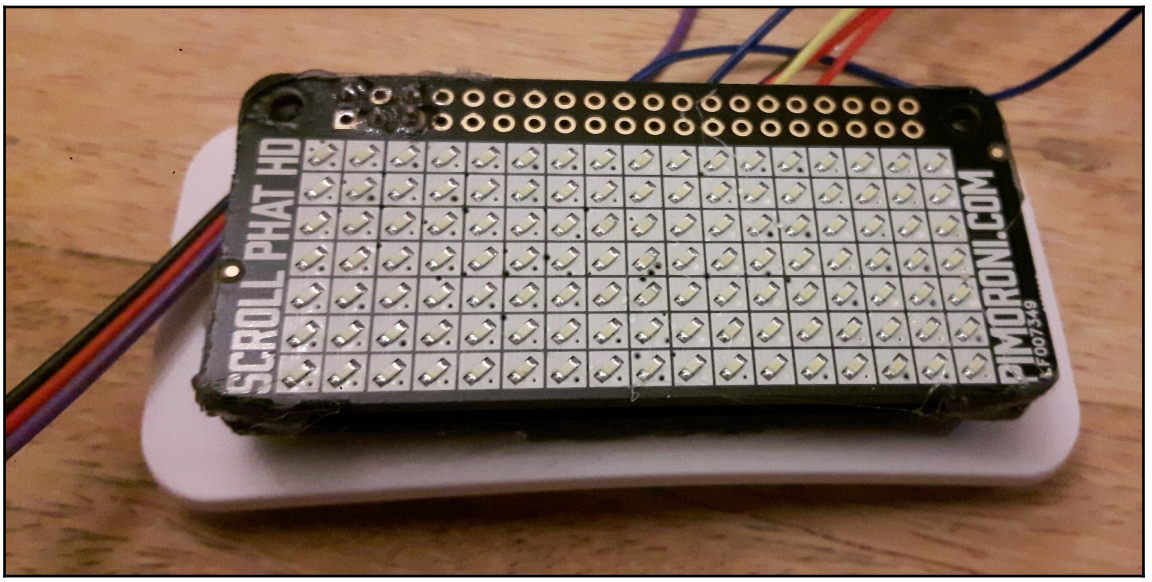

+z
-y
-x
+x
+y
-z

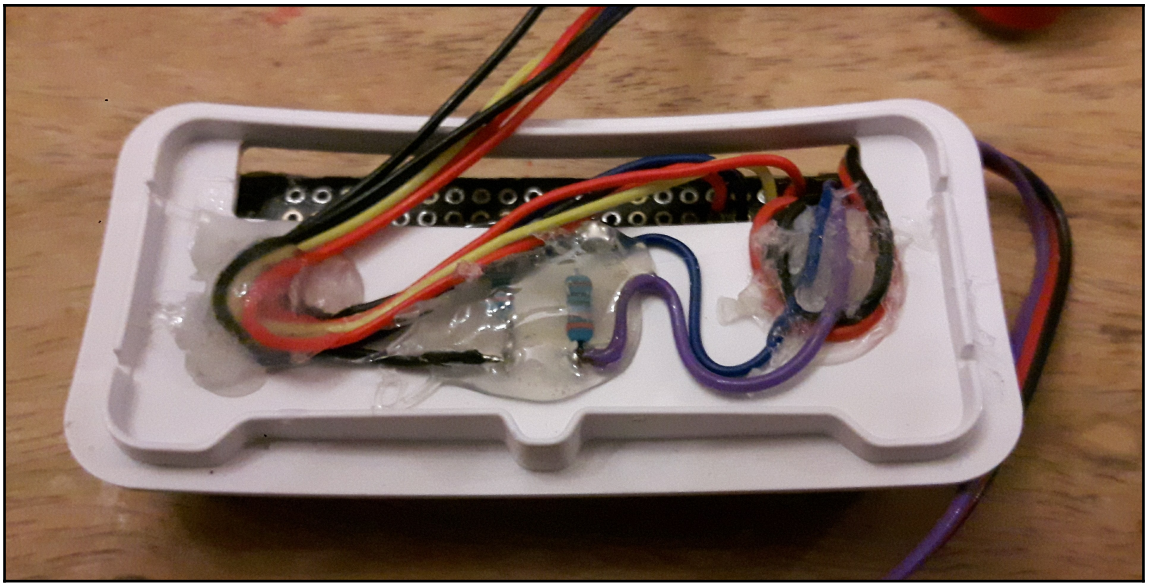

1.00
0.75
0.50
0.25
0.00
-0.25
-0.50
-0.75
-1.00
Step 1
Step 2
Step 3
0
50
100
150
200

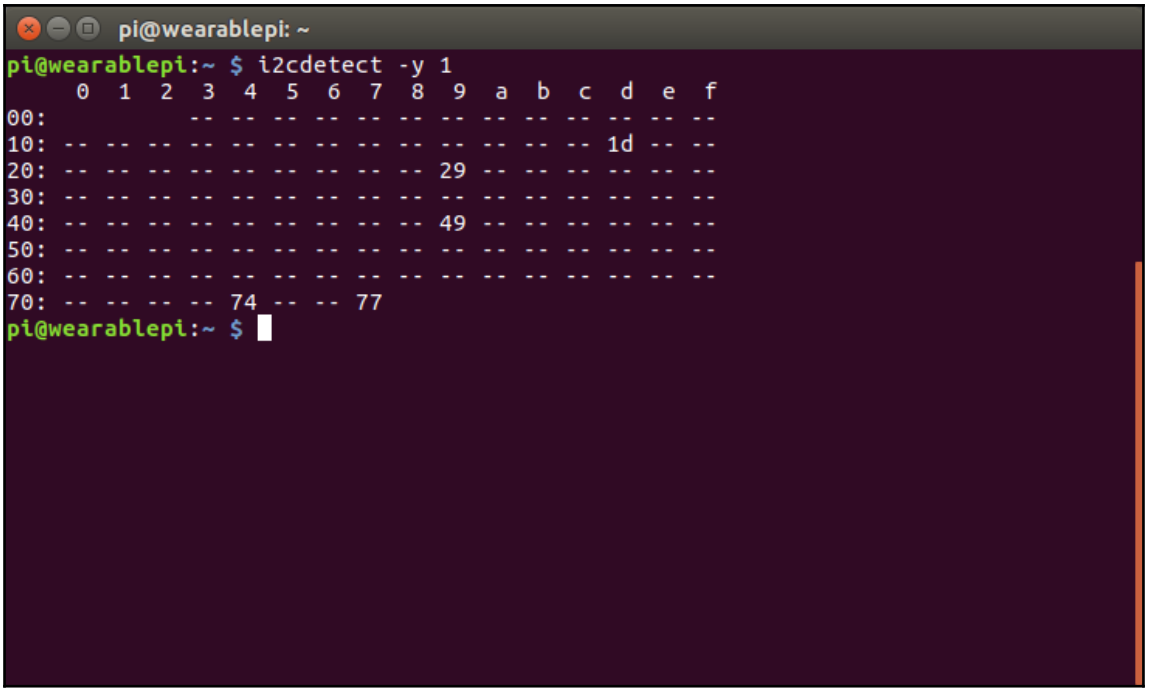


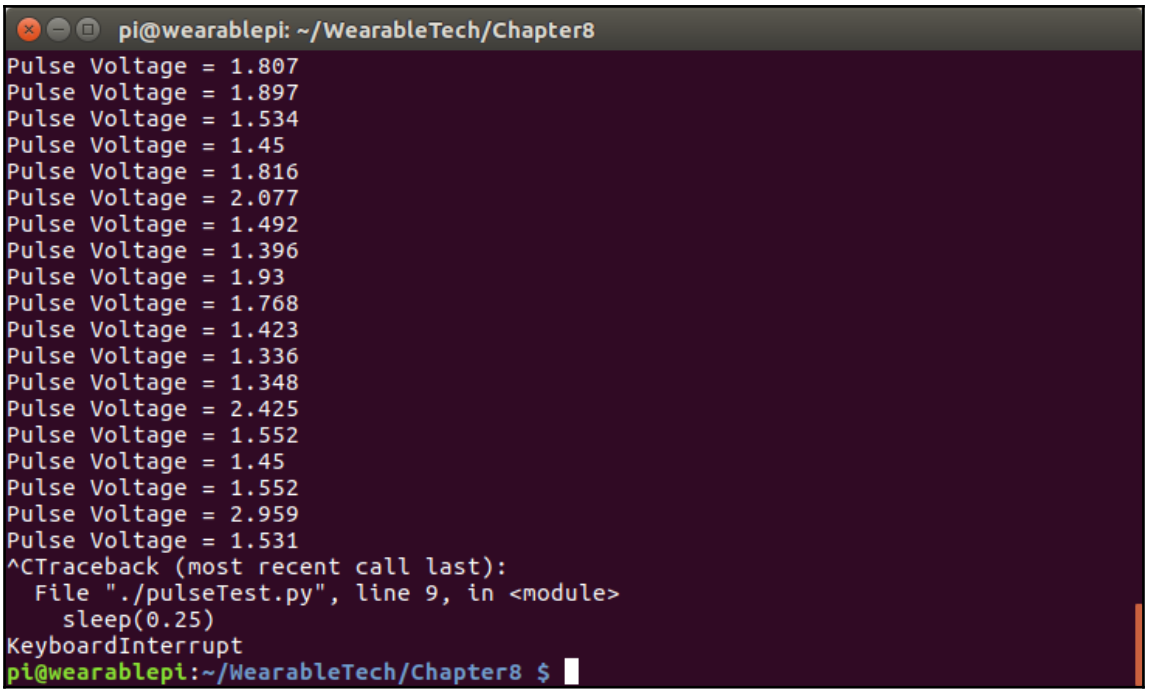

SCROLL PHAT HD
PIMORONI.COM
fritzing

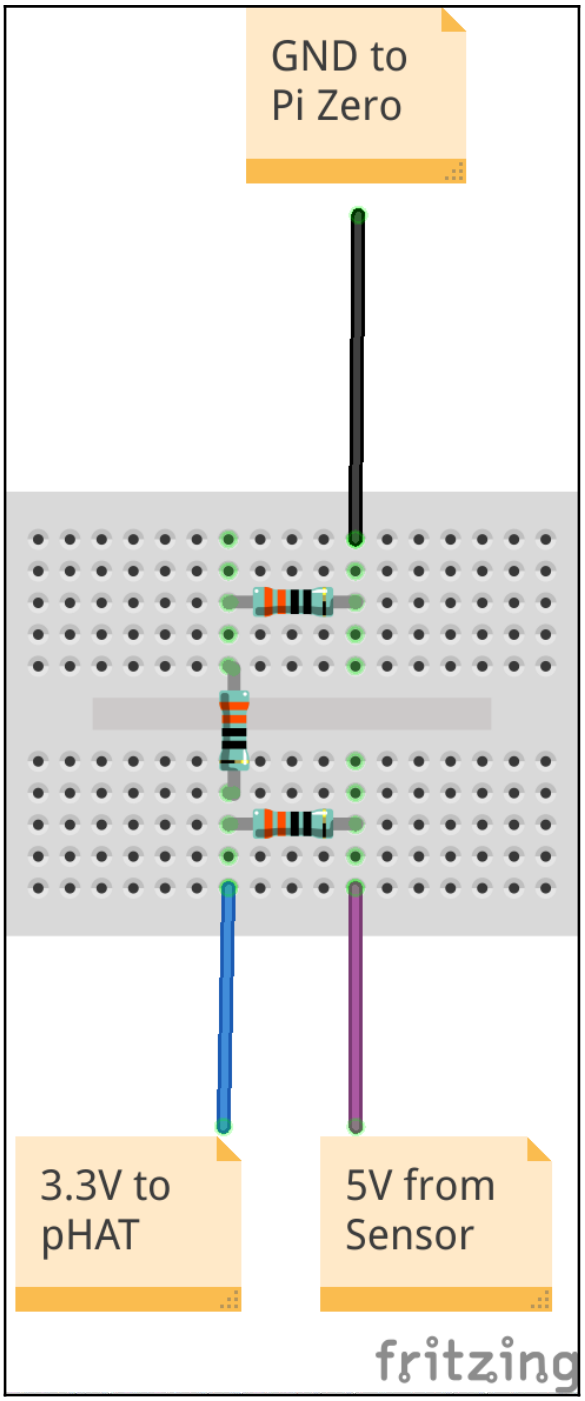
Chapter 8: Creating Your Own Heart Rate Monitor

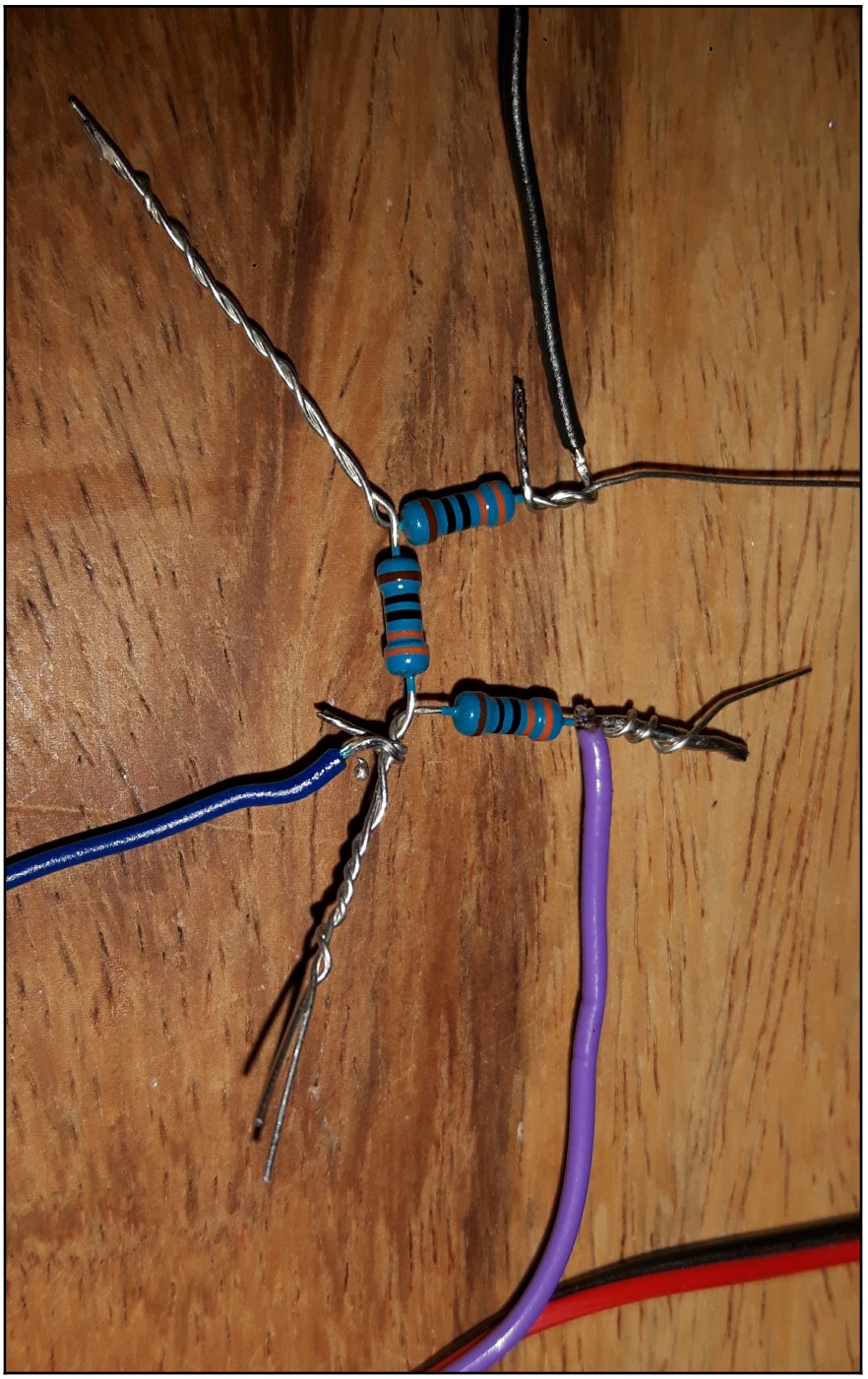


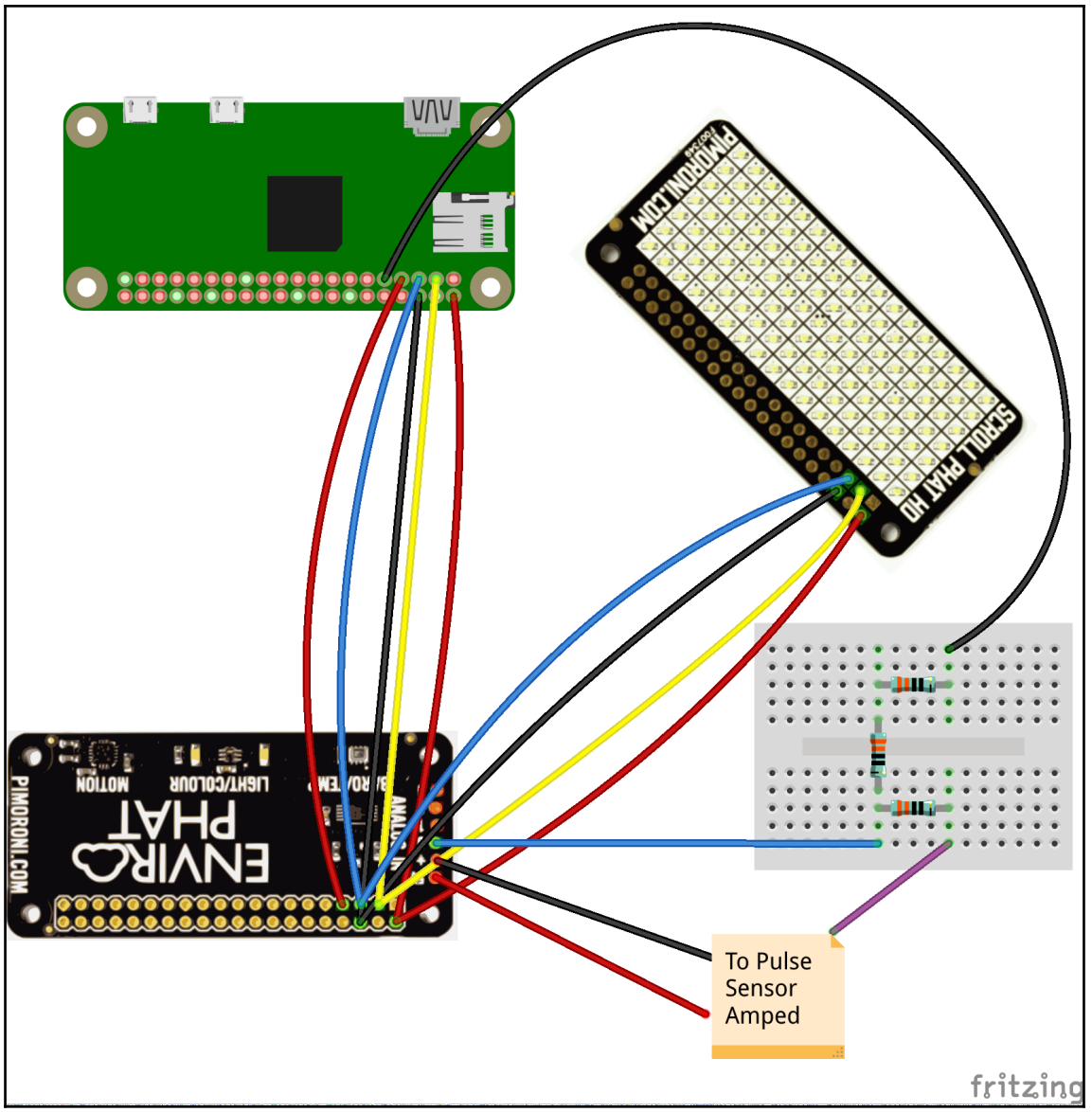


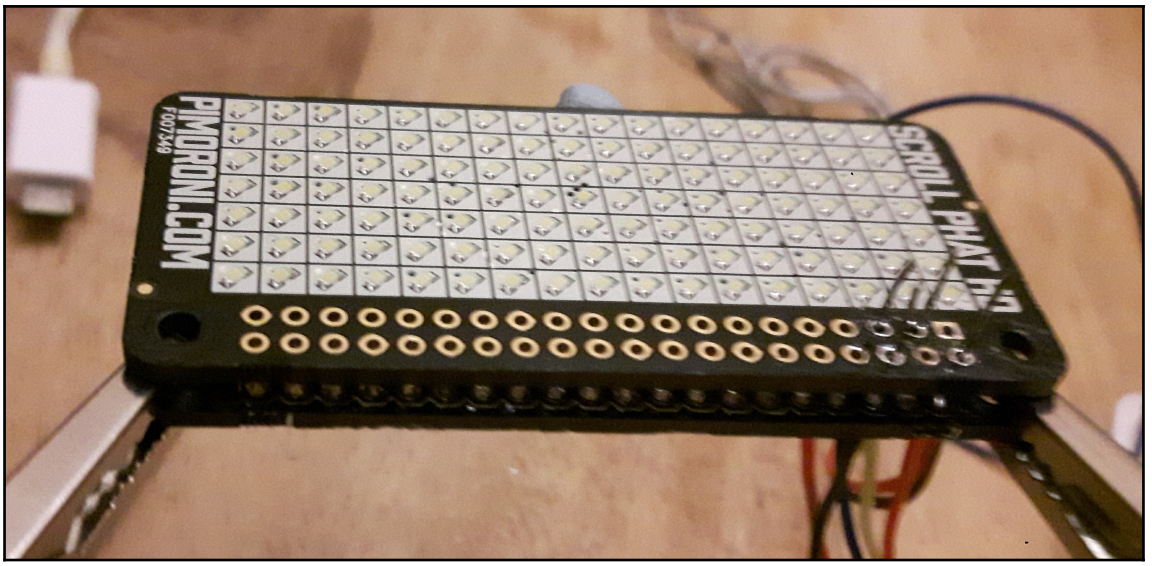

pi@wearablepi: ~
pi@wearablepi:~ $ i2cdetect -y 1
0 1 2 3 4 5 6 7 8 9 a b c d e f
00: -- -- -- -- -- -- -- -- -- -- -- -- -- --
10: -- -- -- -- -- -- -- -- -- -- -- -- -- 1d -- --
20: -- -- -- -- -- -- -- -- -- 29 -- -- -- -- -- --
30: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
40: -- -- -- -- -- -- -- -- -- 49 -- -- -- -- -- --
50: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
60: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
70: -- -- -- -- 74 -- -- 77
pi@wearablepi:~ $


pi@wearablepi: ~/WearableTech/Chapter8
Pulse Voltage = 1.807
Pulse Voltage = 1.897
Pulse Voltage = 1.534
Pulse Voltage = 1.45
Pulse Voltage = 1.816
Pulse Voltage = 2.077
Pulse Voltage = 1.492
Pulse Voltage = 1.396
Pulse Voltage = 1.93
Pulse Voltage = 1.768
Pulse Voltage = 1.423
Pulse Voltage = 1.336
Pulse Voltage = 1.348
Pulse Voltage = 2.425
Pulse Voltage = 1.552
Pulse Voltage = 1.45
Pulse Voltage = 1.552
Pulse Voltage = 2.959
Pulse Voltage = 1.531
^CTraceback (most recent call last):
File "./pulseTest.py", line 9, in <module>
sleep(0.25)
KeyboardInterrupt
pi@wearablepi:~/WearableTech/Chapter8 $

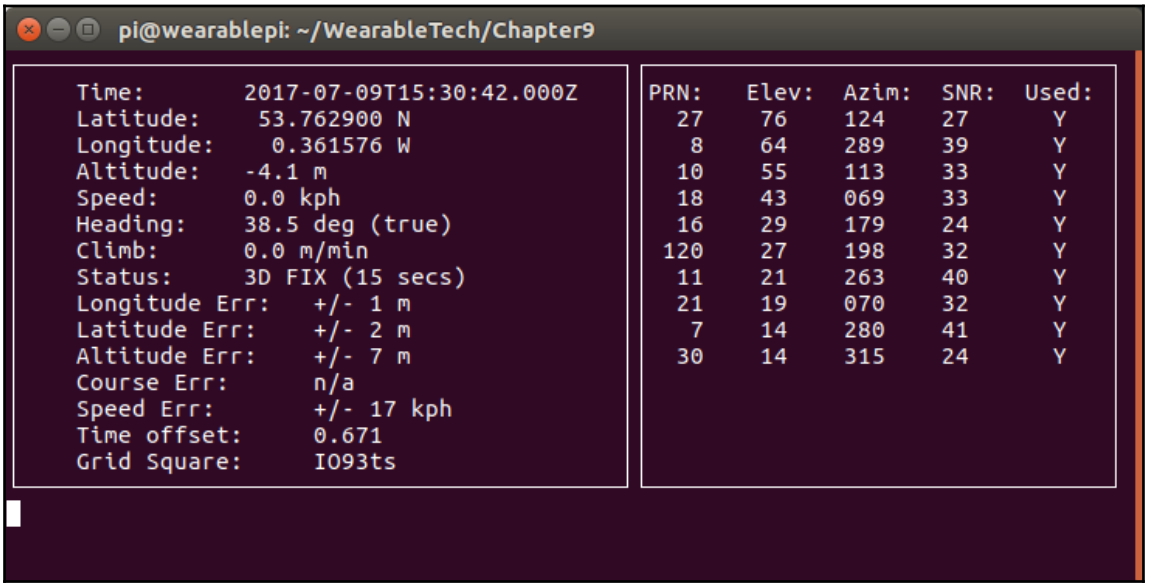

GND to
Pi Zero
3.3V to
pHAT
5V from
Sensor
fritzing

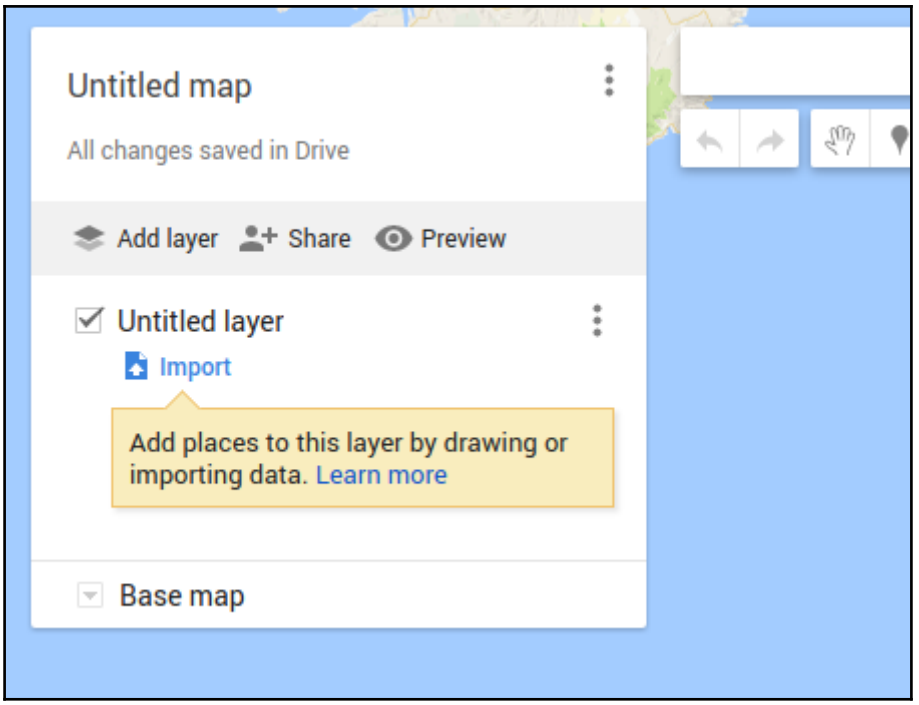


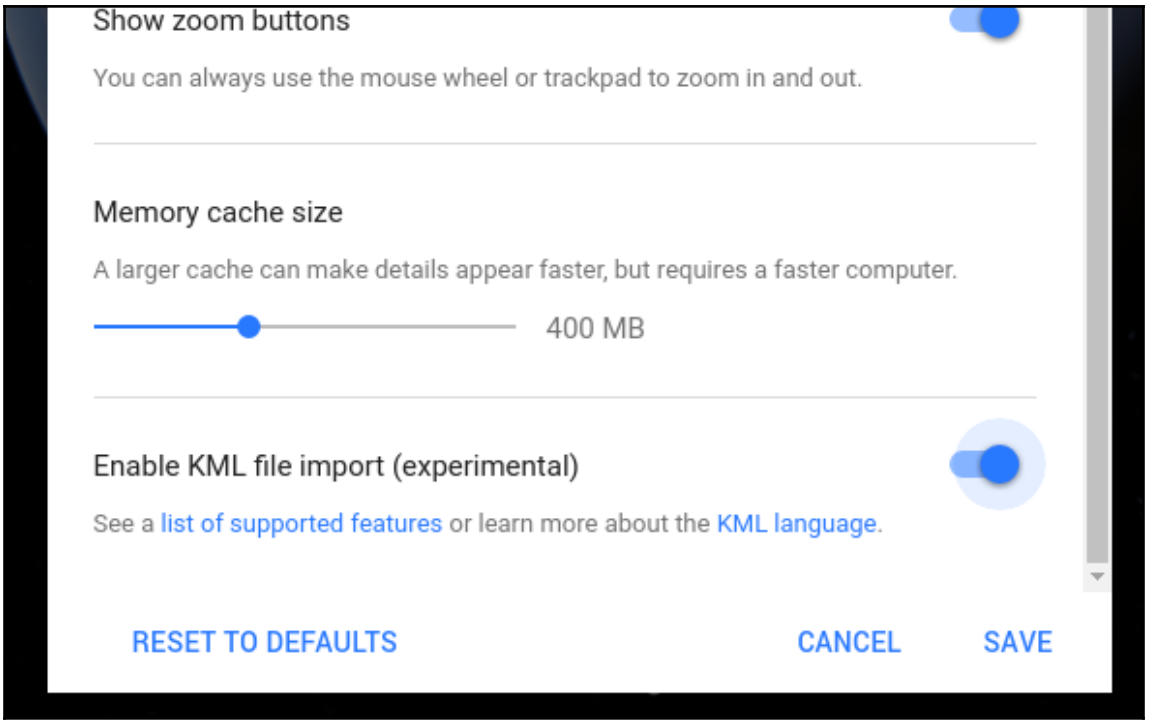

PIMORONI.COM
SCROLL PHAT HD
PIMORONI.COM
ENVIRO PHAT
MOTION
LIGHT/COLOUR
PIMORONI.COM
To Pulse Sensor Amped
fritzing

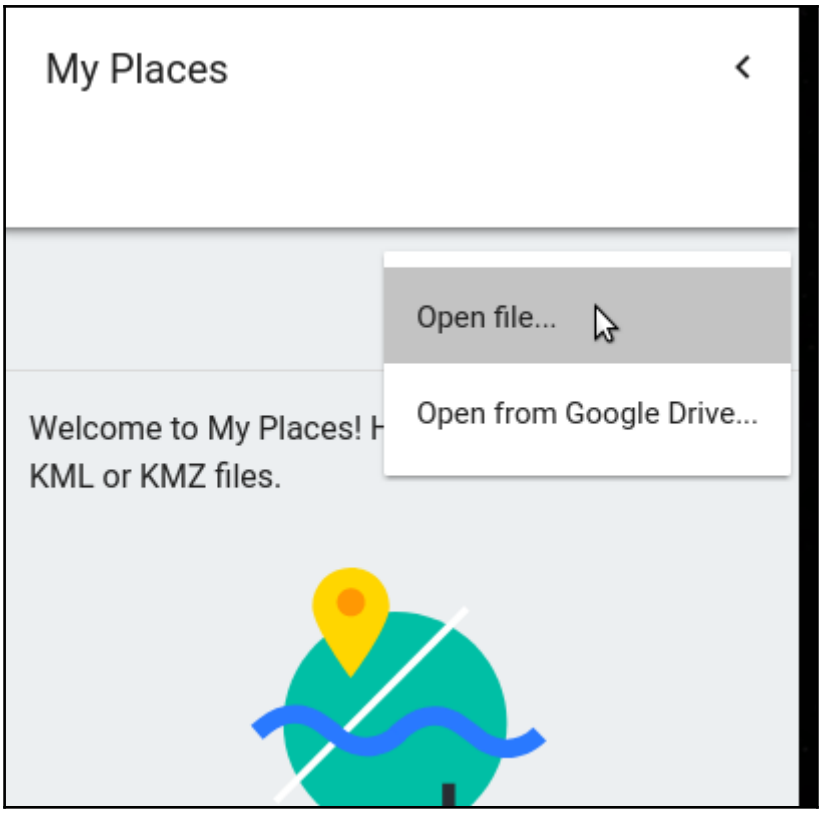

SCROLL PHAT HD
PIMORONI.COM

Chapter 9: Creating Your Own GPS Tracker

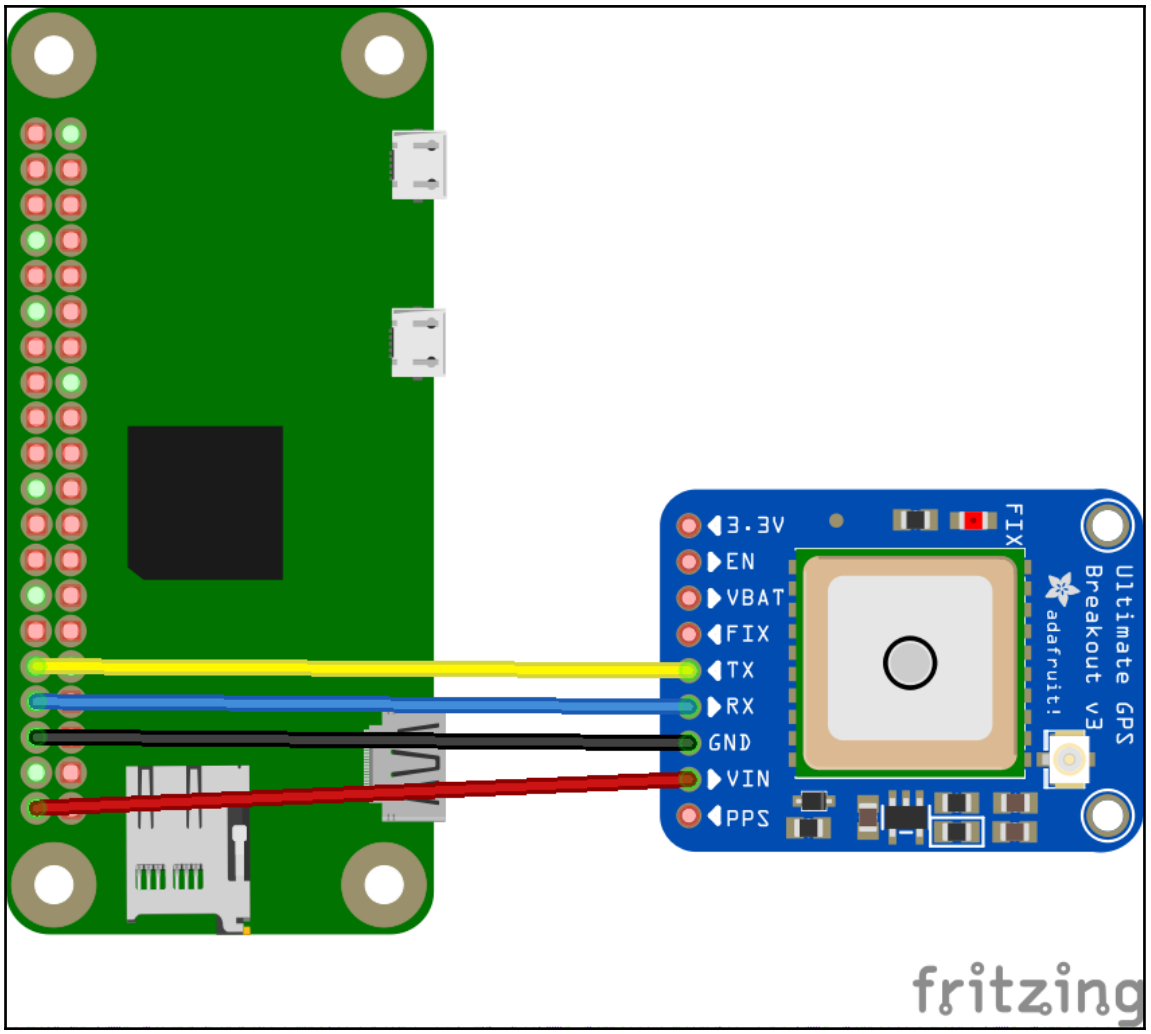


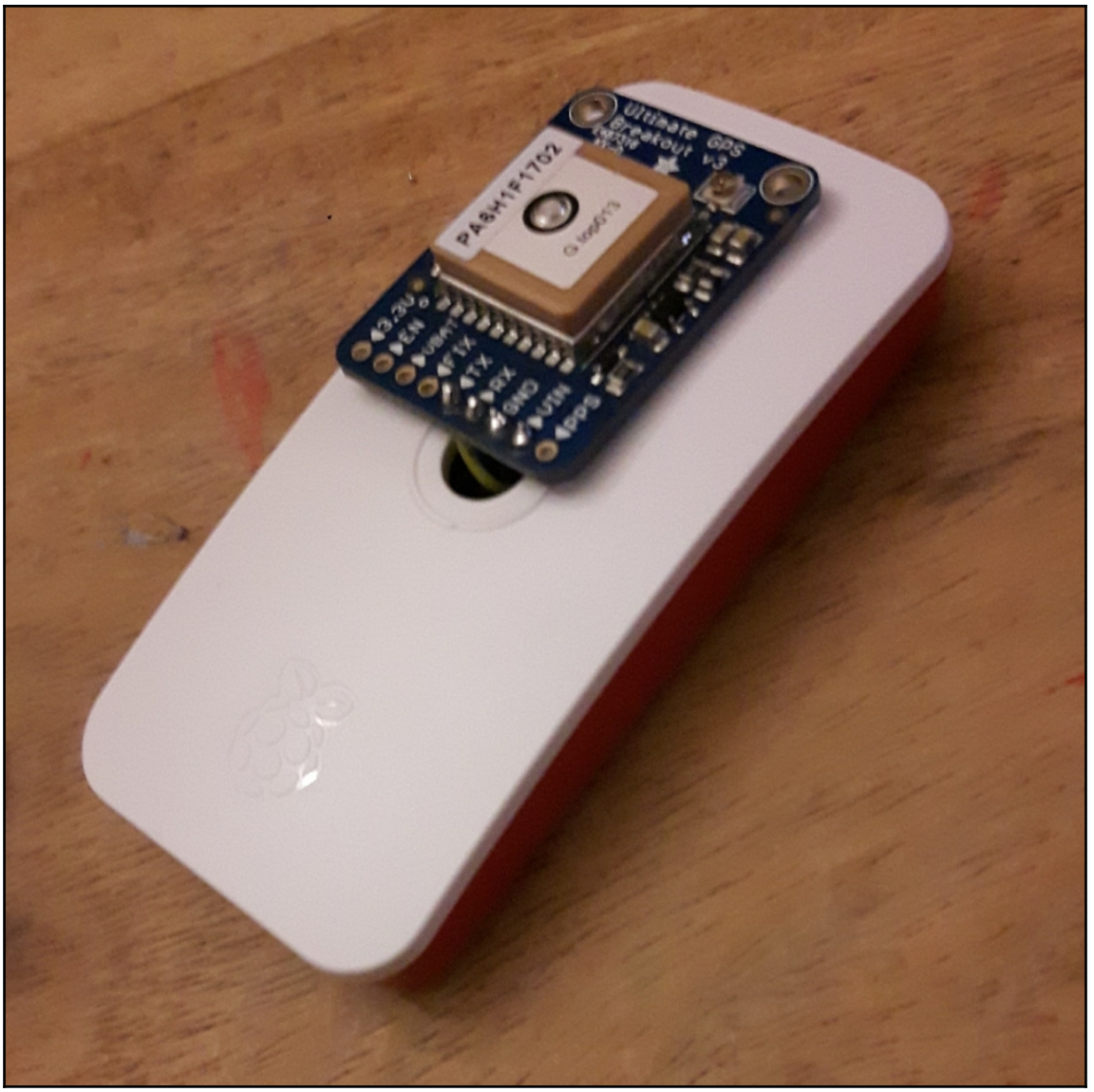

Untitled map
All changes saved in Drive
Add layer
Share
Preview
Untitled layer
Import
Add places to this layer by drawing or importing data. Learn more
Base map

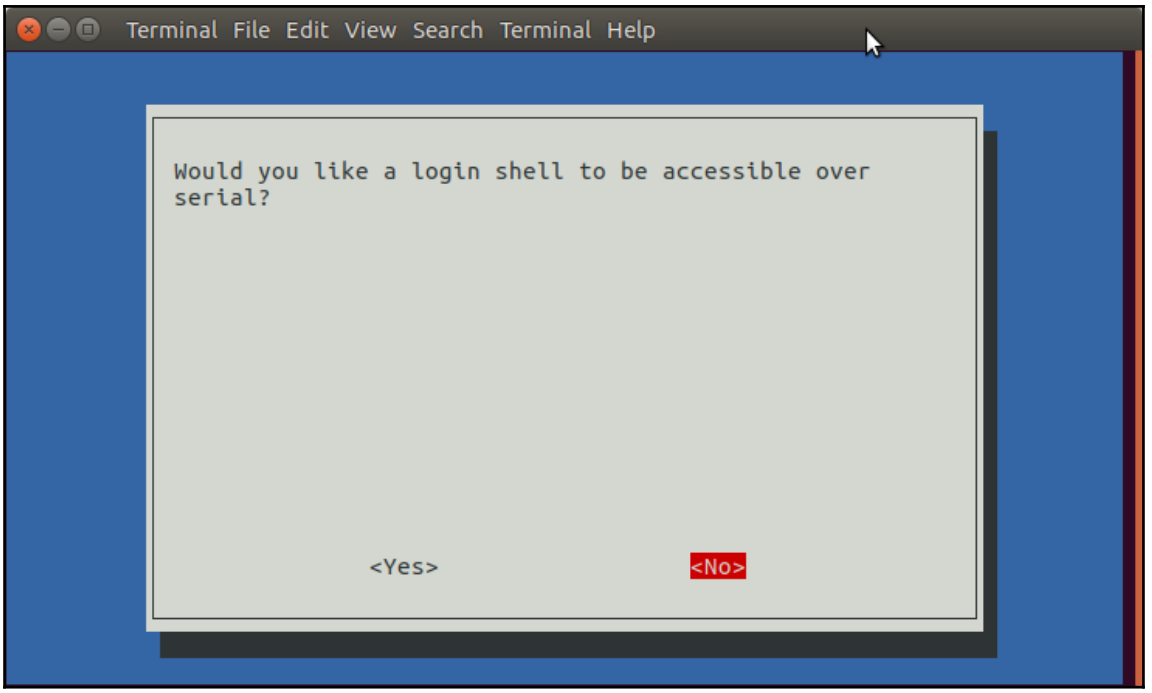

Show zoom buttons
You can always use the mouse wheel or trackpad to zoom in and out.
Memory cache size
A larger cache can make details appear faster, but requires a faster computer.
400 MB
Enable KML file import (experimental)
See a list of supported features or learn more about the KML language.
RESET TO DEFAULTS
CANCEL
SAVE

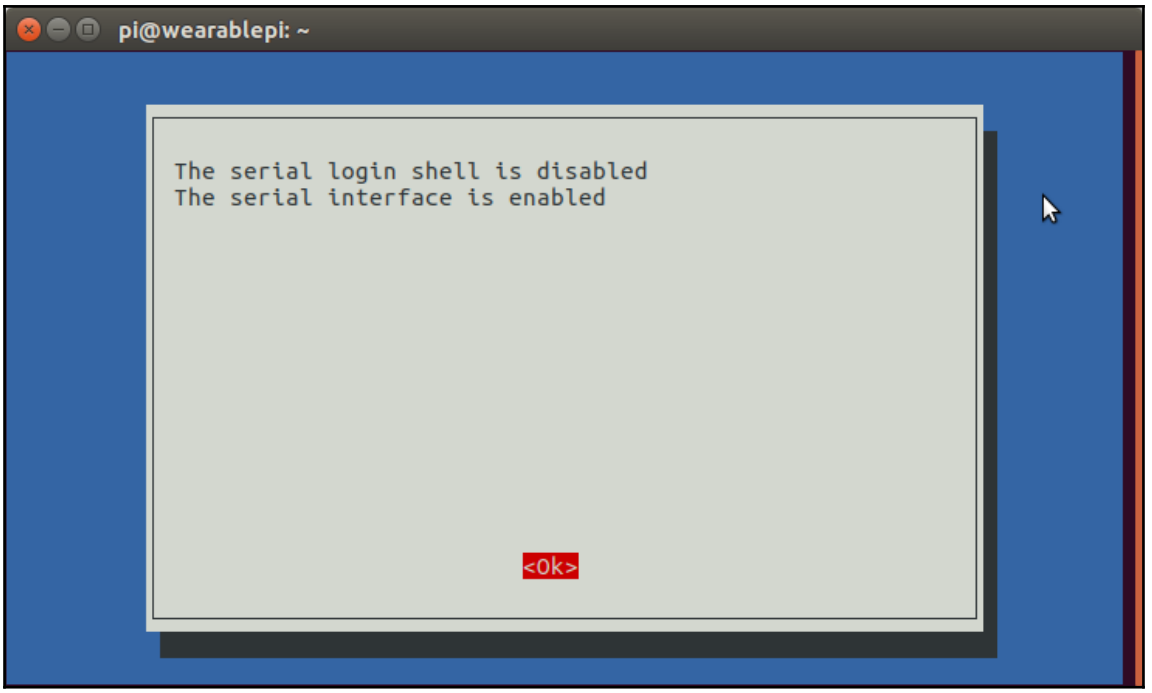

My Places
Open file...
Open from Google Drive...
Welcome to My Places! H
KML or KMZ files.

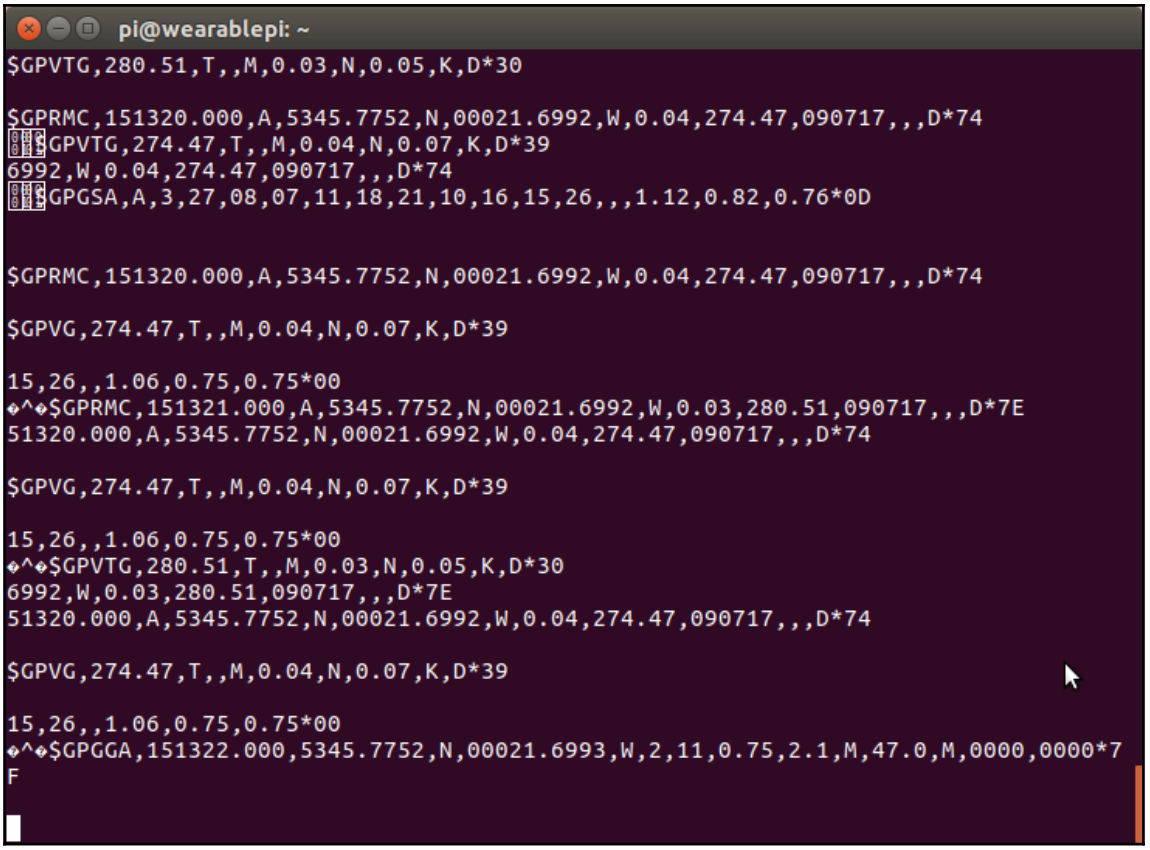

2D
Google


3.3V
EN
VBAT
FIX
TX
RX
GND
VIN
PPS
FIX
Ultimate GPS
Breakout v3
adafruit!
fritzing


Ultimate GPS
Breakout
v3
PA6H1F17G2
3.3V
EN
VBAT
RX
GND
VIN
PPS


Terminal File Edit View Search Terminal Help
Would you like a login shell to be accessible over serial?
<Yes>
<No>


pi@wearablepi: ~
The serial login shell is disabled
The serial interface is enabled
<Ok>


pi@wearablepi: ~
$GPVTG,280.51,T,,M,0.03,N,0.05,K,D*30
$GPRMC,151320.000,A,5345.7752,N,00021.6992,W,0.04,274.47,090717,,,D*74
$GPVTG,274.47,T,,M,0.04,N,0.07,K,D*39
6992,W,0.04,274.47,090717,,,D*74
GPGSA,A,3,27,08,07,11,18,21,10,16,15,26,,,1.12,0.82,0.76*0D
$GPRMC,151320.000,A,5345.7752,N,00021.6992,W,0.04,274.47,090717,,,D*74
$GPVG,274.47,T,,M,0.04,N,0.07,K,D*39
15,26,,1.06,0.75,0.75*00
$GPRMC,151321.000,A,5345.7752,N,00021.6992,W,0.03,280.51,090717,,,D*7E
51320.000,A,5345.7752,N,00021.6992,W,0.04,274.47,090717,,,D*74
$GPVG,274.47,T,,M,0.04,N,0.07,K,D*39
15,26,,1.06,0.75,0.75*00
$GPVTG,280.51,T,,M,0.03,N,0.05,K,D*30
6992,W,0.03,280.51,090717,,,D*7E
51320.000,A,5345.7752,N,00021.6992,W,0.04,274.47,090717,,,D*74
$GPVG,274.47,T,,M,0.04,N,0.07,K,D*39
15,26,,1.06,0.75,0.75*00
$GPGGA,151322.000,5345.7752,N,00021.6993,W,2,11,0.75,2.1,M,47.0,M,0000,0000*7
F