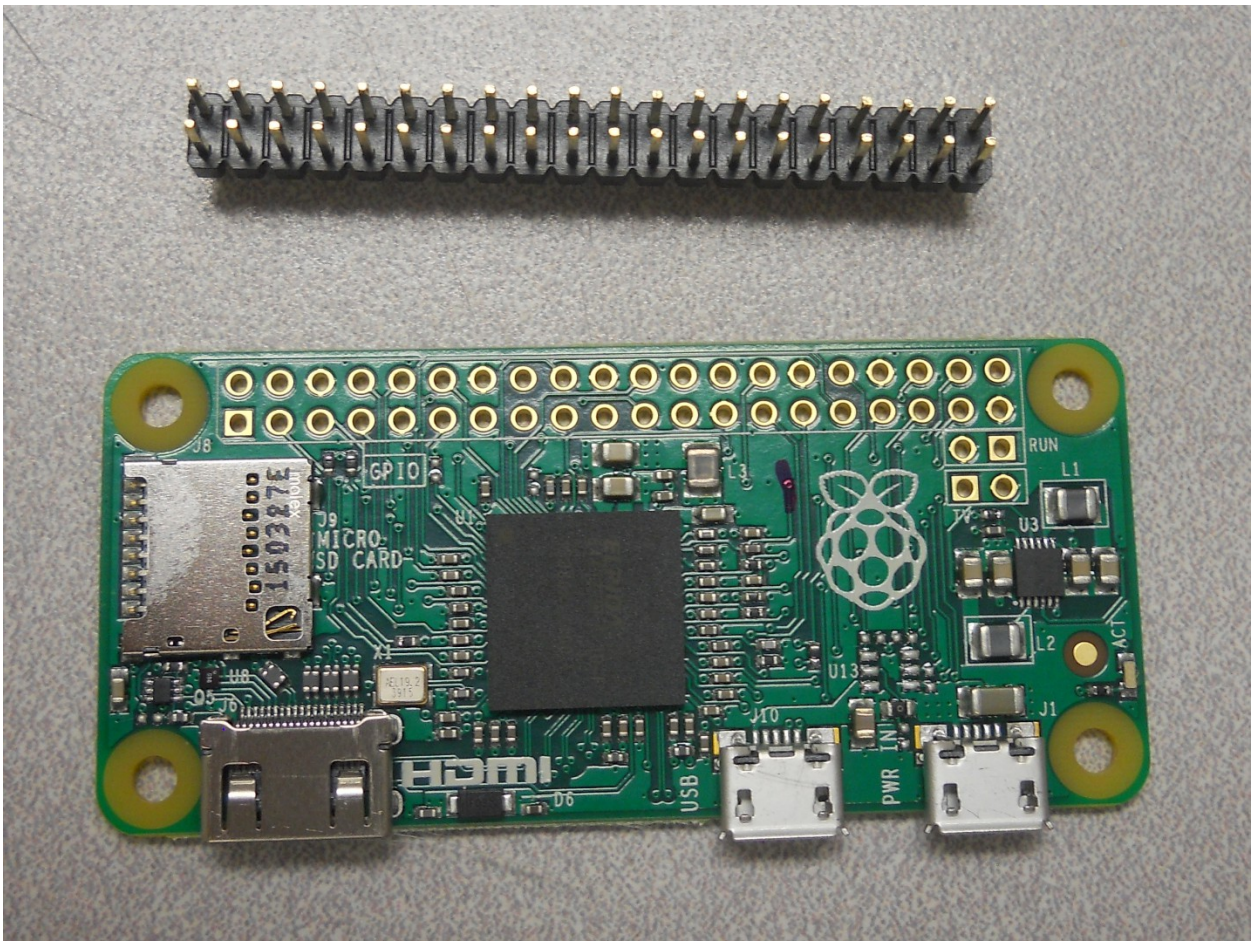
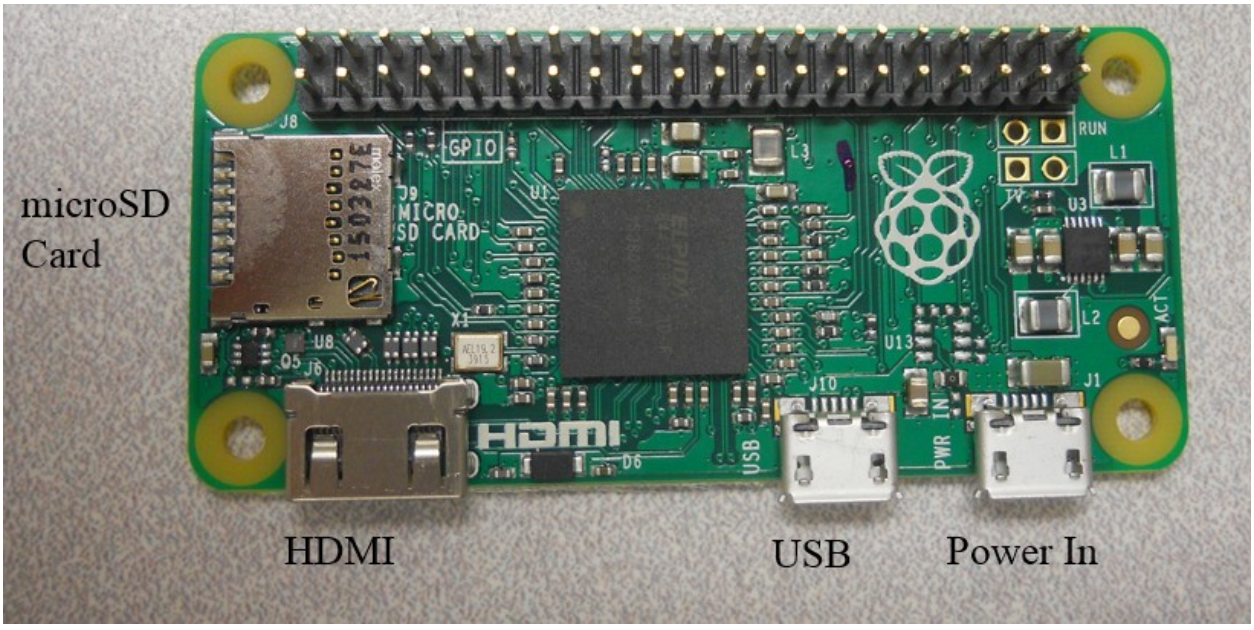
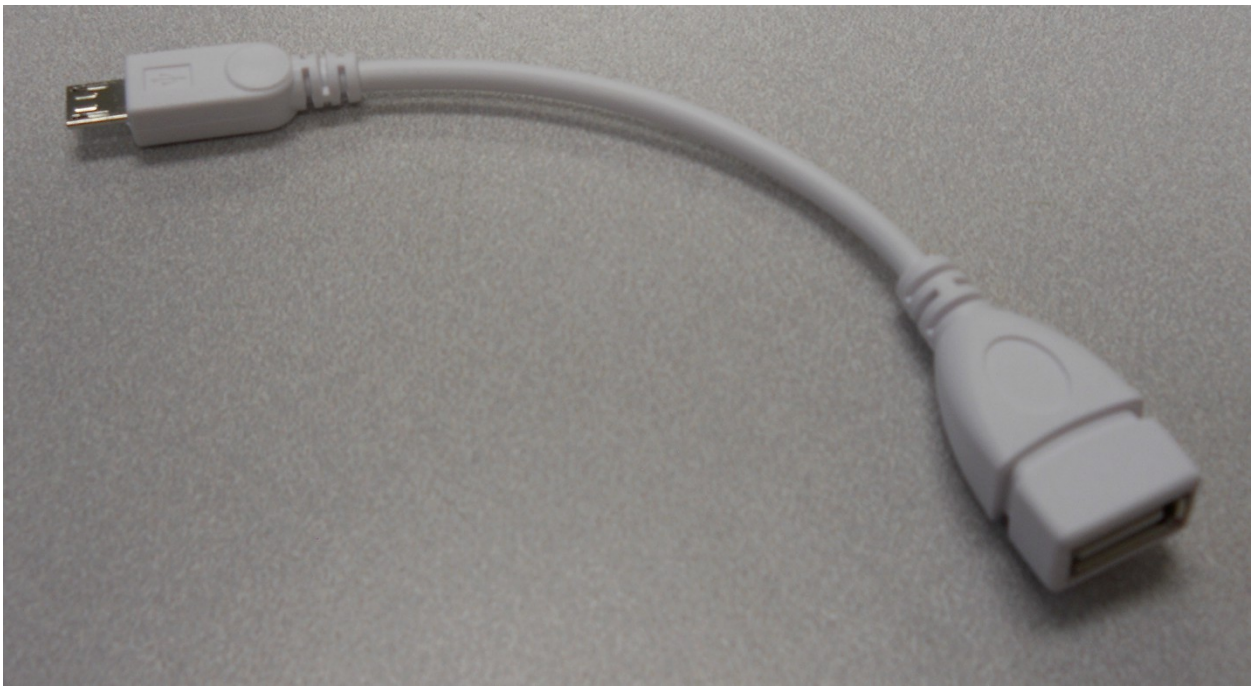
Chapter 1: Getting Started with Raspberry Pi Zero

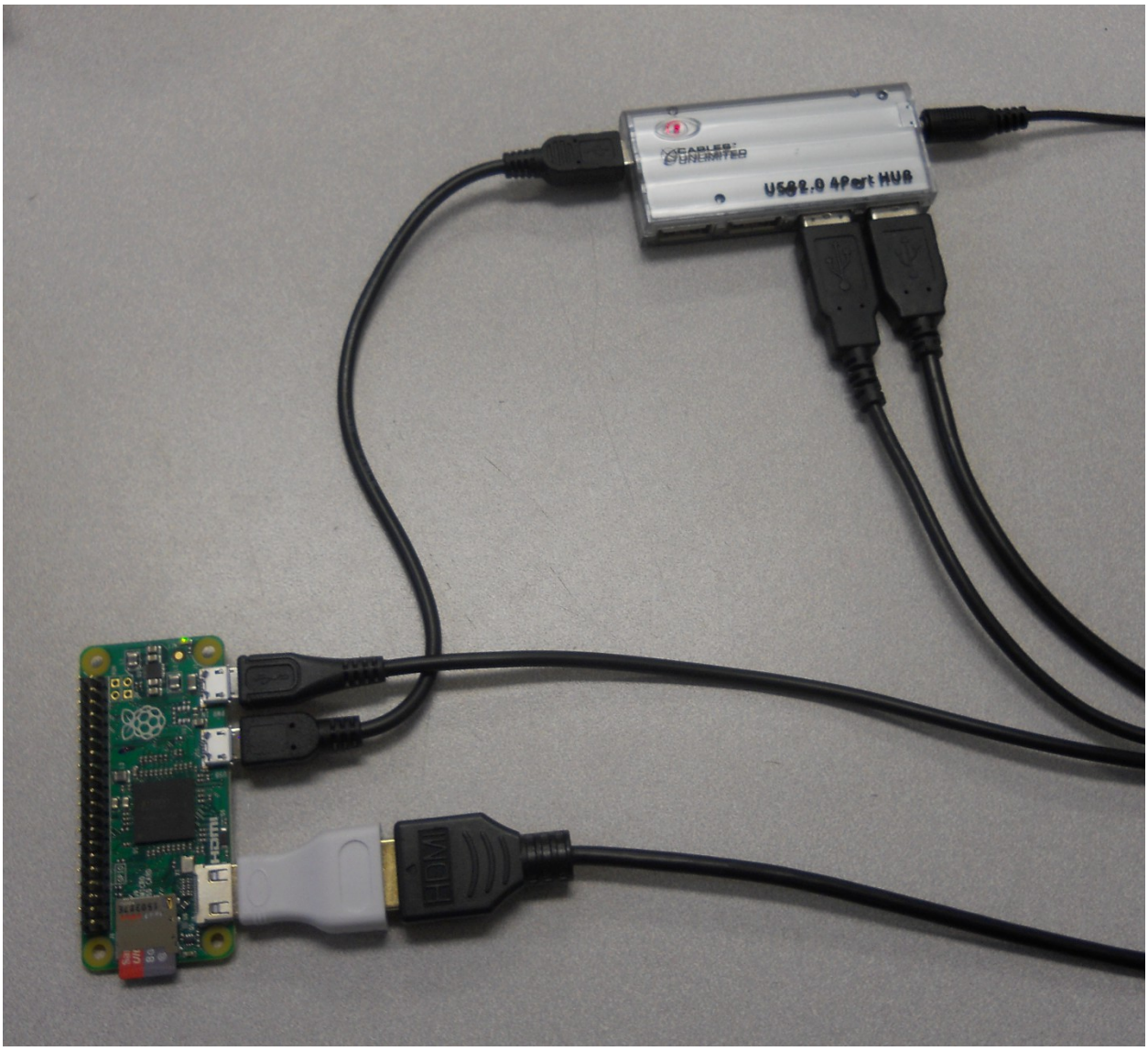


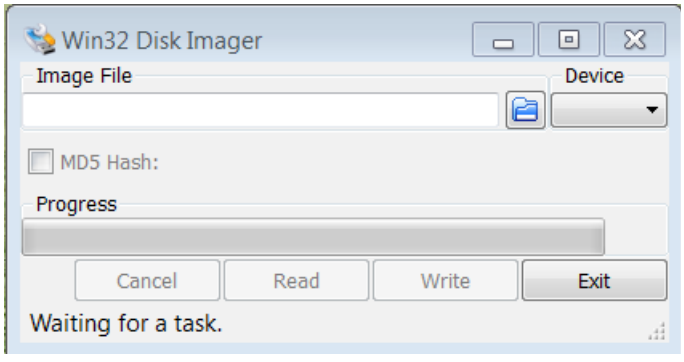


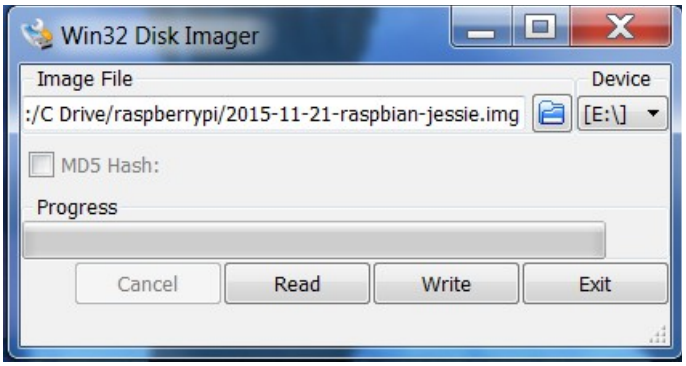


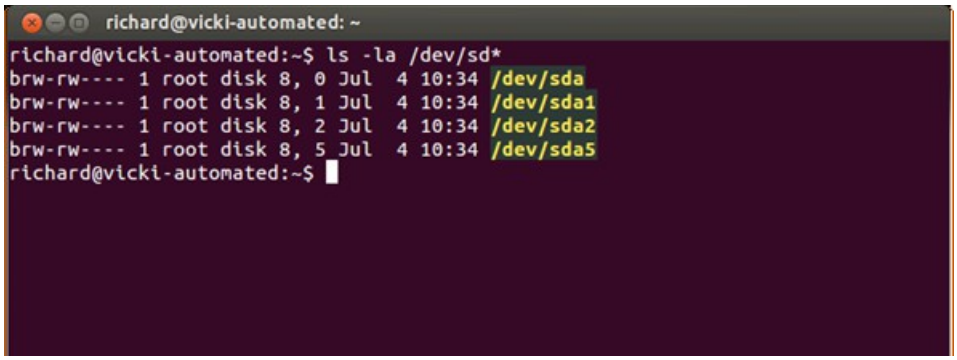

CABLES UNLIMITED
USB2.0 4Port HUB

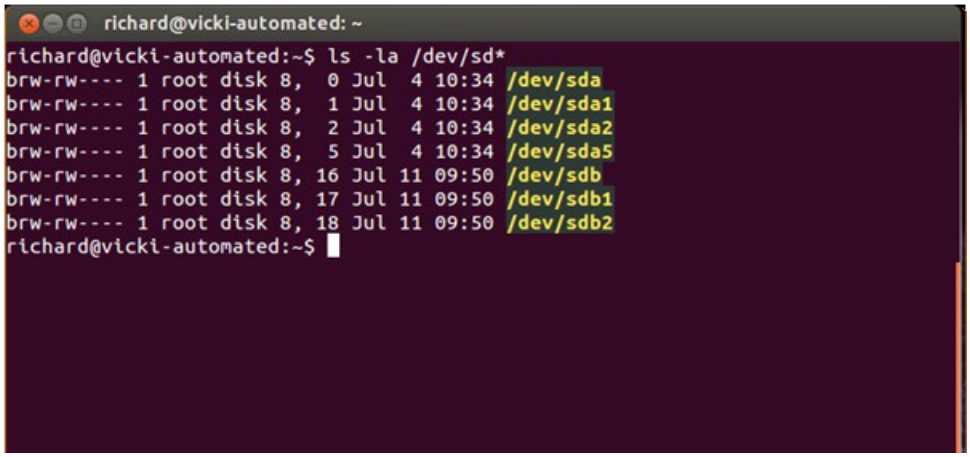

SVideo
SVideo
(RCA Connector)
VGA
DVI
HDMI

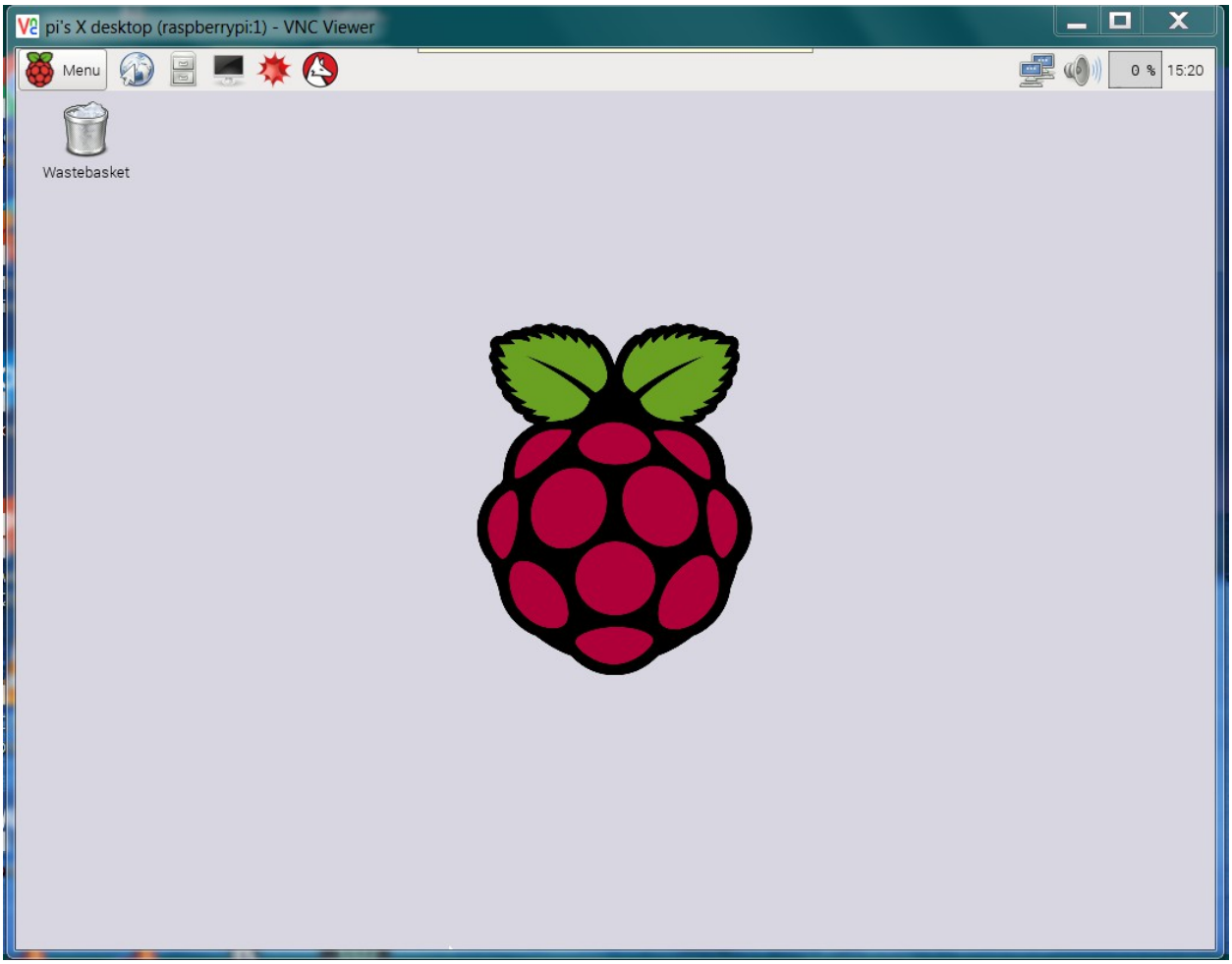

USB2.0 4Port HUB
HDMI

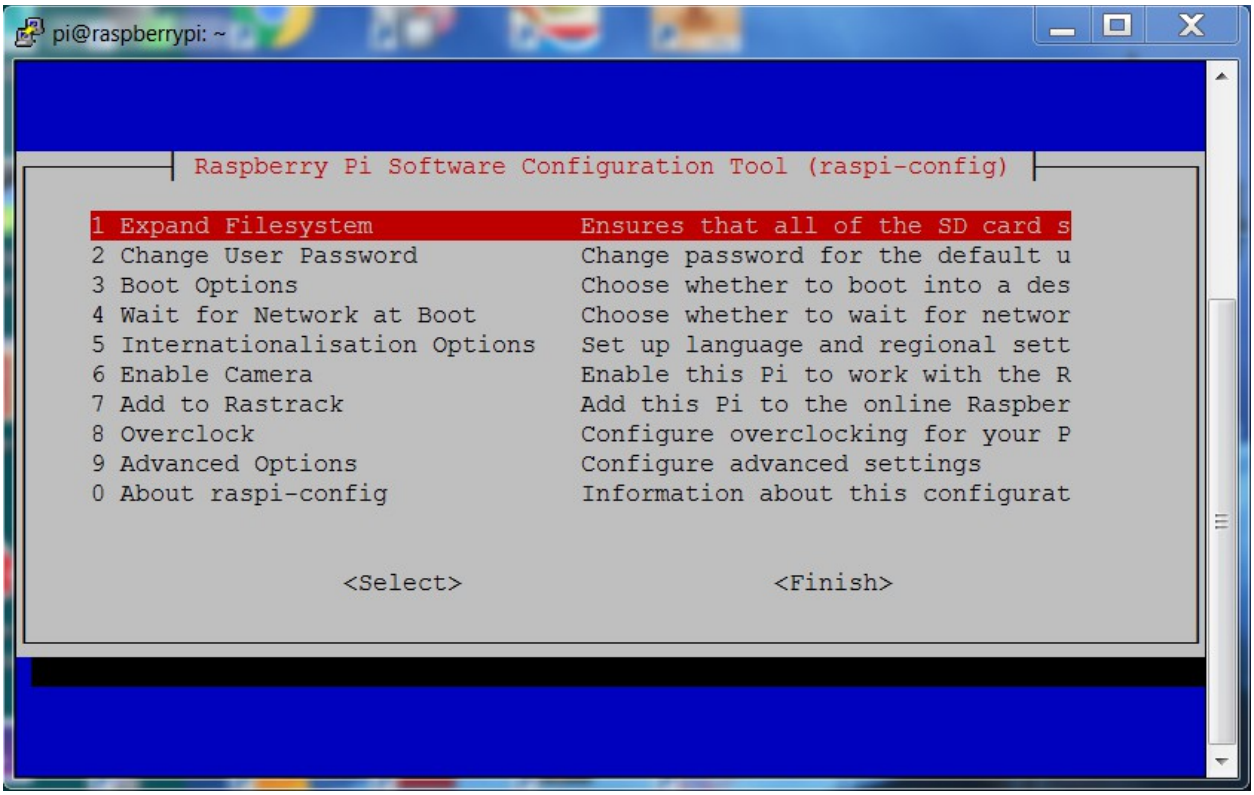

Win32 Disk Imager
Image File
Device
MD5 Hash:
Progress
Cancel
Read
Write
Exit
Waiting for a task.

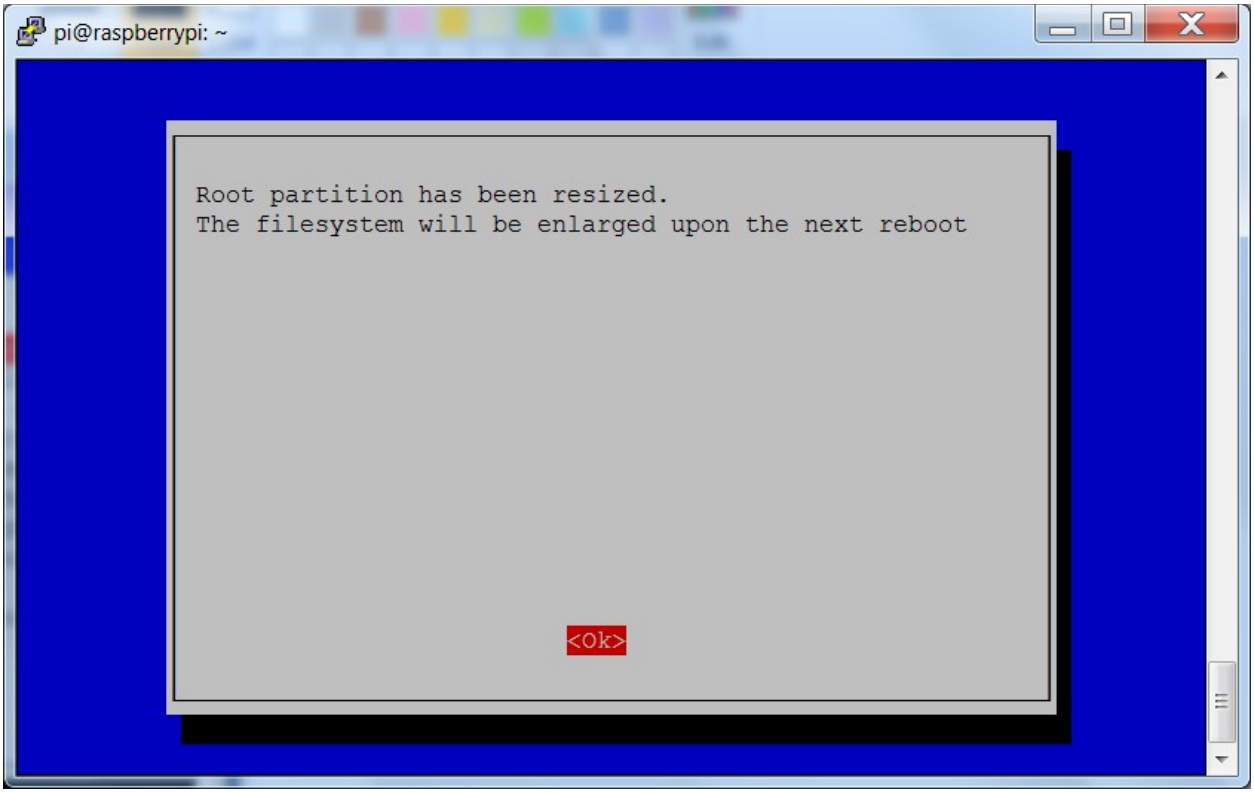

Win32 Disk Imager
Image File
Device
:/C Drive/raspberrypi/2015-11-21-raspbian-jessie.img
[E:\]
MD5 Hash:
Progress
Cancel
Read
Write
Exit


richard@vicki-automated: ~
richard@vicki-automated:~$ ls -la /dev/sd*
brw-rw---- 1 root disk 8, 0 Jul 4 10:34 /dev/sda
brw-rw---- 1 root disk 8, 1 Jul 4 10:34 /dev/sda1
brw-rw---- 1 root disk 8, 2 Jul 4 10:34 /dev/sda2
brw-rw---- 1 root disk 8, 5 Jul 4 10:34 /dev/sda5
richard@vicki-automated:~$


richard@vicki-automated: ~
richard@vicki-automated:~$ ls -la /dev/sd*
brw-rw---- 1 root disk 8, 0 Jul 4 10:34 /dev/sda
brw-rw---- 1 root disk 8, 1 Jul 4 10:34 /dev/sda1
brw-rw---- 1 root disk 8, 2 Jul 4 10:34 /dev/sda2
brw-rw---- 1 root disk 8, 5 Jul 4 10:34 /dev/sda5
brw-rw---- 1 root disk 8, 16 Jul 11 09:50 /dev/sdb
brw-rw---- 1 root disk 8, 17 Jul 11 09:50 /dev/sdb1
brw-rw---- 1 root disk 8, 18 Jul 11 09:50 /dev/sdb2
richard@vicki-automated:~$

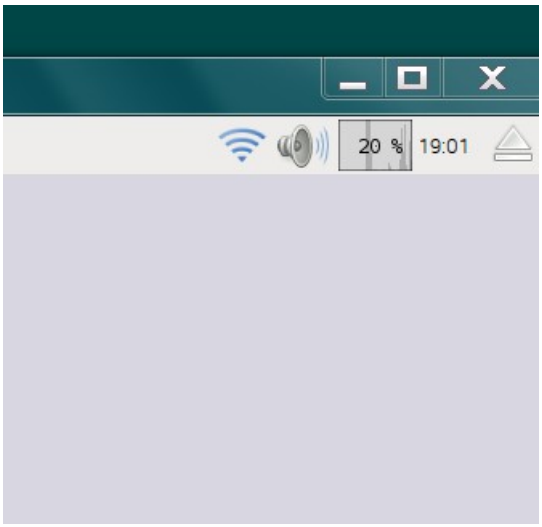

pi's X desktop (raspberrypi:1) - VNC Viewer
Menu
0 %
15:20
Wastebasket


pi@raspberrypi: ~
Raspberry Pi Software Configuration Tool (raspi-config)
1 Expand Filesystem Ensures that all of the SD card s
2 Change User Password Change password for the default u
3 Boot Options Choose whether to boot into a des
4 Wait for Network at Boot Choose whether to wait for networ
5 Internationalisation Options Set up language and regional sett
6 Enable Camera Enable this Pi to work with the R
7 Add to Rastrack Add this Pi to the online Raspber
8 Overclock Configure overclocking for your P
9 Advanced Options Configure advanced settings
0 About raspi-config Information about this configurat
<Select>
<Finish>

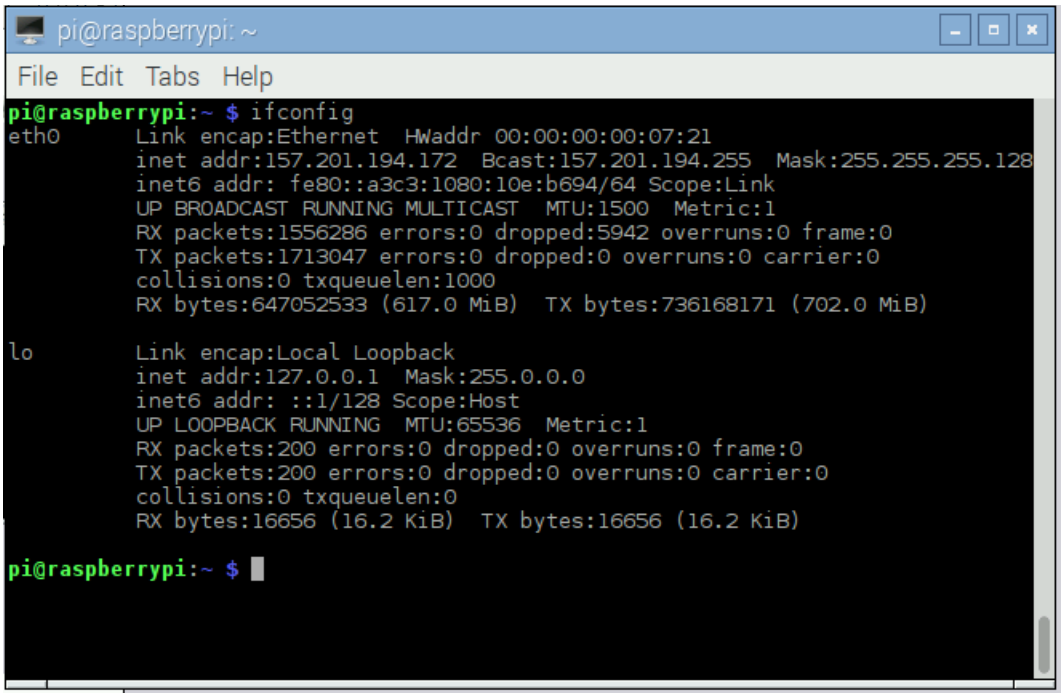

pi@raspberrypi: ~
Root partition has been resized.
The filesystem will be enlarged upon the next reboot
<Ok>

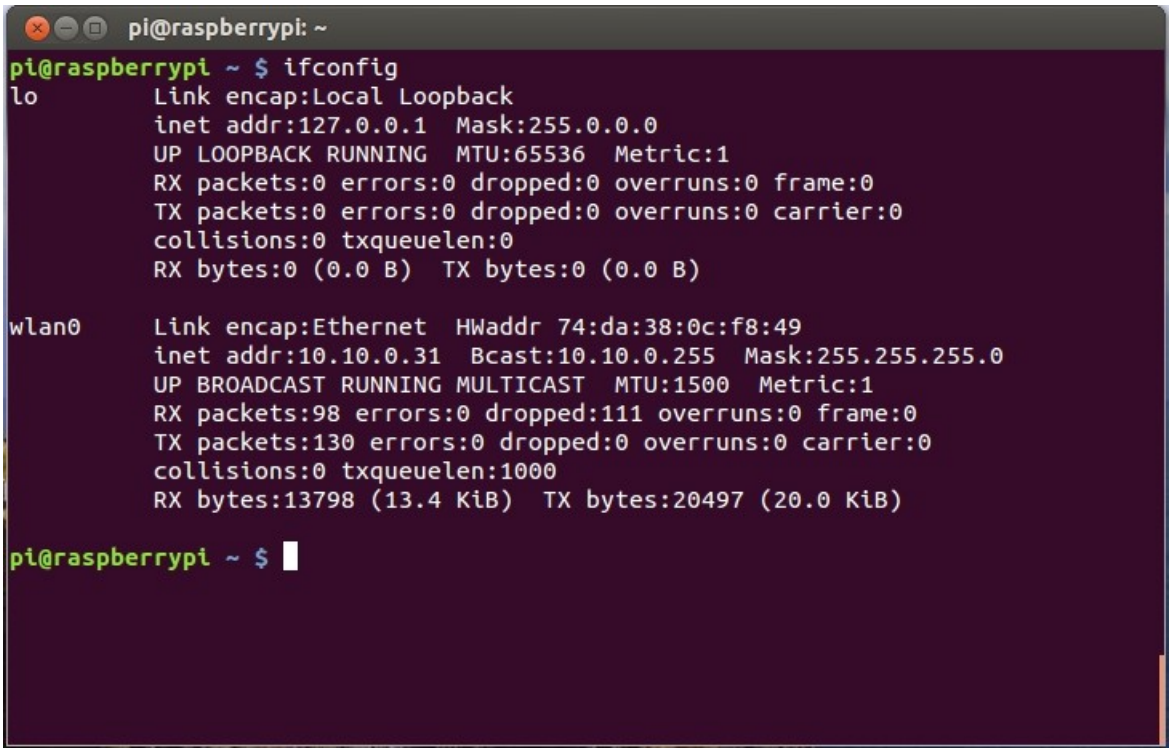
pi@raspberrypi: ~

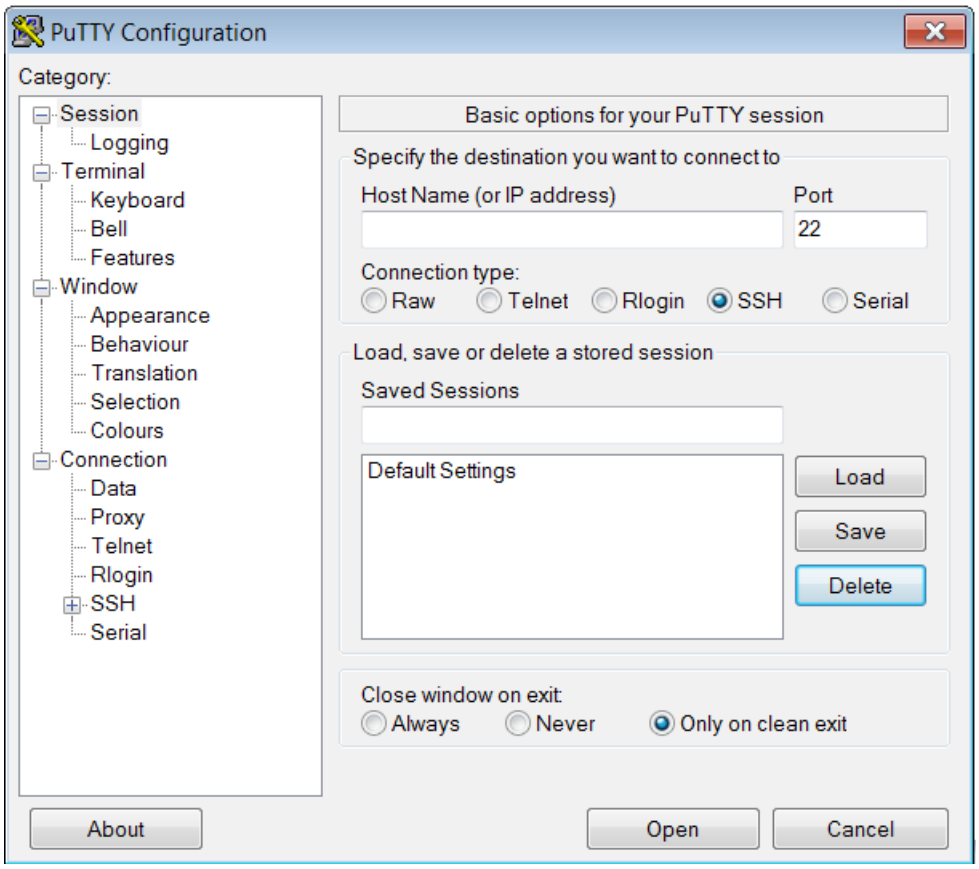
```
  GNU nano 2.2.6    File: /etc/wpa_supplicant/wpa_supplicant.conf

ctrl_interface=DIR=/var/run/wpa_supplicant GROUP=netdev
update_config=1

network={
        ssid="RoboPi"
        psk="12345678"
}

                              [ Read 7 lines ]
^G Get Help  ^O WriteOut  ^R Read File ^Y Prev Page ^K Cut Text  ^C Cur Pos
^X Exit      ^J Justify   ^W Where Is  ^V Next Page ^U UnCut Text^T To Spell
```

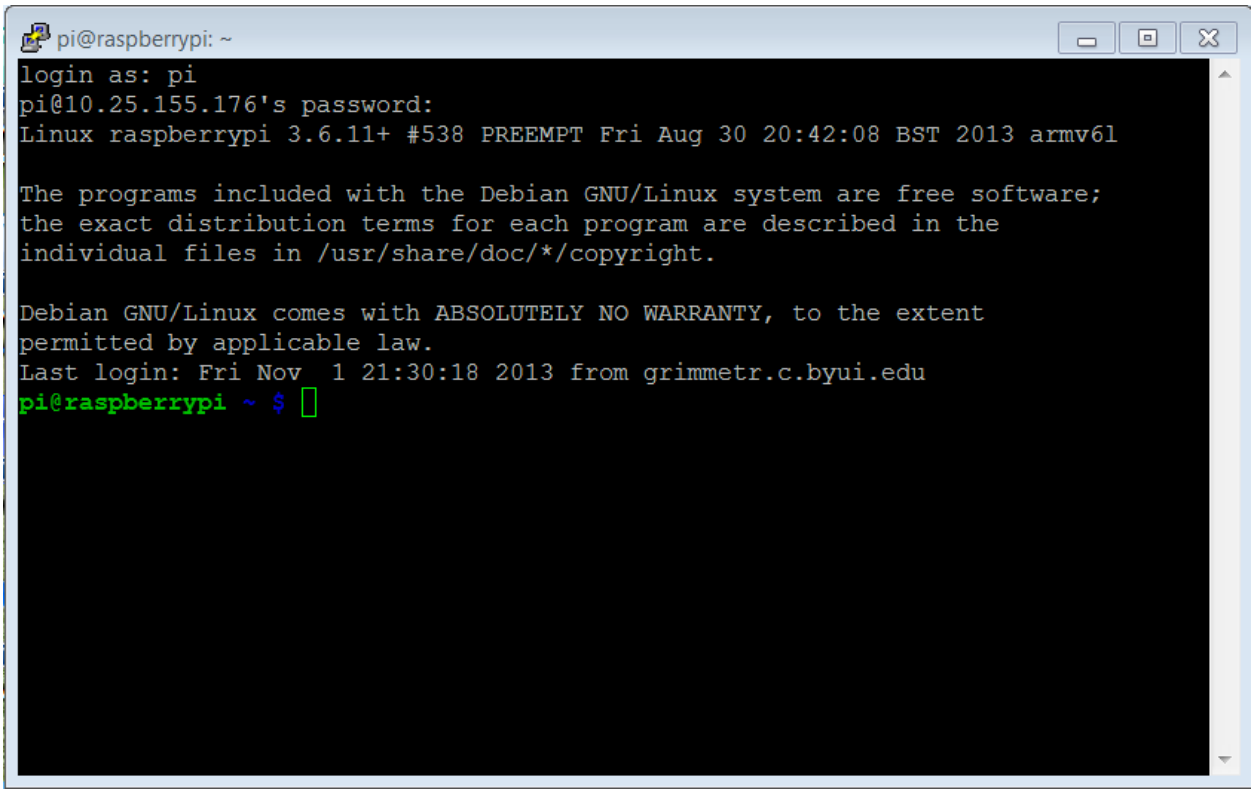

20 %
19:01

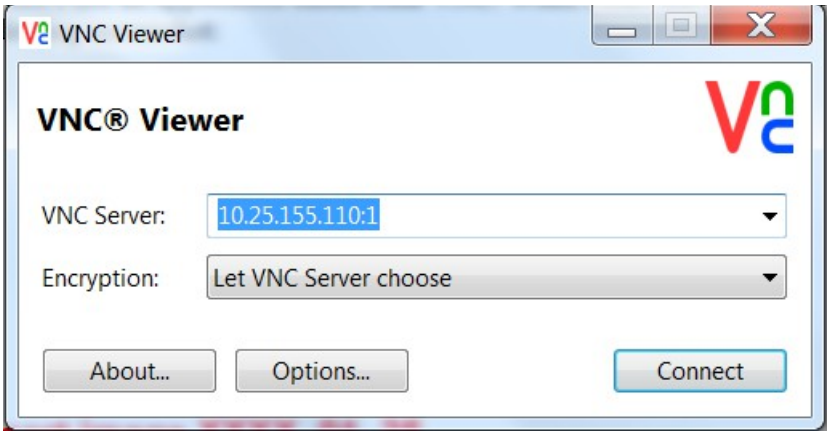

SABRENT

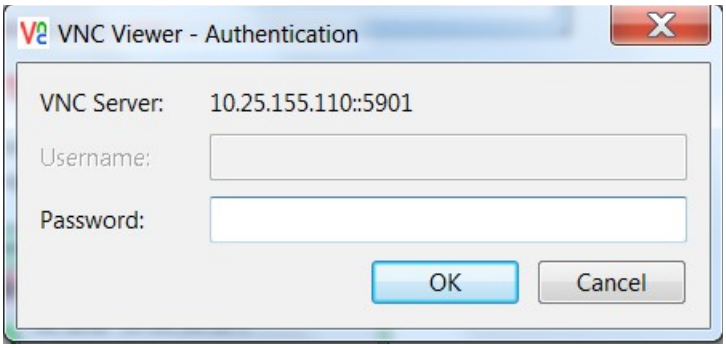

pi@raspberrypi: ~
File Edit Tabs Help
pi@raspberrypi:~ $ ifconfig
eth0 Link encap:Ethernet HWaddr 00:00:00:00:07:21
inet addr:157.201.194.172 Bcast:157.201.194.255 Mask:255.255.255.128
inet6 addr: fe80::a3c3:1080:10e:b694/64 Scope:Link
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
RX packets:1556286 errors:0 dropped:5942 overruns:0 frame:0
TX packets:1713047 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:647052533 (617.0 MiB) TX bytes:736168171 (702.0 MiB)
lo Link encap:Local Loopback
inet addr:127.0.0.1 Mask:255.0.0.0
inet6 addr: ::1/128 Scope:Host
UP LOOPBACK RUNNING MTU:65536 Metric:1
RX packets:200 errors:0 dropped:0 overruns:0 frame:0
TX packets:200 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:0
RX bytes:16656 (16.2 KiB) TX bytes:16656 (16.2 KiB)
pi@raspberrypi:~ $

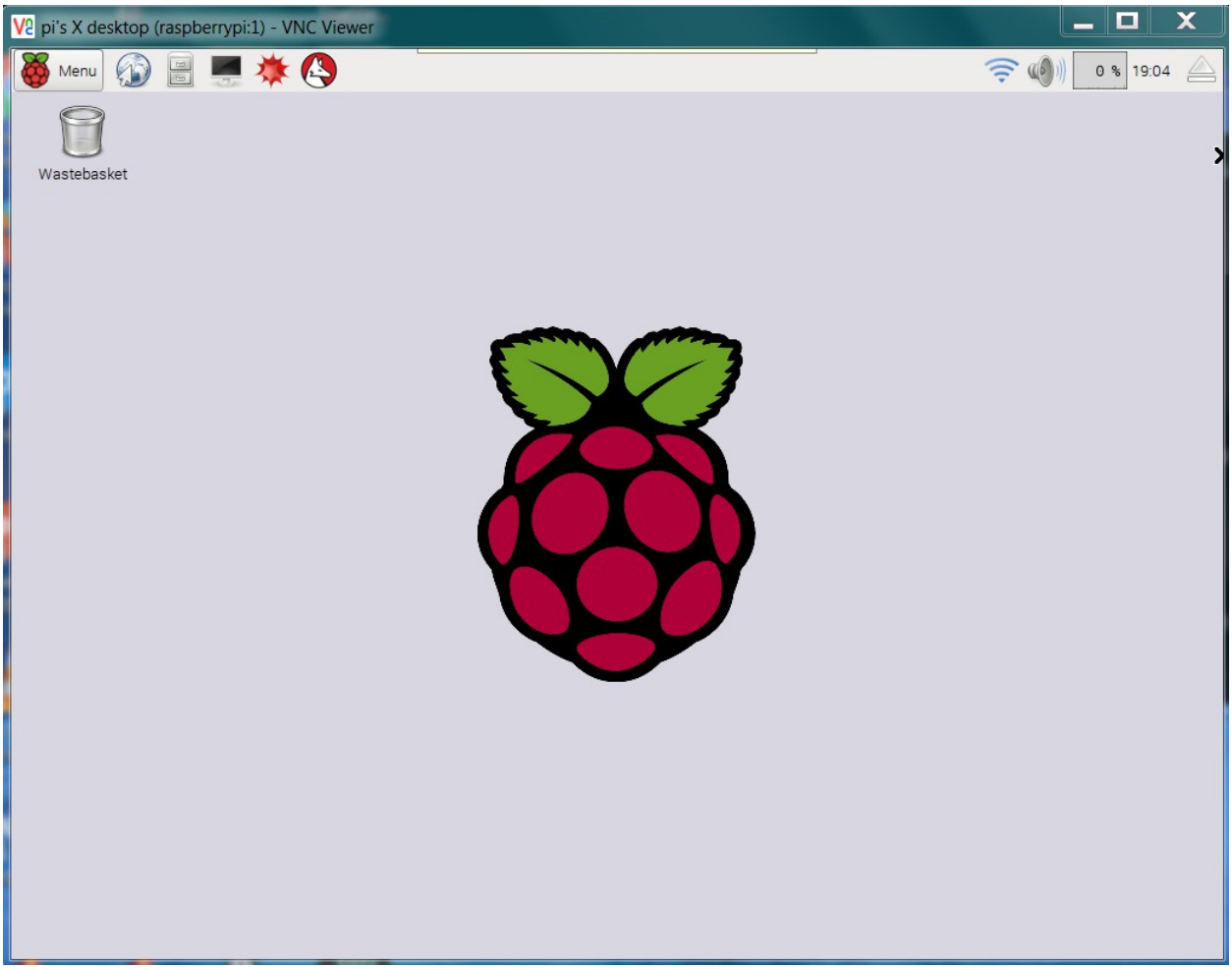

pi@raspberrypi: ~
pi@raspberrypi ~ $ ifconfig
lo Link encap:Local Loopback
inet addr:127.0.0.1 Mask:255.0.0.0
UP LOOPBACK RUNNING MTU:65536 Metric:1
RX packets:0 errors:0 dropped:0 overruns:0 frame:0
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:0
RX bytes:0 (0.0 B) TX bytes:0 (0.0 B)
wlan0 Link encap:Ethernet HWaddr 74:da:38:0c:f8:49
inet addr:10.10.0.31 Bcast:10.10.0.255 Mask:255.255.255.0
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
RX packets:98 errors:0 dropped:111 overruns:0 frame:0
TX packets:130 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:13798 (13.4 KiB) TX bytes:20497 (20.0 KiB)
pi@raspberrypi ~ $

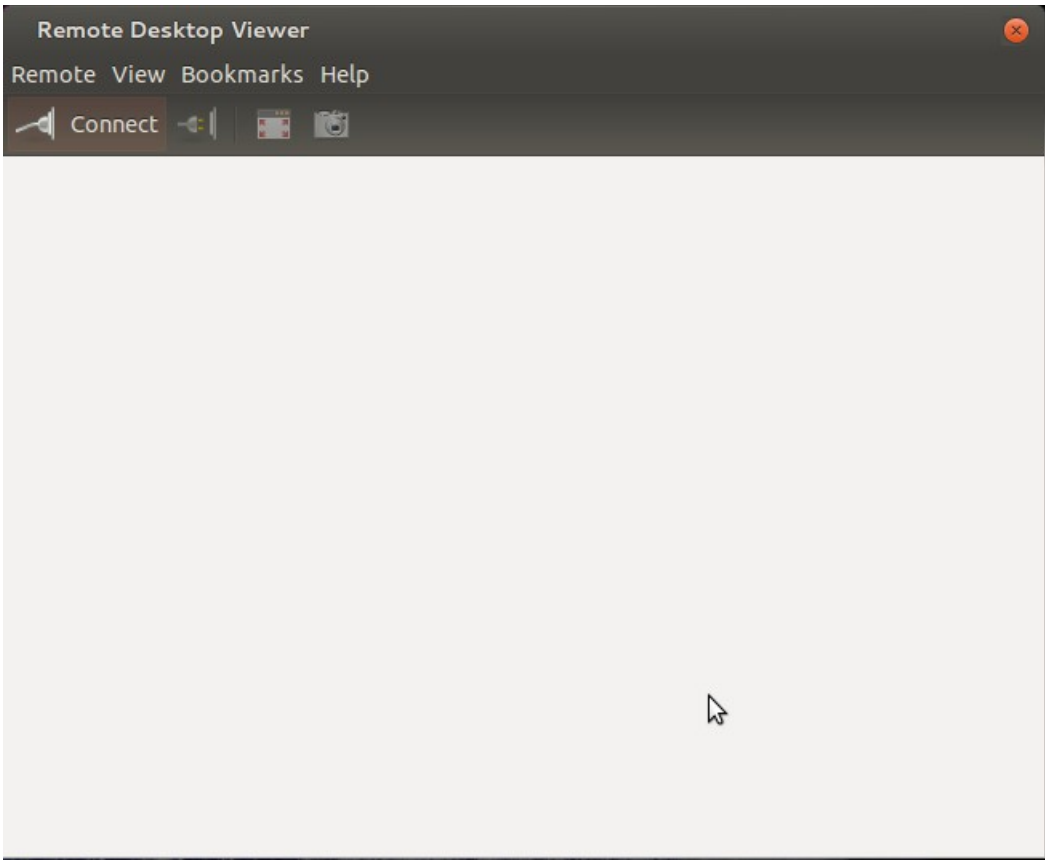

PuTTY Configuration
Category:
Session
Logging
Terminal
Keyboard
Bell
Features
Window
Appearance
Behaviour
Translation
Selection
Colours
Connection
Data
Proxy
Telnet
Rlogin
SSH
Serial
Basic options for your PuTTY session
Specify the destination you want to connect to
Host Name (or IP address)
Port
22
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
Open
Cancel

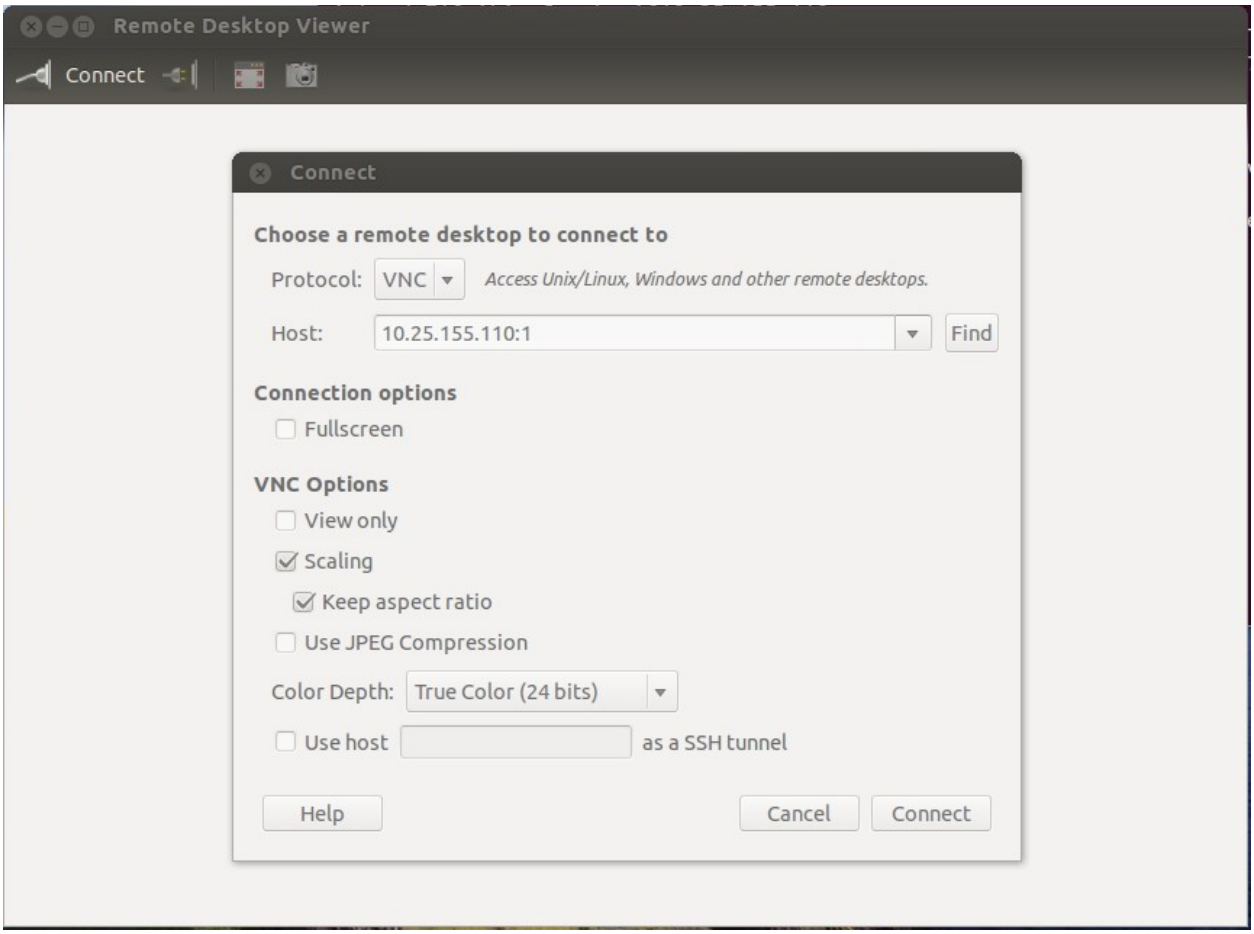

pi@raspberrypi: ~
login as: pi
pi@10.25.155.176's password:
Linux raspberrypi 3.6.11+ #538 PREEMPT Fri Aug 30 20:42:08 BST 2013 armv6l
The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Fri Nov 1 21:30:18 2013 from grimmetr.c.byui.edu
pi@raspberrypi ~ $

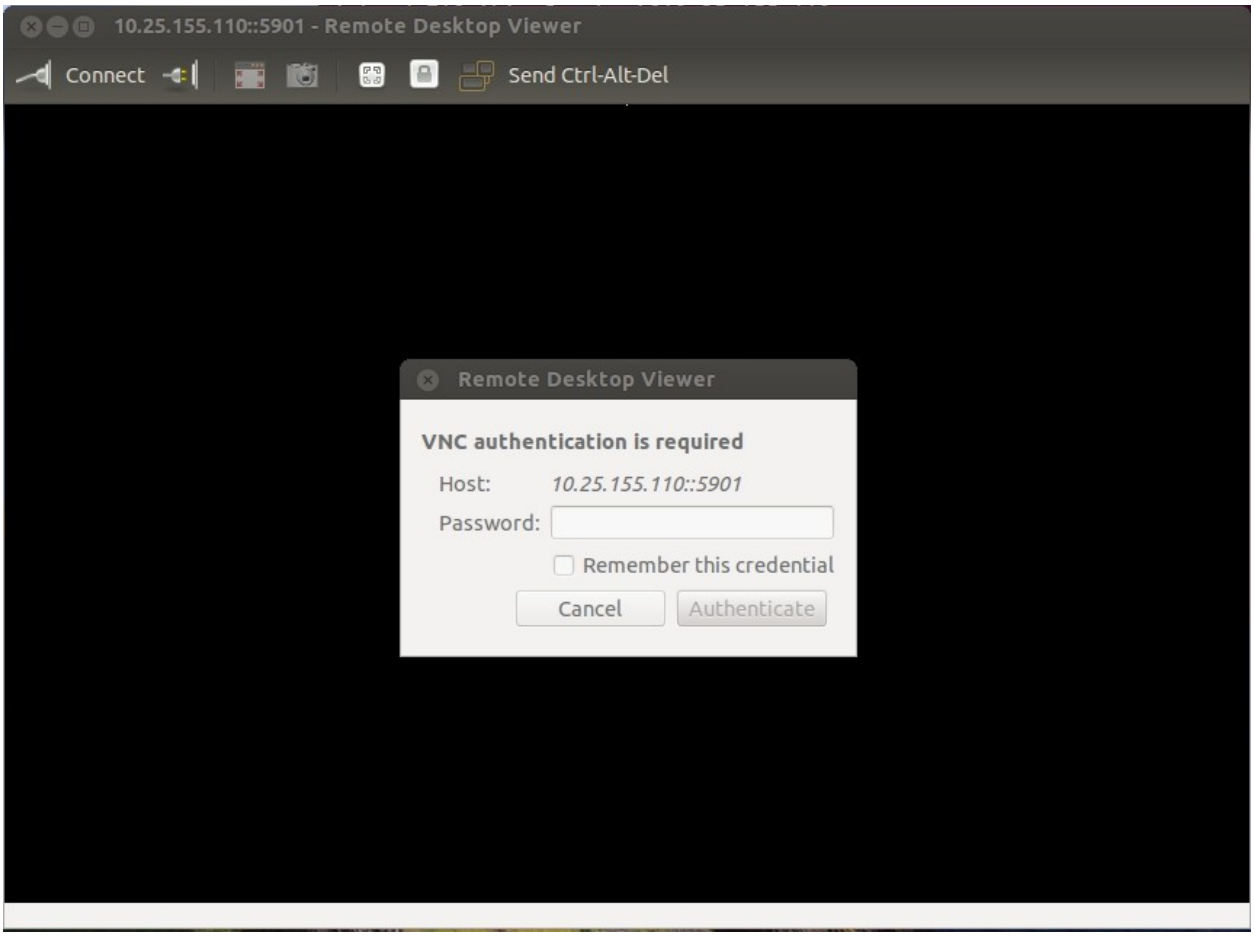

VNC Viewer
VNC® Viewer
VNC Server:
10.25.155.110:1
Encryption:
Let VNC Server choose
About...
Options...
Connect

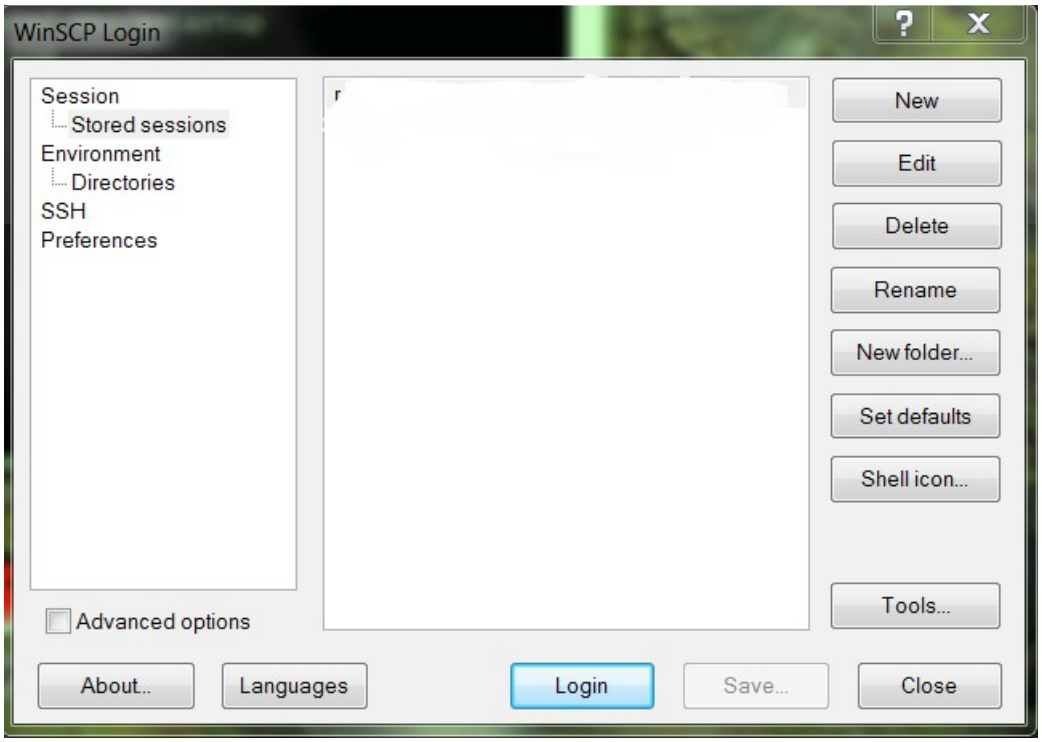

VNC Viewer - Authentication
VNC Server:
10.25.155.110::5901
Username:
Password:
OK
Cancel

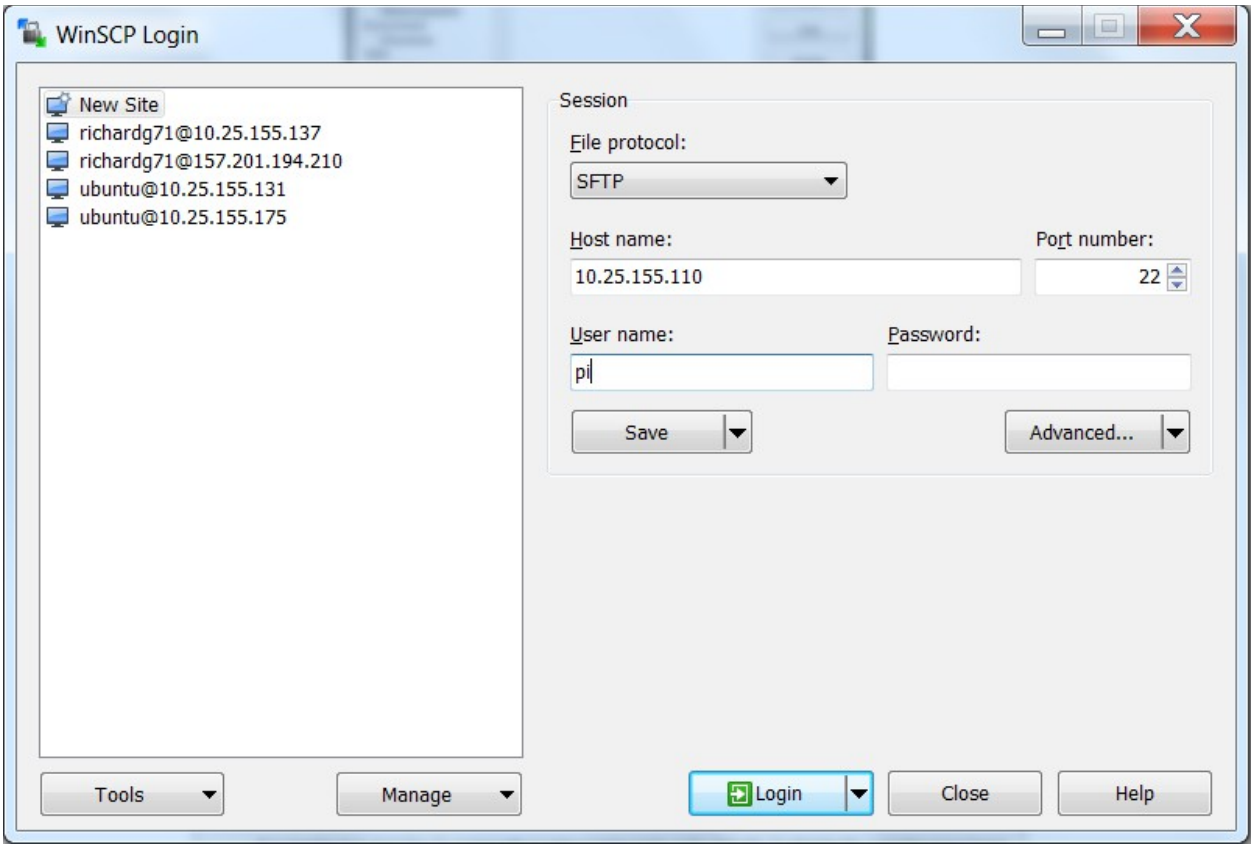

pi's X desktop (raspberrypi:1) - VNC Viewer
Menu
0 %
19:04
Wastebasket

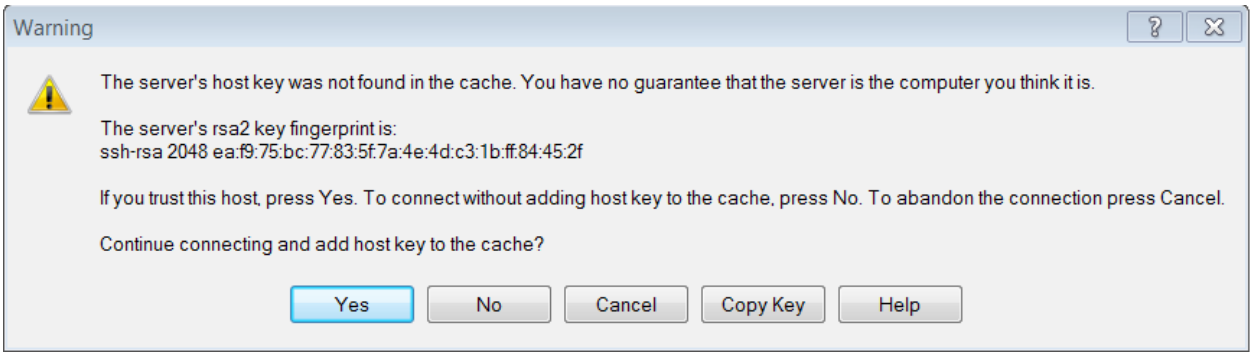

Remote Desktop Viewer
Remote View Bookmarks Help
Connect

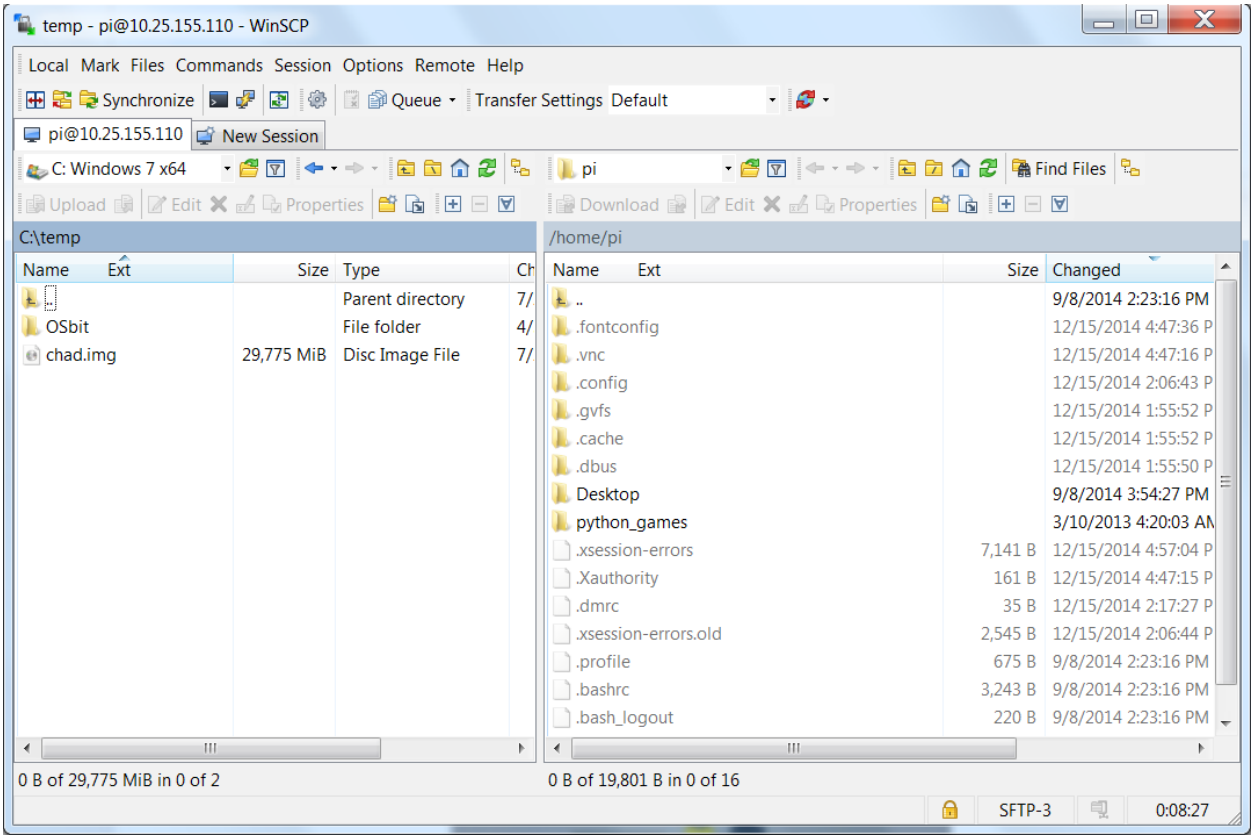

Remote Desktop Viewer
Connect
Connect
Choose a remote desktop to connect to
Protocol:
VNC
Access Unix/Linux, Windows and other remote desktops.
Host:
10.25.155.110:1
Find
Connection options
Fullscreen
VNC Options
View only
Scaling
Keep aspect ratio
Use JPEG Compression
Color Depth:
True Color (24 bits)
Use host
as a SSH tunnel
Help
Cancel
Connect

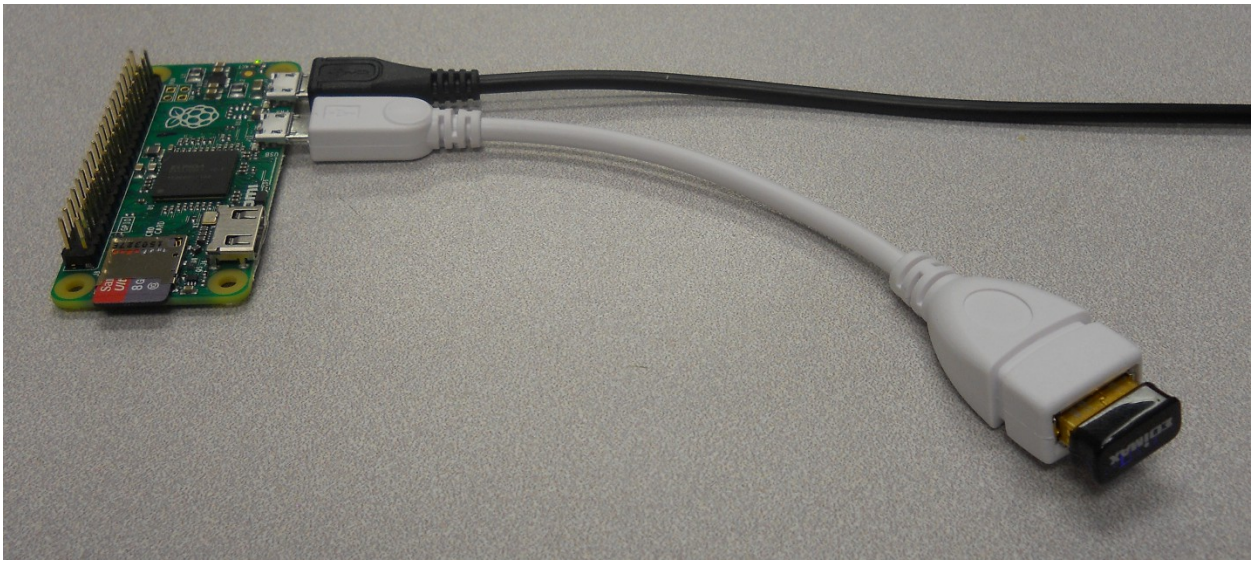

10.25.155.110::5901 - Remote Desktop Viewer
Connect
Send Ctrl-Alt-Del
Remote Desktop Viewer
VNC authentication is required
Host:
10.25.155.110::5901
Password:
Remember this credential
Cancel
Authenticate

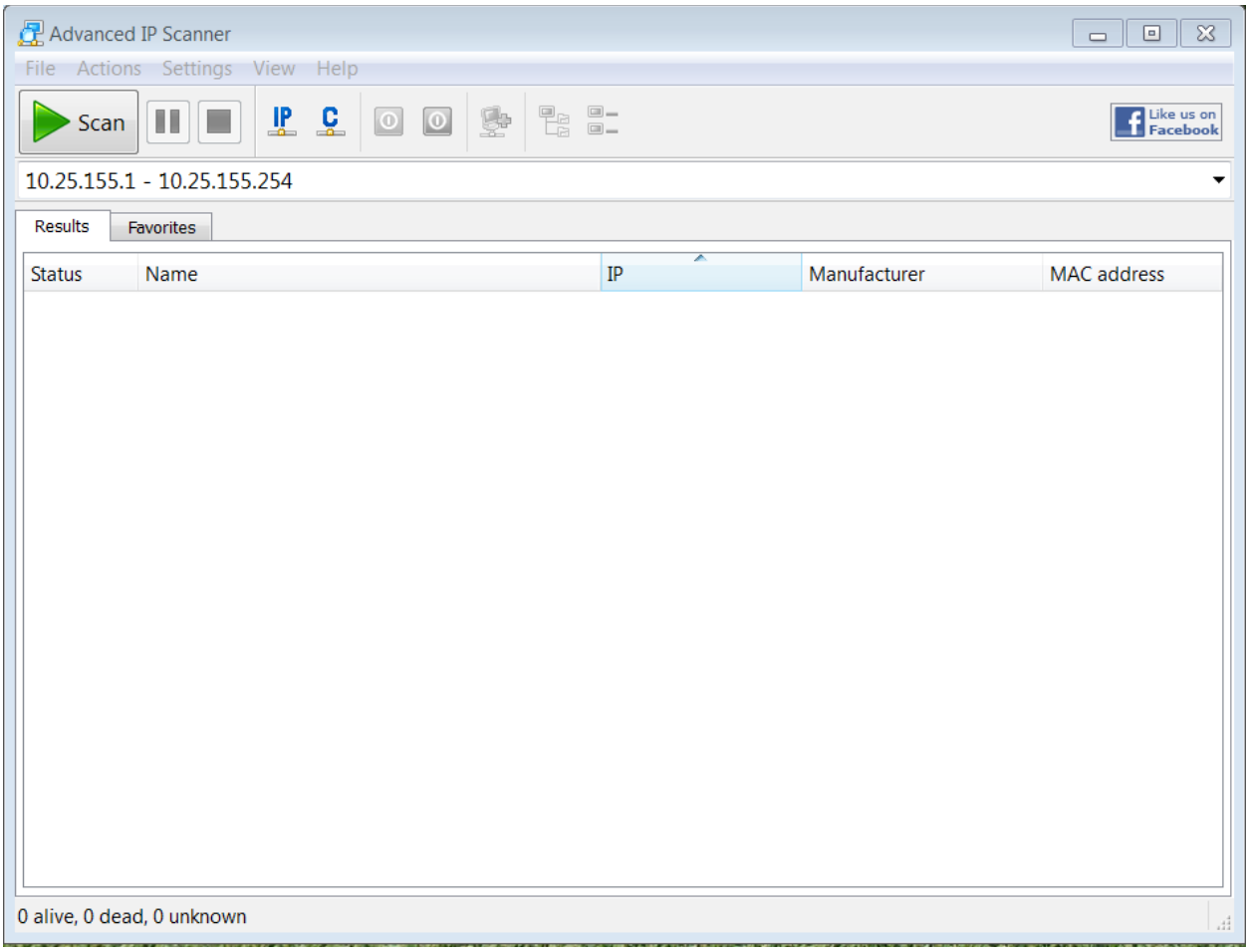

WinSCP Login
Session
Stored sessions
Environment
Directories
SSH
Preferences
New
Edit
Delete
Rename
New folder...
Set defaults
Shell icon...
Tools...
Advanced options
About...
Languages
Login
Save...
Close


WinSCP Login
New Site
richardg71@10.25.155.137
richardg71@157.201.194.210
ubuntu@10.25.155.131
ubuntu@10.25.155.175
Session
File protocol:
SFTP
Host name:
Port number:
10.25.155.110
22
User name:
Password:
pi
Save
Advanced...
Tools
Manage
Login
Close
Help

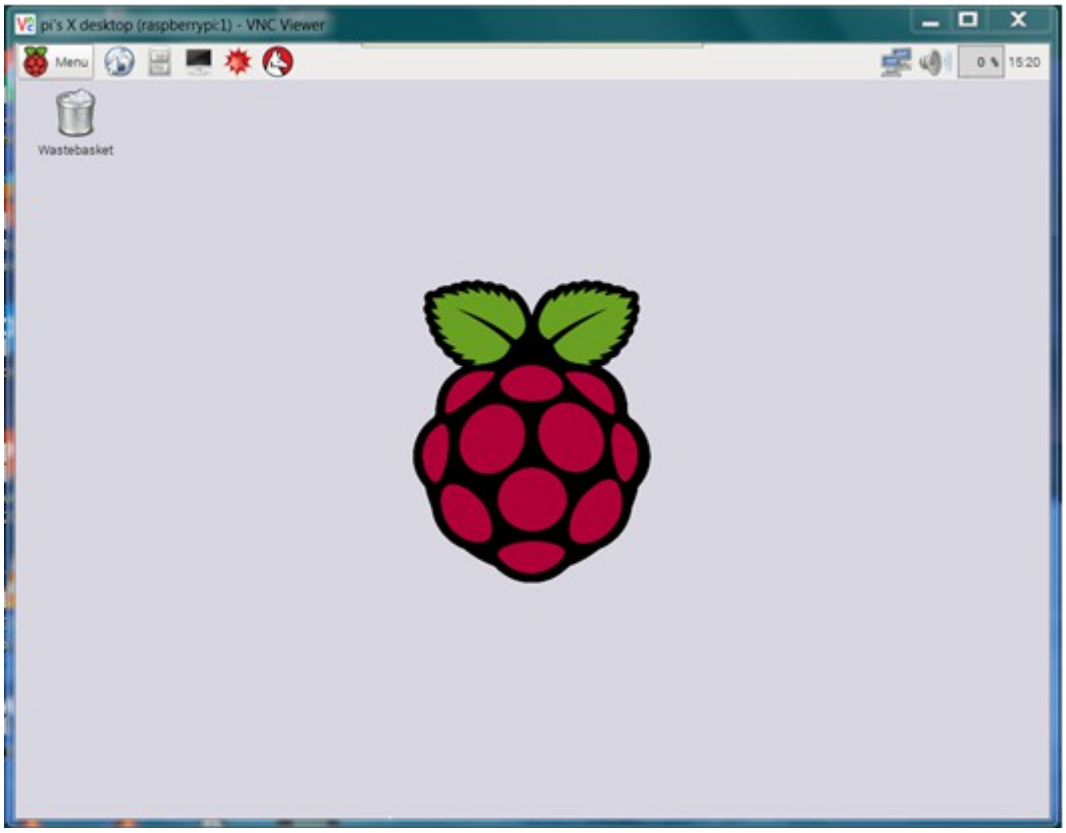

Warning
The server's host key was not found in the cache. You have no guarantee that the server is the computer you think it is.
The server's rsa2 key fingerprint is:
ssh-rsa 2048 ea:f9:75:bc:77:83:5f:7a:4e:4d:c3:1b:ff:84:45:2f
If you trust this host, press Yes. To connect without adding host key to the cache, press No. To abandon the connection press Cancel.
Continue connecting and add host key to the cache?
Yes
No
Cancel
Copy Key
Help

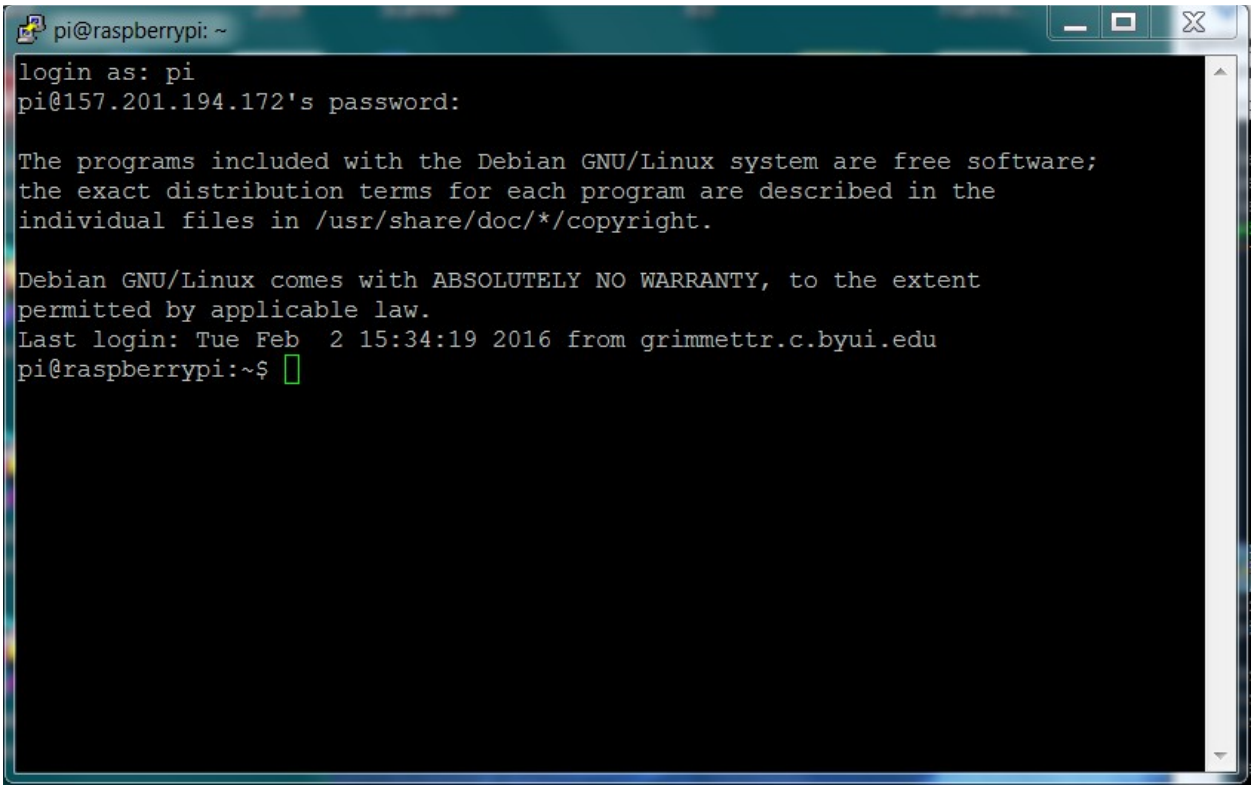

temp - pi@10.25.155.110 - WinSCP
Local Mark Files Commands Session Options Remote Help
Synchronize
Queue
Transfer Settings Default
pi@10.25.155.110
New Session
C: Windows 7 x64
pi
Find Files
Upload
Edit
Properties
Download
Edit
Properties
C:\temp
Name Ext Size Type Ch
Parent directory 7/
OSbit File folder 4/
chad.img 29,775 MiB Disc Image File 7/
/home/pi
Name Ext Size Changed
.. 9/8/2014 2:23:16 PM
.fontconfig 12/15/2014 4:47:36 P
.vnc 12/15/2014 4:47:16 P
.config 12/15/2014 2:06:43 P
.gvfs 12/15/2014 1:55:52 P
.cache 12/15/2014 1:55:52 P
.dbus 12/15/2014 1:55:50 P
Desktop 9/8/2014 3:54:27 PM
python_games 3/10/2013 4:20:03 AM
.xsession-errors 7,141 B 12/15/2014 4:57:04 P
.Xauthority 161 B 12/15/2014 4:47:15 P
.dmrc 35 B 12/15/2014 2:17:27 P
.xsession-errors.old 2,545 B 12/15/2014 2:06:44 P
.profile 675 B 9/8/2014 2:23:16 PM
.bashrc 3,243 B 9/8/2014 2:23:16 PM
.bash_logout 220 B 9/8/2014 2:23:16 PM
0 B of 29,775 MiB in 0 of 2
0 B of 19,801 B in 0 of 16
SFTP-3
0:08:27

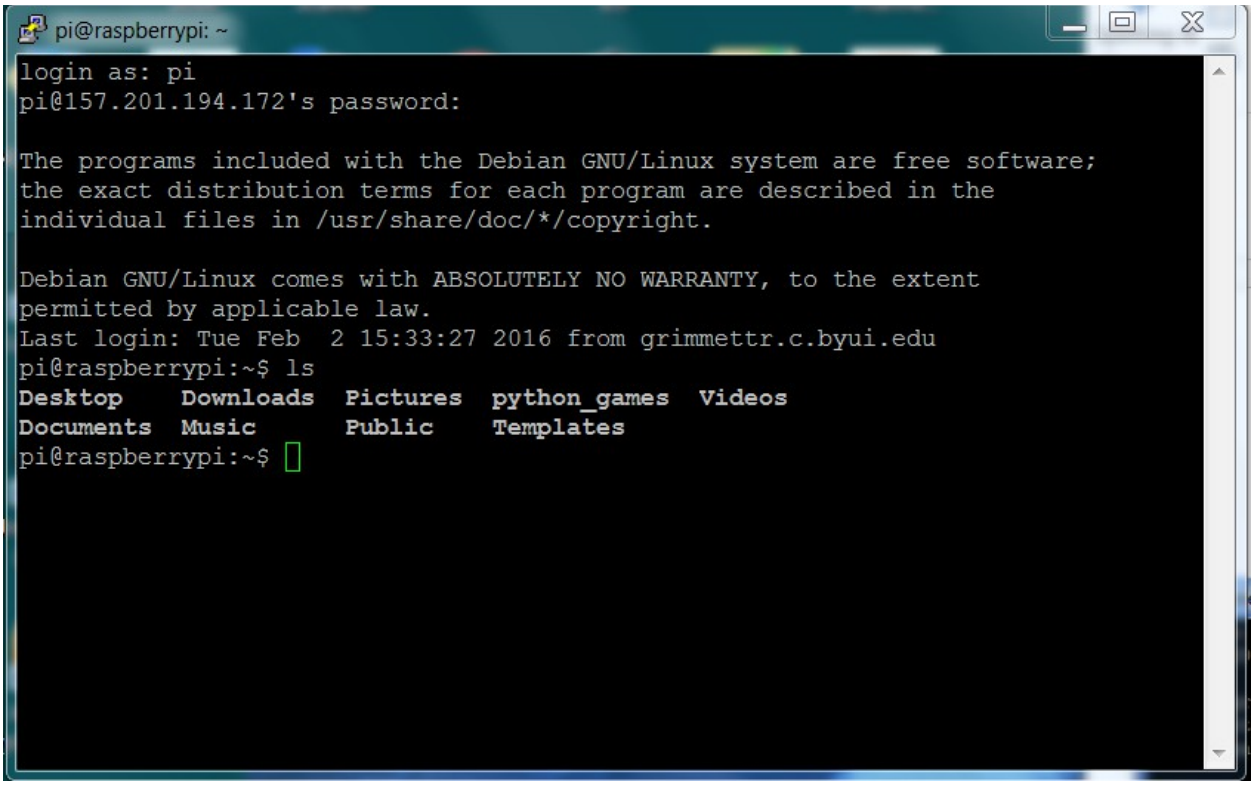


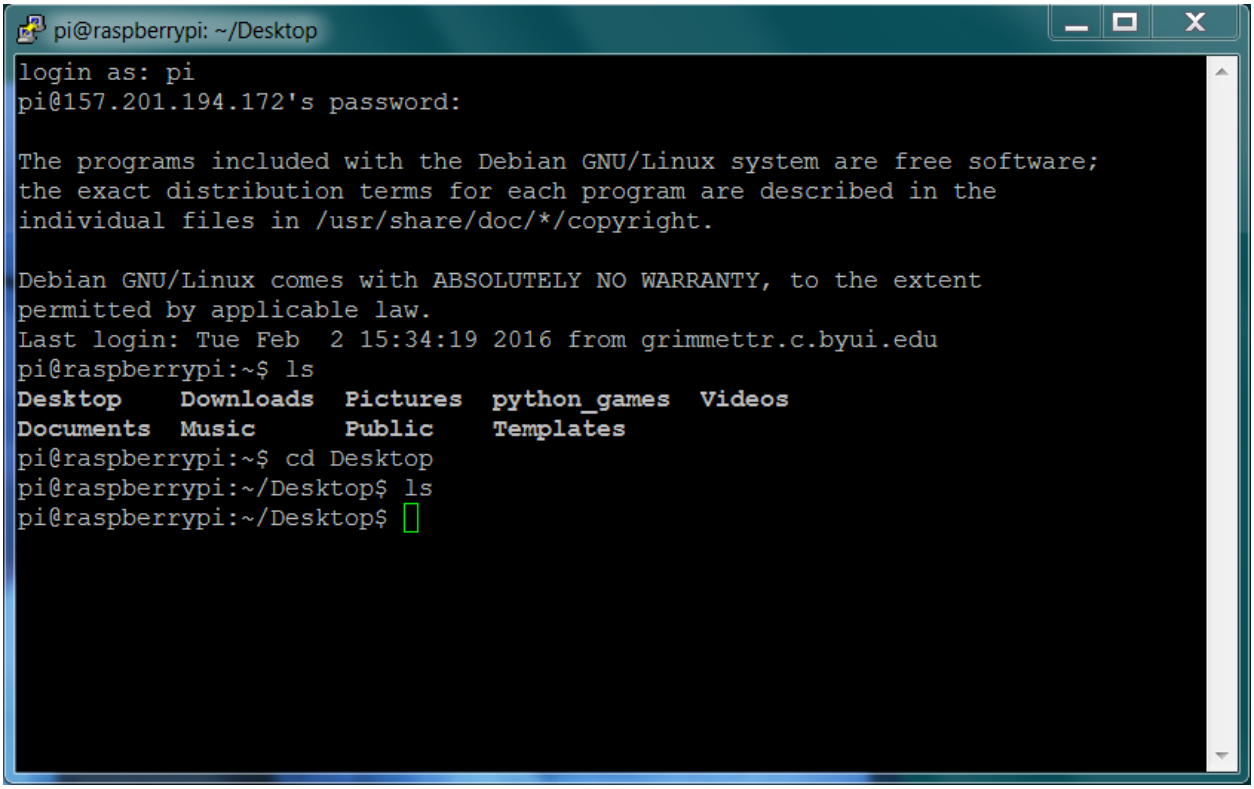

Advanced IP Scanner
File
Actions
Settings
View
Help
Scan
Like us on Facebook
10.25.155.1 - 10.25.155.254
Results
Favorites
Status
Name
IP
Manufacturer
MAC address
0 alive, 0 dead, 0 unknown

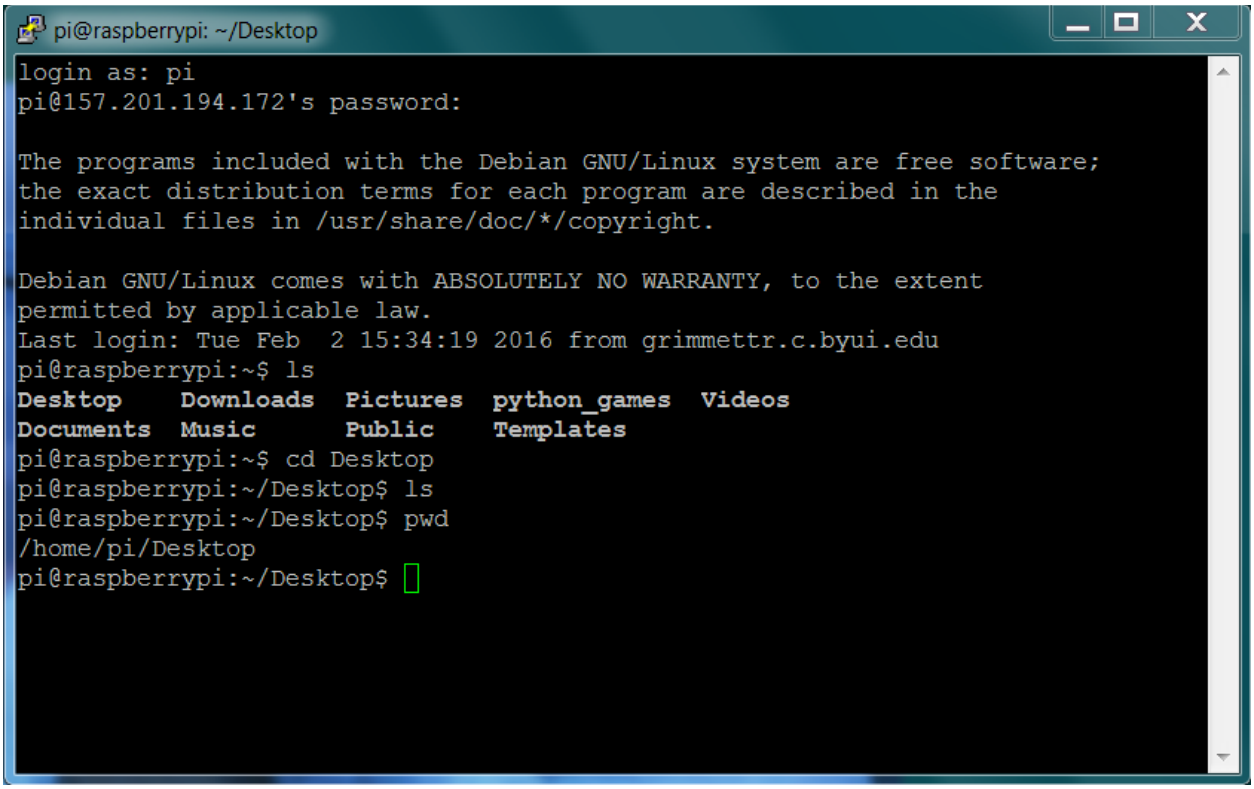
Chapter 2: Programming Raspberry Pi Zero






pi@raspberrypi: ~
login as: pi
pi@157.201.194.172's password:
The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Tue Feb 2 15:33:27 2016 from grimmettr.c.byui.edu
pi@raspberrypi:~$ ls
Desktop Downloads Pictures python_games Videos
Documents Music Public Templates
pi@raspberrypi:~$


pi@raspberrypi: ~/Desktop
login as: pi
pi@157.201.194.172's password:
The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Tue Feb 2 15:34:19 2016 from grimmettr.c.byui.edu
pi@raspberrypi:~$ ls
Desktop Downloads Pictures python_games Videos
Documents Music Public Templates
pi@raspberrypi:~$ cd Desktop
pi@raspberrypi:~/Desktop$ ls
pi@raspberrypi:~/Desktop$


pi@raspberrypi: ~/Desktop
login as: pi
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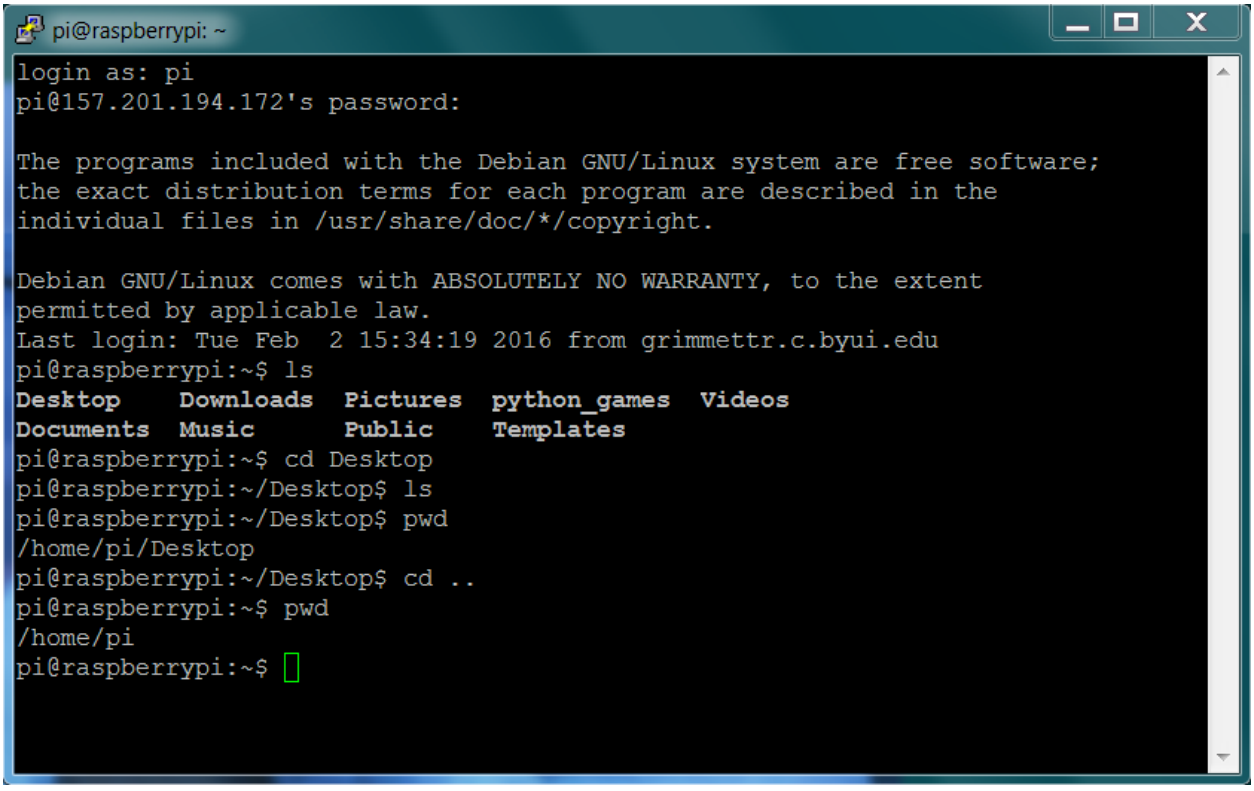
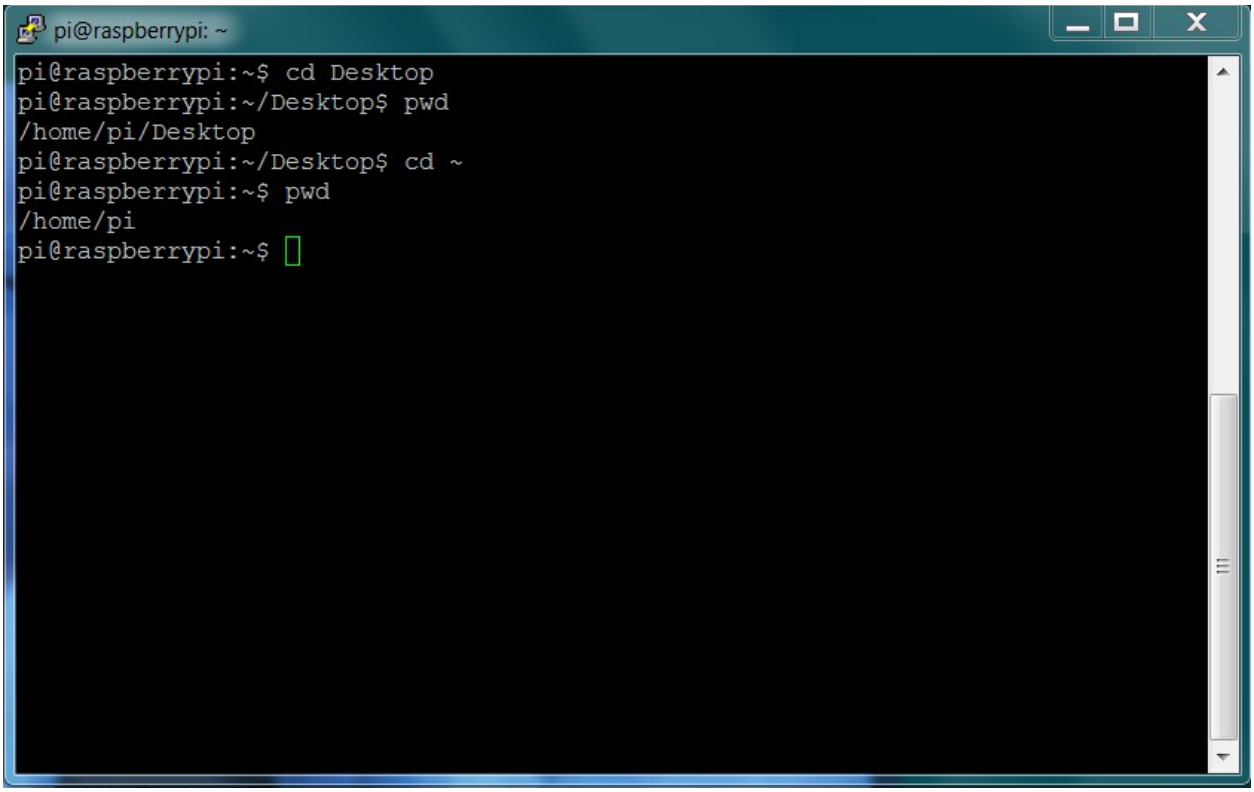
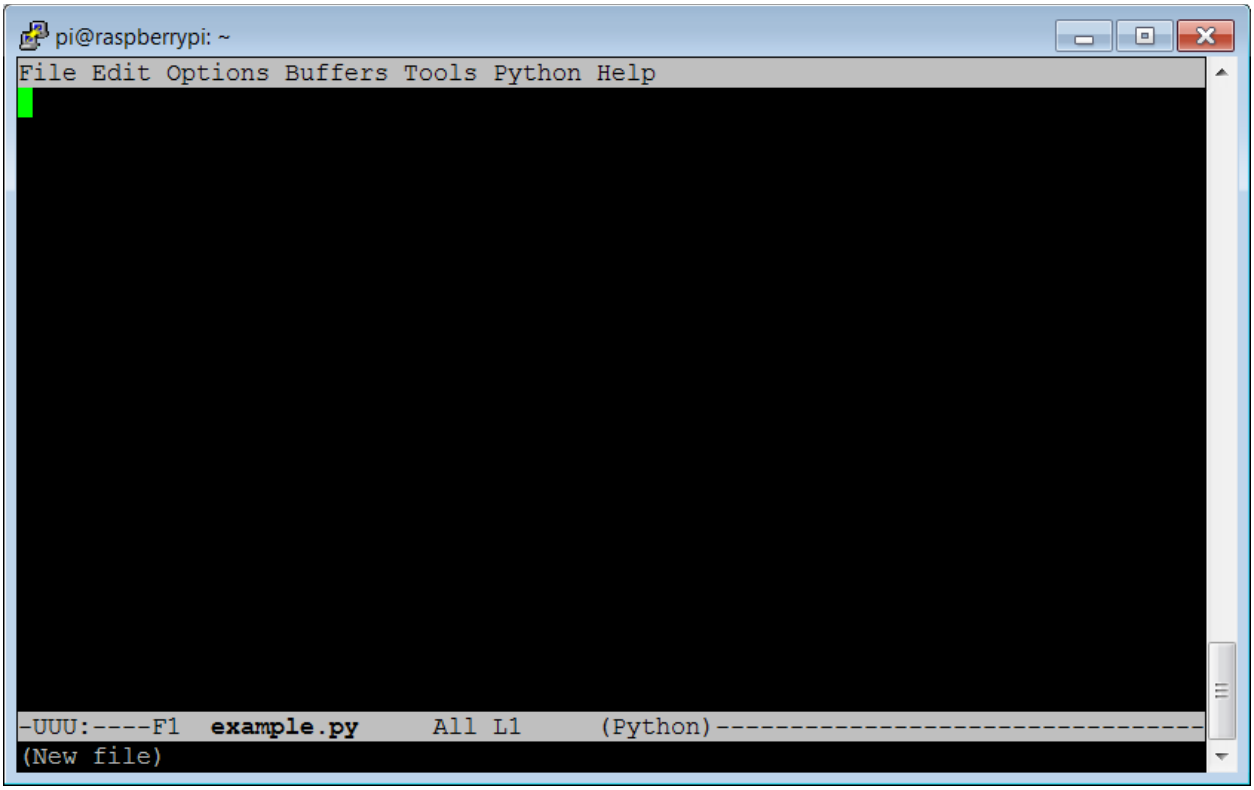
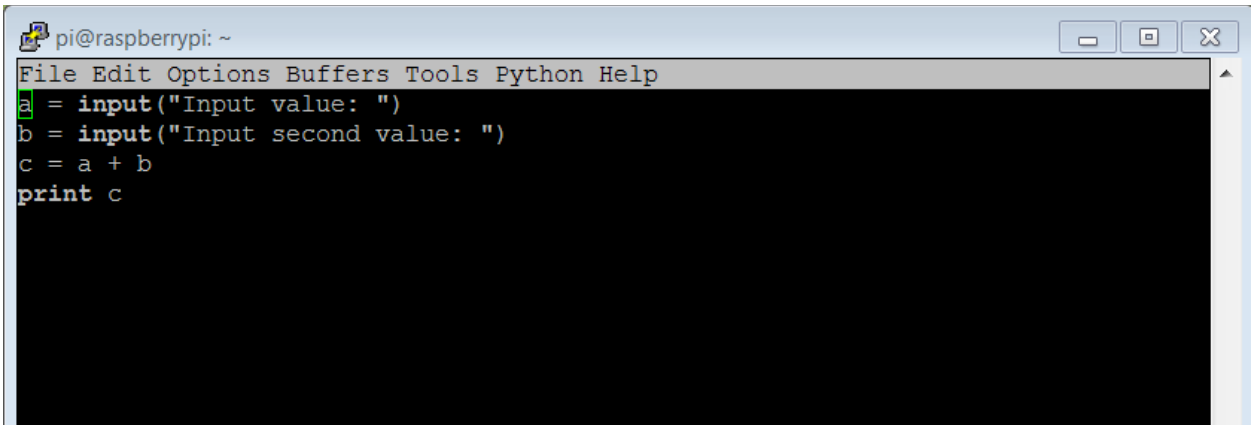
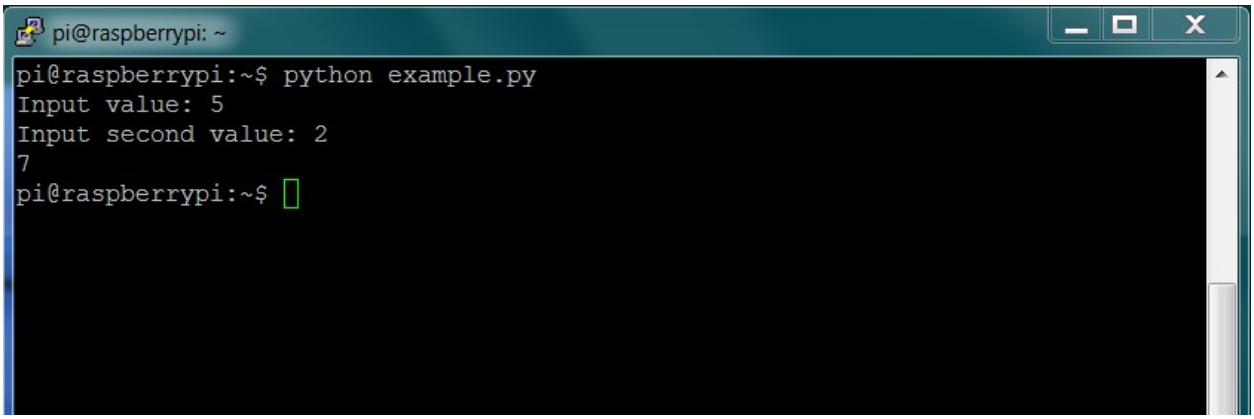
permitted by applicable law.
Last login: Tue Feb 2 15:34:19 2016 from grimmettr.c.byui.edu
pi@raspberrypi:~$ ls
Desktop Downloads Pictures python_games Videos
Documents Music Public Templates
pi@raspberrypi:~$ cd Desktop
pi@raspberrypi:~/Desktop$ ls
pi@raspberrypi:~/Desktop$ pwd
/home/pi/Desktop
pi@raspberrypi:~/Desktop$

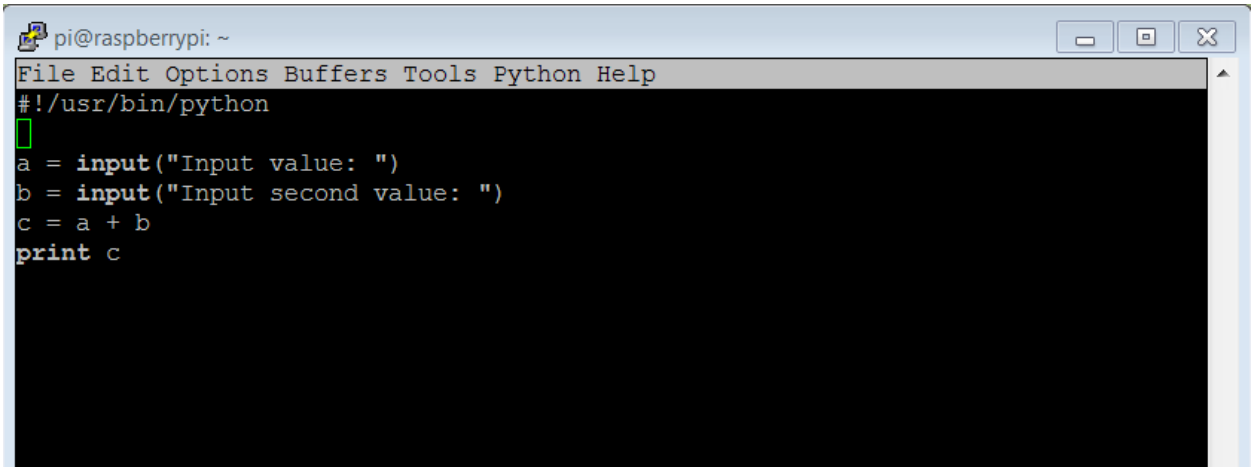

pi@raspberrypi: ~
login as: pi
pi@157.201.194.172's password:
The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Tue Feb 2 15:34:19 2016 from grimmettr.c.byui.edu
pi@raspberrypi:~$ ls
Desktop Downloads Pictures python_games Videos
Documents Music Public Templates
pi@raspberrypi:~$ cd Desktop
pi@raspberrypi:~/Desktop$ ls
pi@raspberrypi:~/Desktop$ pwd
/home/pi/Desktop
pi@raspberrypi:~/Desktop$ cd ..
pi@raspberrypi:~$ pwd
/home/pi
pi@raspberrypi:~$

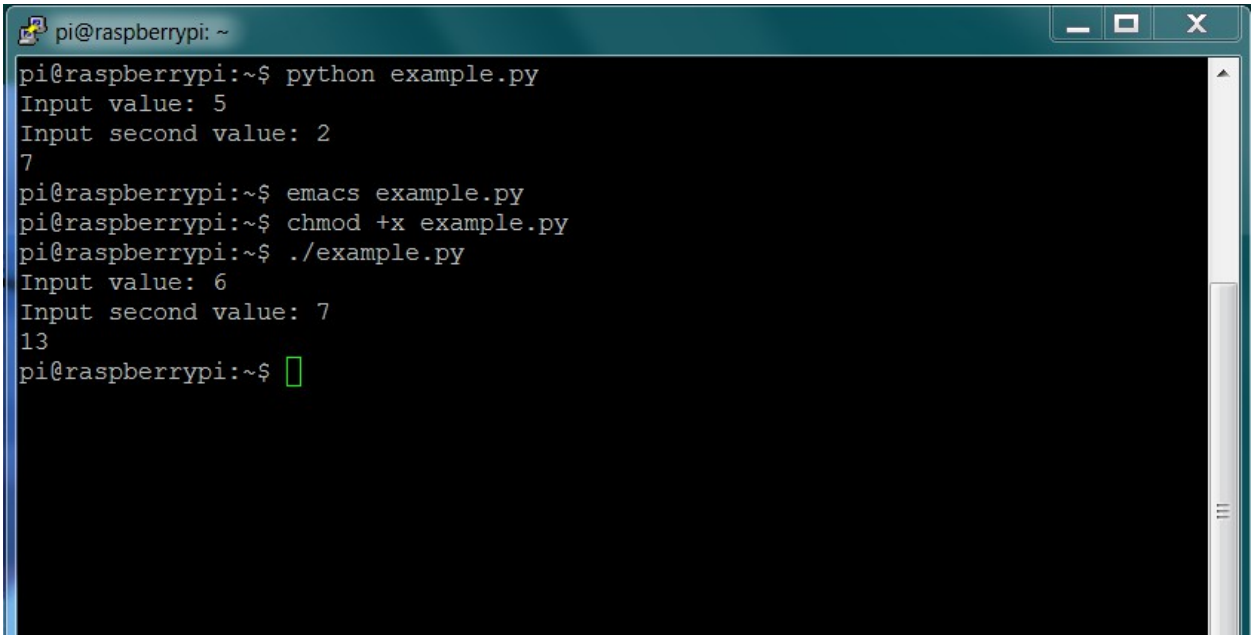

pi@raspberrypi: ~
pi@raspberrypi:~$ cd Desktop
pi@raspberrypi:~/Desktop$ pwd
/home/pi/Desktop
pi@raspberrypi:~/Desktop$ cd ~
pi@raspberrypi:~$ pwd
/home/pi
pi@raspberrypi:~$

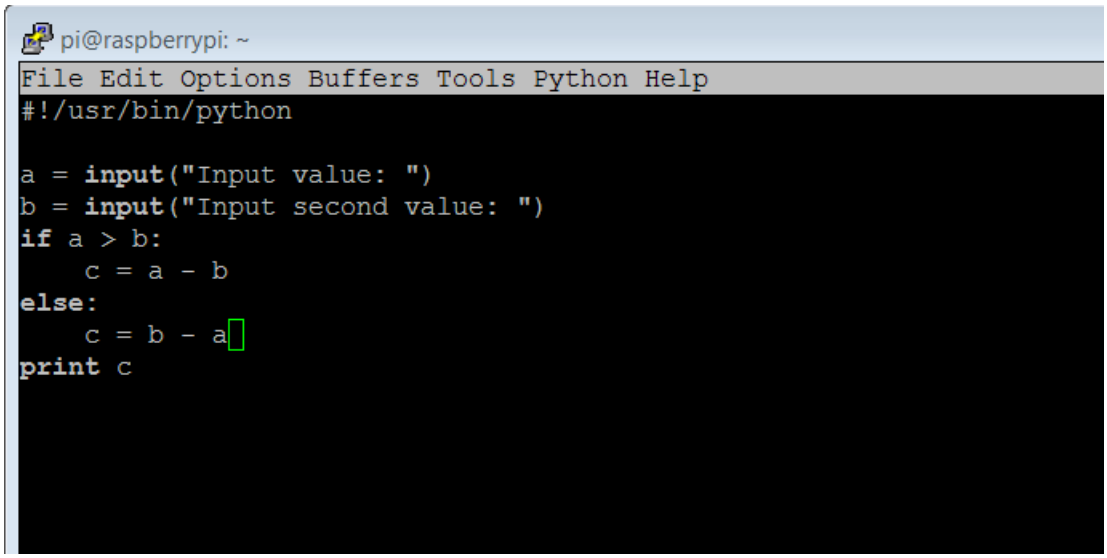

pi@raspberrypi: ~
File Edit Options Buffers Tools Python Help
-UUU:----F1 example.py All L1 (Python)----------
(New file)

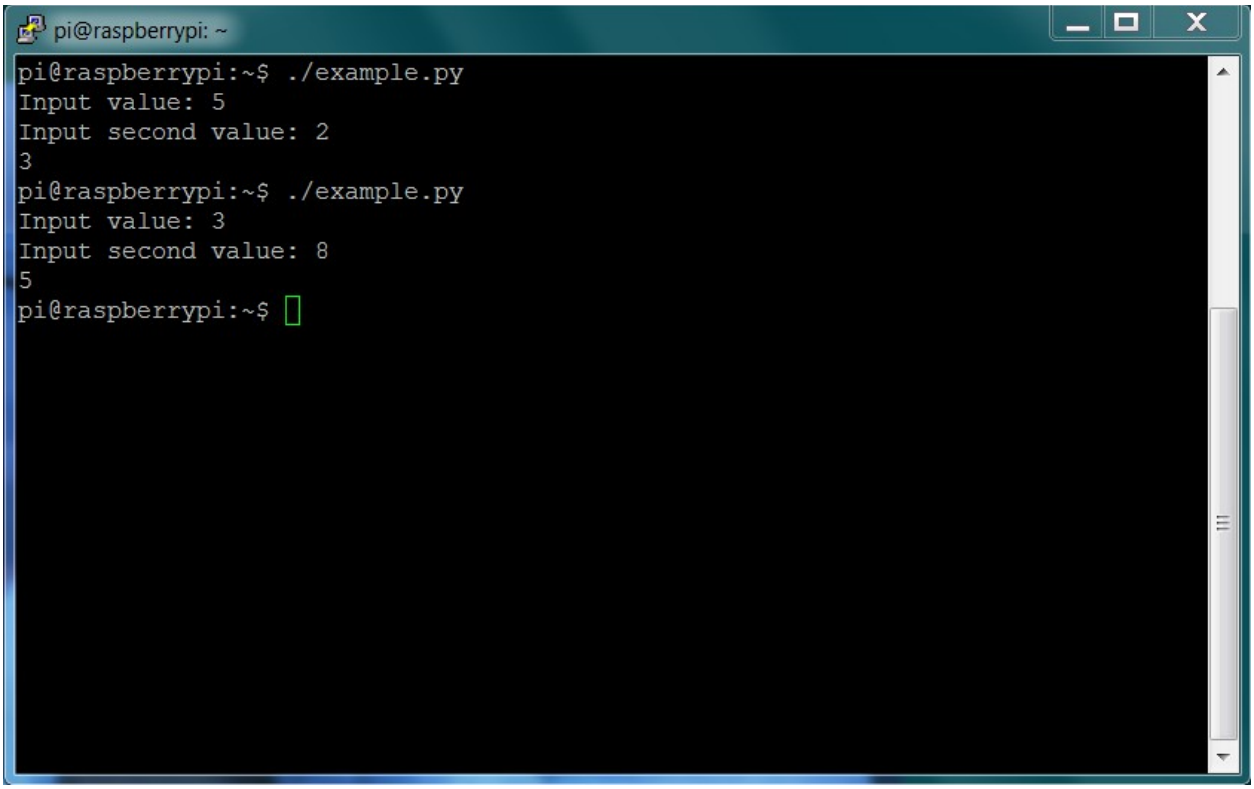

pi@raspberrypi: ~
File Edit Options Buffers Tools Python Help
a = input("Input value: ")
b = input("Input second value: ")
c = a + b
print c

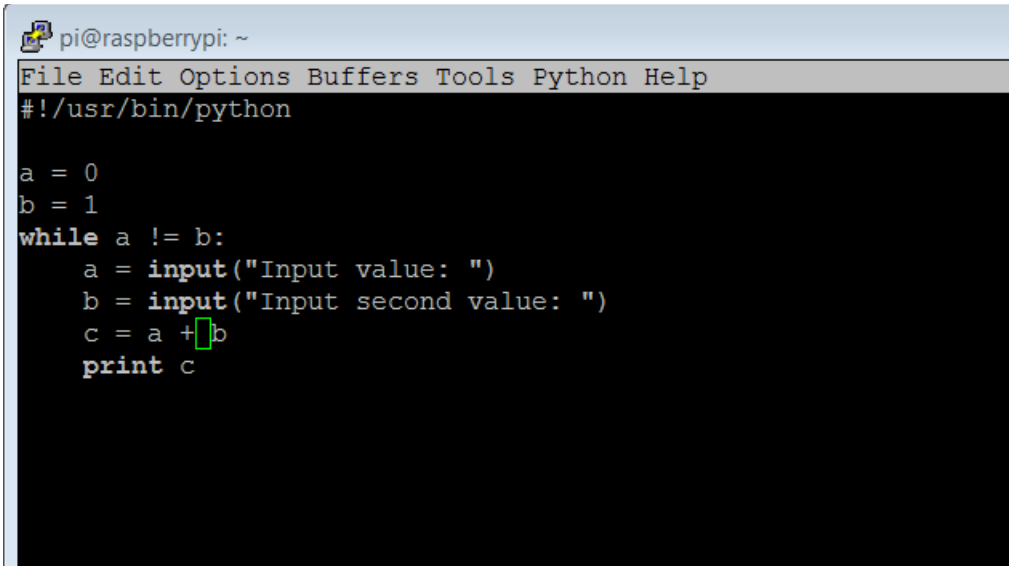

pi@raspberrypi: ~
pi@raspberrypi:~$ python example.py
Input value: 5
Input second value: 2
7
pi@raspberrypi:~$

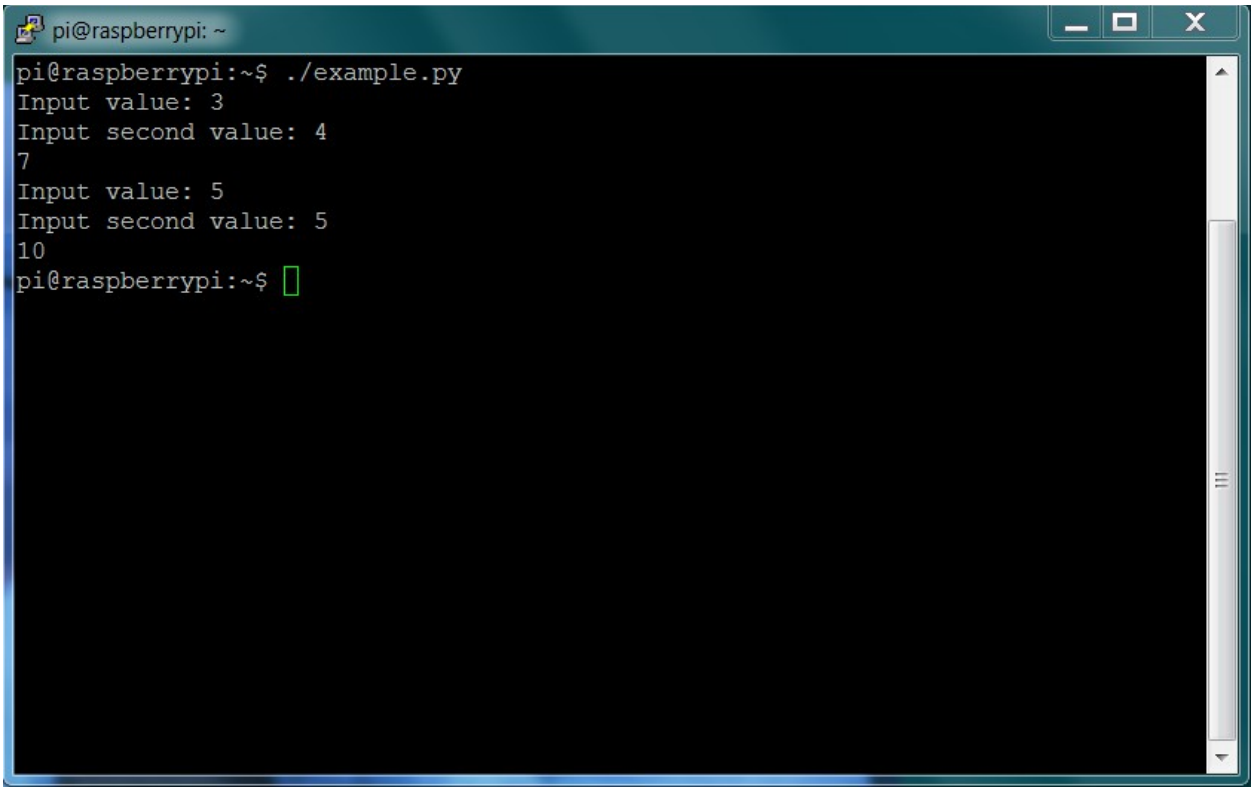

pi@raspberrypi: ~
File Edit Options Buffers Tools Python Help
#!/usr/bin/python
a = input("Input value: ")
b = input("Input second value: ")
c = a + b
print c

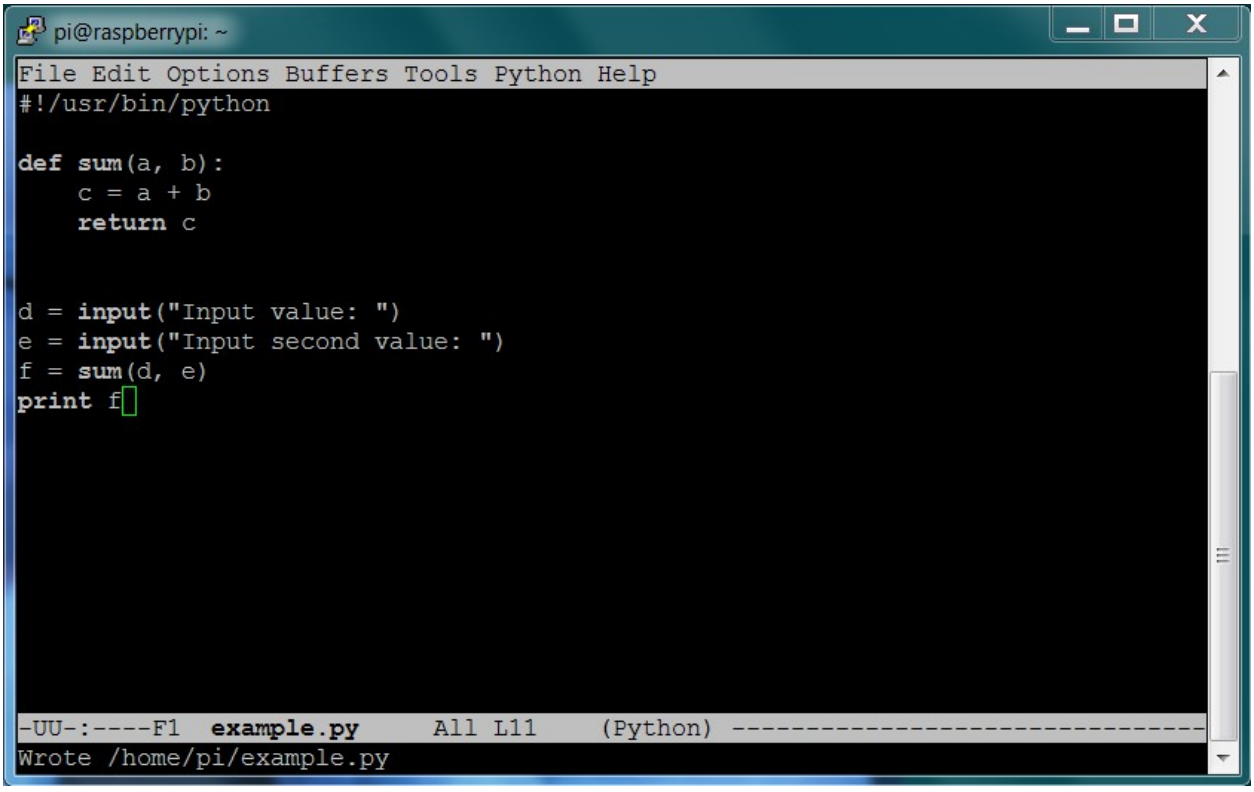

pi@raspberrypi: ~
pi@raspberrypi:~$ python example.py
Input value: 5
Input second value: 2
7
pi@raspberrypi:~$ emacs example.py
pi@raspberrypi:~$ chmod +x example.py
pi@raspberrypi:~$ ./example.py
Input value: 6
Input second value: 7
13
pi@raspberrypi:~$

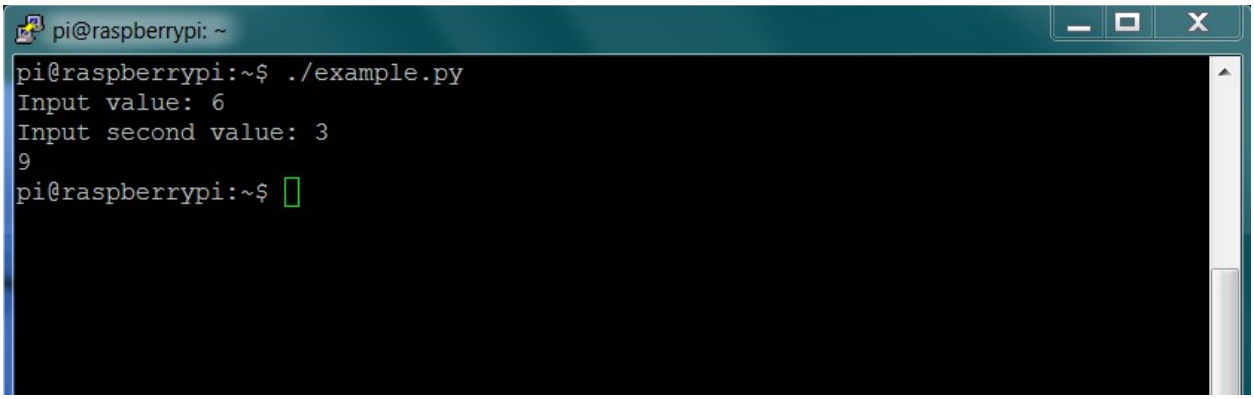

pi@raspberrypi: ~
File Edit Options Buffers Tools Python Help
#!/usr/bin/python
a = input("Input value: ")
b = input("Input second value: ")
if a > b:
c = a - b
else:
c = b - a
print c

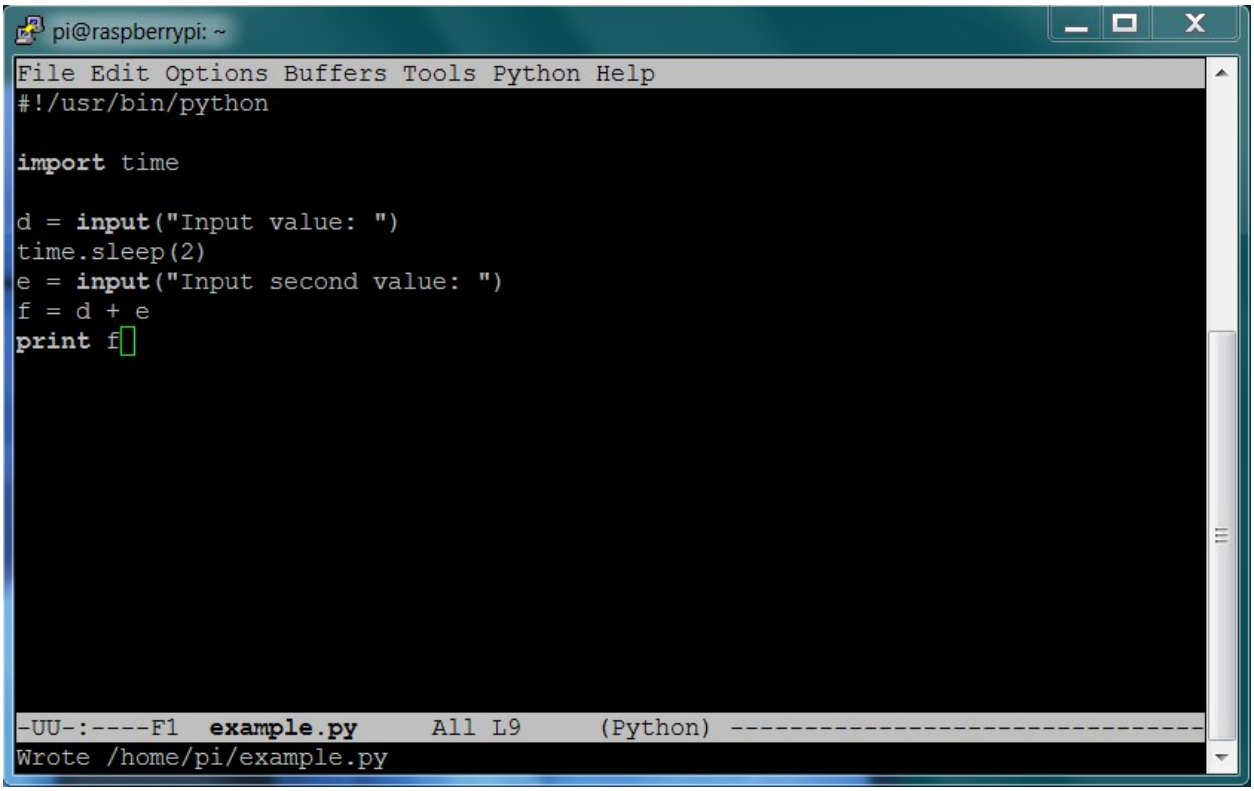

pi@raspberrypi: ~
pi@raspberrypi:~$ ./example.py
Input value: 5
Input second value: 2
3
pi@raspberrypi:~$ ./example.py
Input value: 3
Input second value: 8
5
pi@raspberrypi:~$

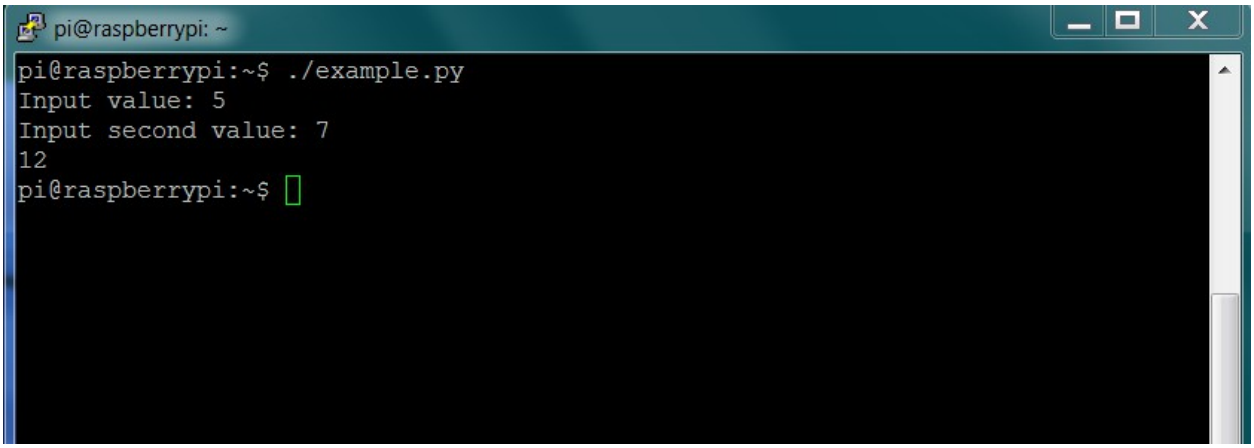

pi@raspberrypi: ~
File Edit Options Buffers Tools Python Help
#!/usr/bin/python
a = 0
b = 1
while a != b:
a = input("Input value: ")
b = input("Input second value: ")
c = a + b
print c


pi@raspberrypi: ~
pi@raspberrypi:~$ ./example.py
Input value: 3
Input second value: 4
7
Input value: 5
Input second value: 5
10
pi@raspberrypi:~$

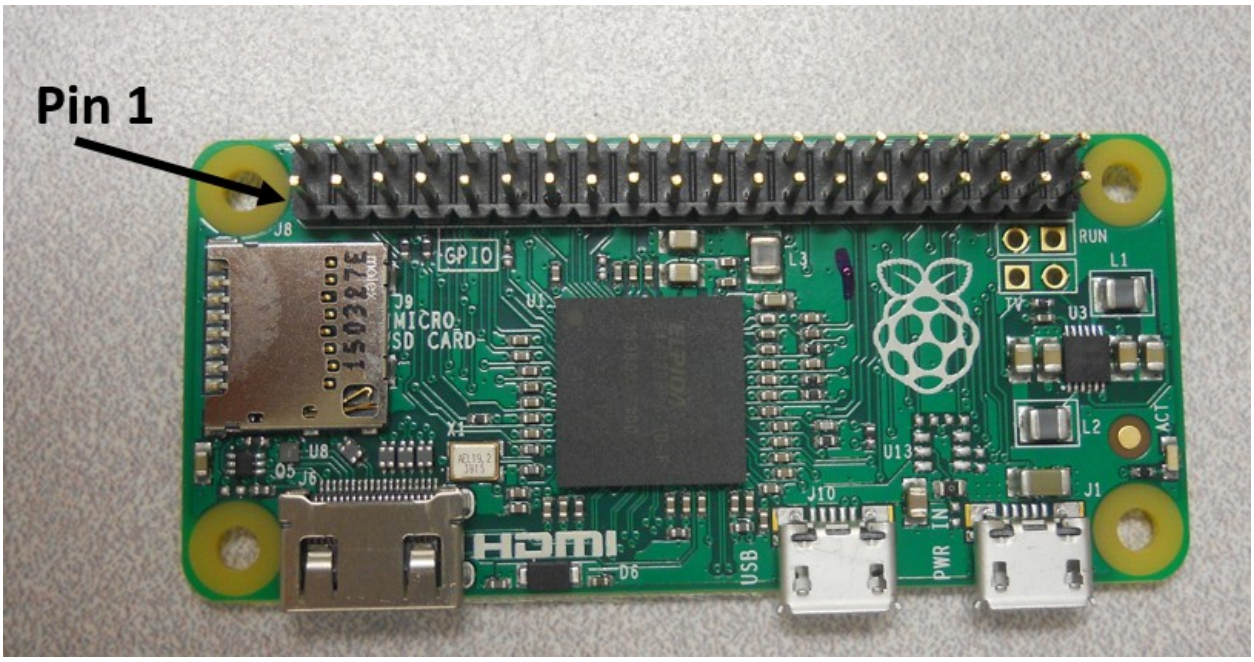

pi@raspberrypi: ~
File Edit Options Buffers Tools Python Help
#!/usr/bin/python
def sum(a, b):
c = a + b
return c
d = input("Input value: ")
e = input("Input second value: ")
f = sum(d, e)
print f
-UU-:----F1 example.py All L11 (Python)
Wrote /home/pi/example.py

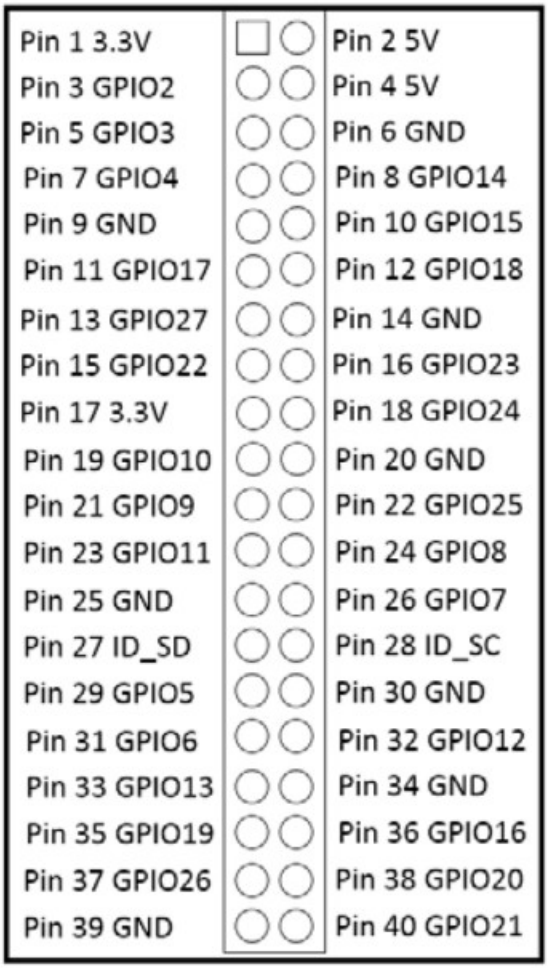

pi@raspberrypi: ~
pi@raspberrypi:~$ ./example.py
Input value: 6
Input second value: 3
9
pi@raspberrypi:~$

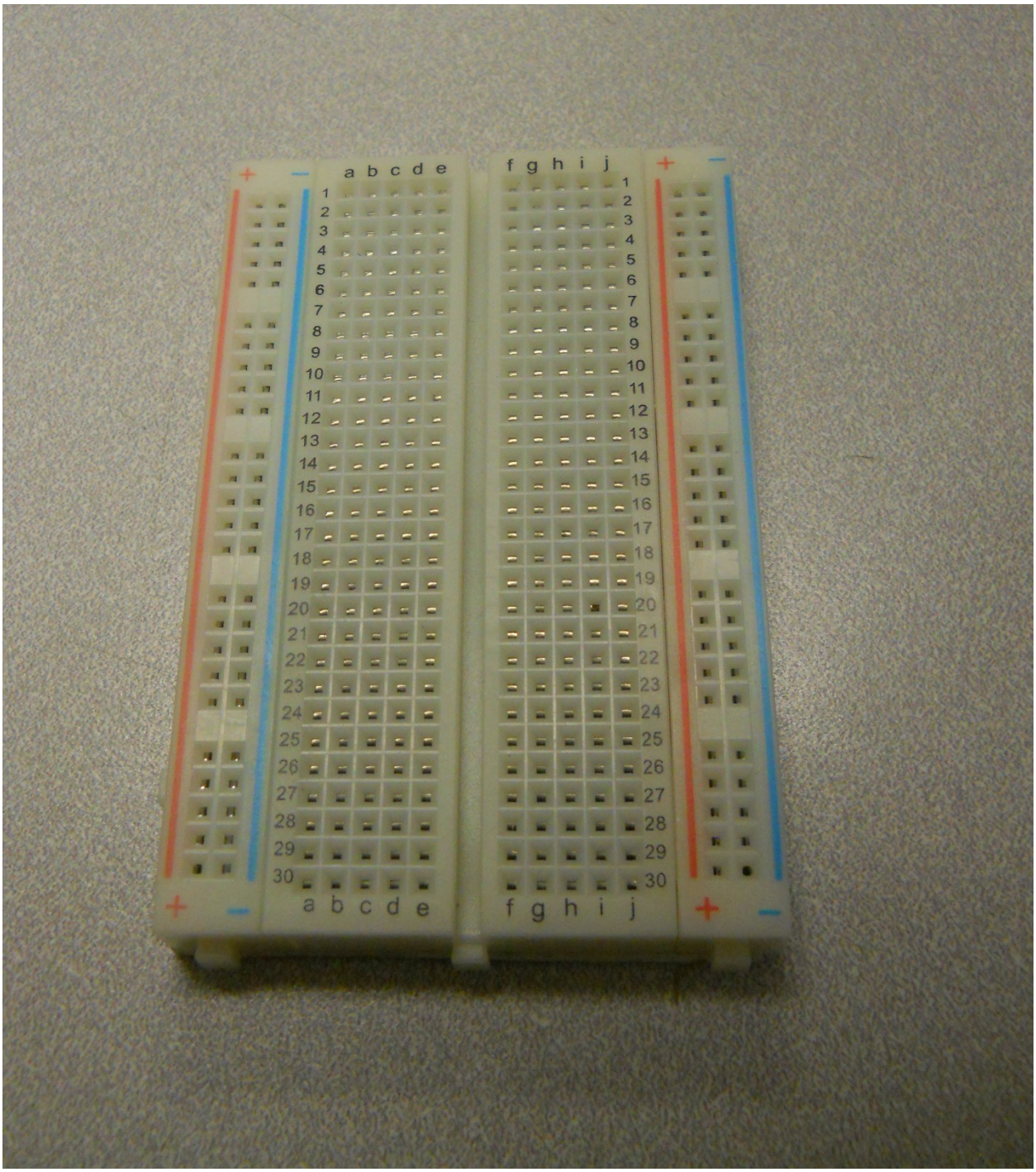

pi@raspberrypi: ~
File Edit Options Buffers Tools Python Help
#!/usr/bin/python
import time
d = input("Input value: ")
time.sleep(2)
e = input("Input second value: ")
f = d + e
print f
-UU-:----F1 example.py All L9 (Python)
Wrote /home/pi/example.py

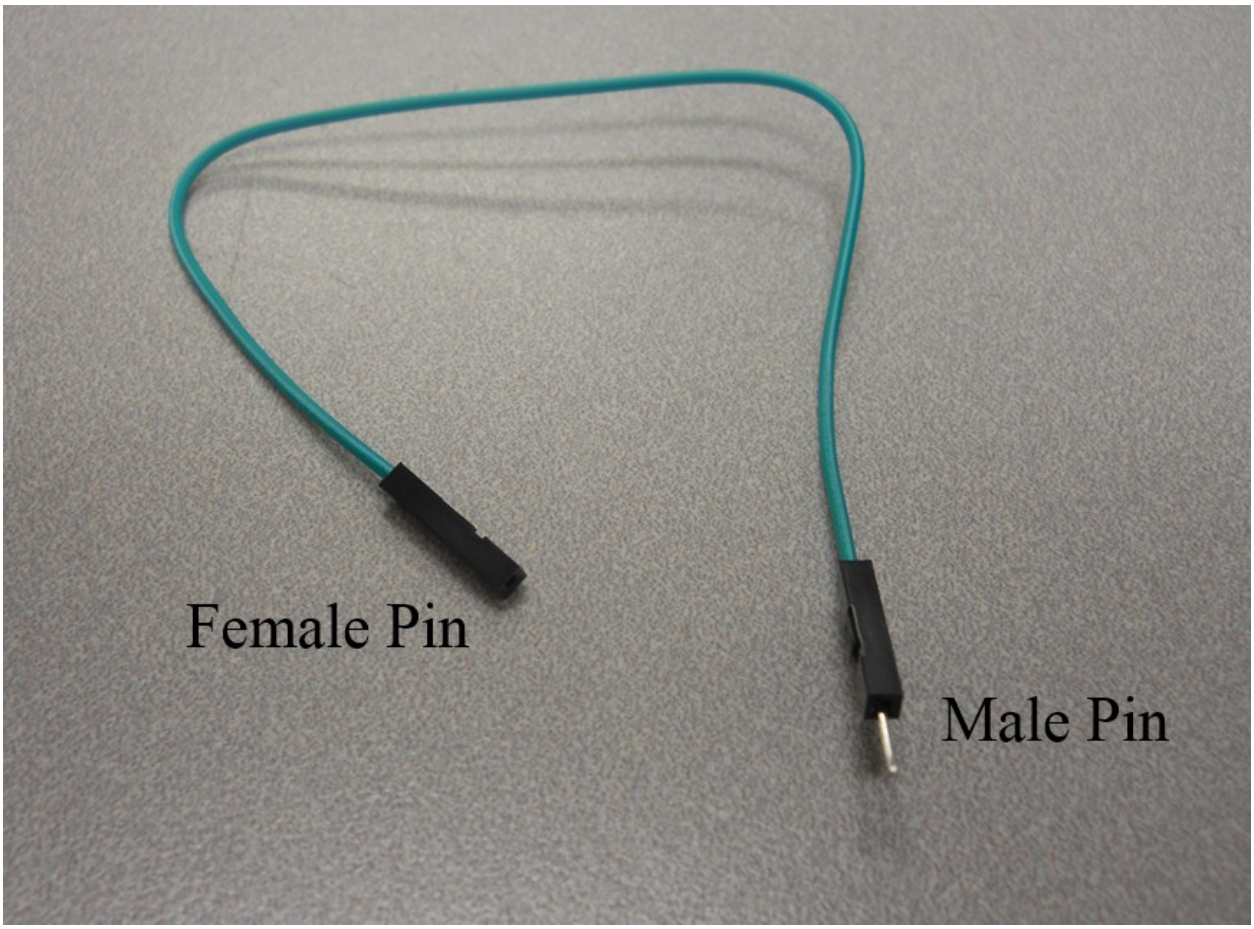

pi@raspberrypi: ~
pi@raspberrypi:~$ ./example.py
Input value: 5
Input second value: 7
12
pi@raspberrypi:~$

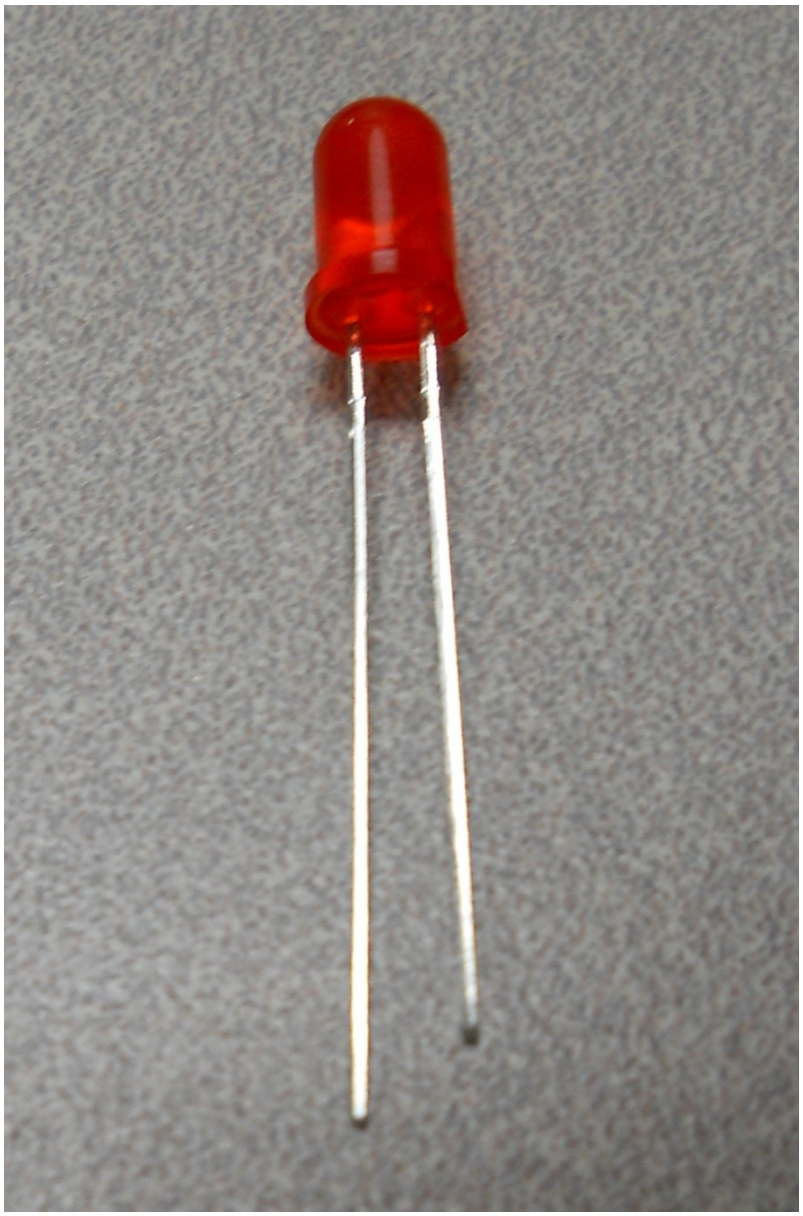
Chapter 3: Accessing the GPIO Pins on Raspberry Pi Zero

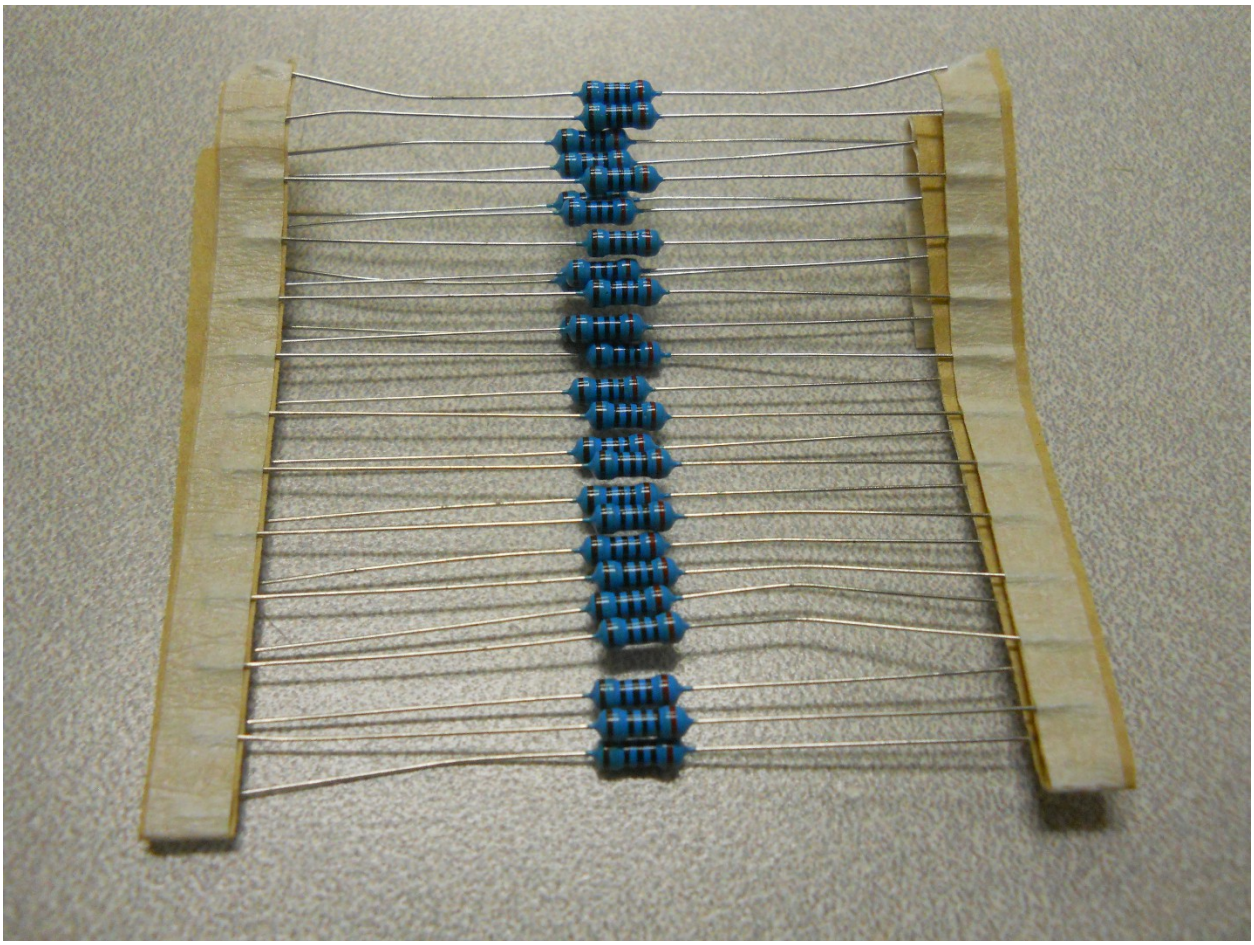


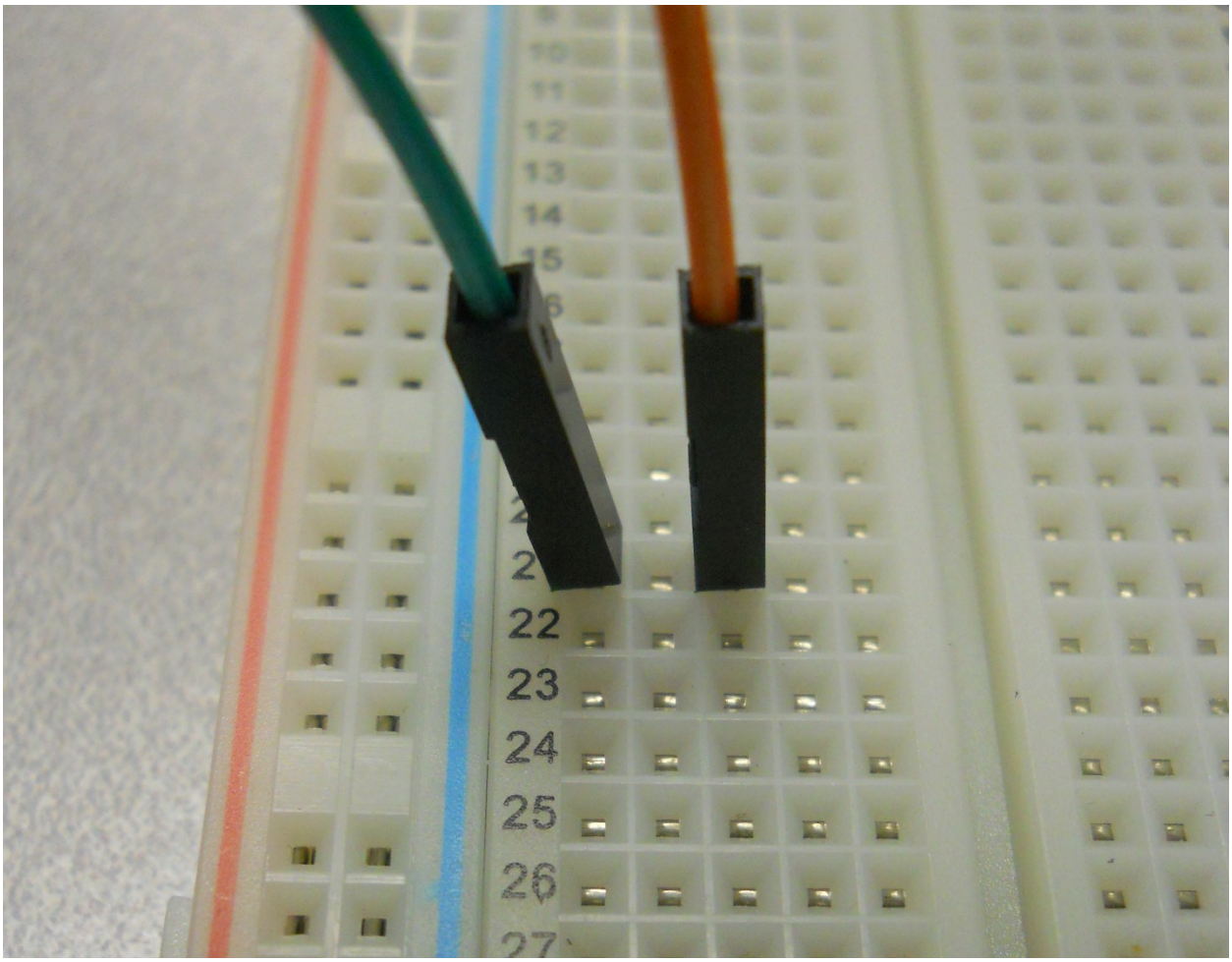

Pin 1 3.3V
Pin 2 5V
Pin 3 GPIO2
Pin 4 5V
Pin 5 GPIO3
Pin 6 GND
Pin 7 GPIO4
Pin 8 GPIO14
Pin 9 GND
Pin 10 GPIO15
Pin 11 GPIO17
Pin 12 GPIO18
Pin 13 GPIO27
Pin 14 GND
Pin 15 GPIO22
Pin 16 GPIO23
Pin 17 3.3V
Pin 18 GPIO24
Pin 19 GPIO10
Pin 20 GND
Pin 21 GPIO9
Pin 22 GPIO25
Pin 23 GPIO11
Pin 24 GPIO8
Pin 25 GND
Pin 26 GPIO7
Pin 27 ID_SD
Pin 28 ID_SC
Pin 29 GPIO5
Pin 30 GND
Pin 31 GPIO6
Pin 32 GPIO12
Pin 33 GPIO13
Pin 34 GND
Pin 35 GPIO19
Pin 36 GPIO16
Pin 37 GPIO26
Pin 38 GPIO20
Pin 39 GND
Pin 40 GPIO21

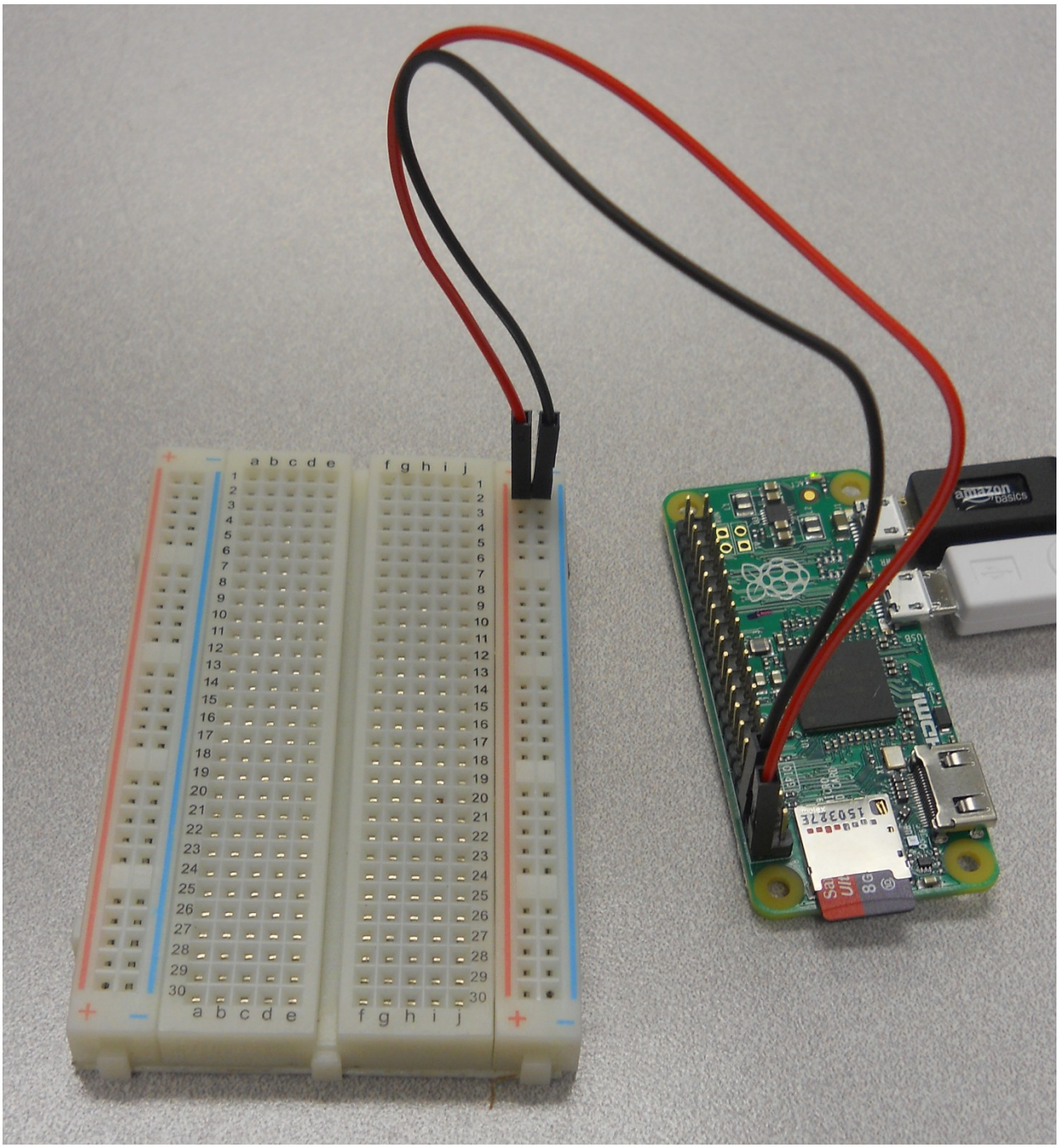

a b c d e
f g h i j
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
+ −

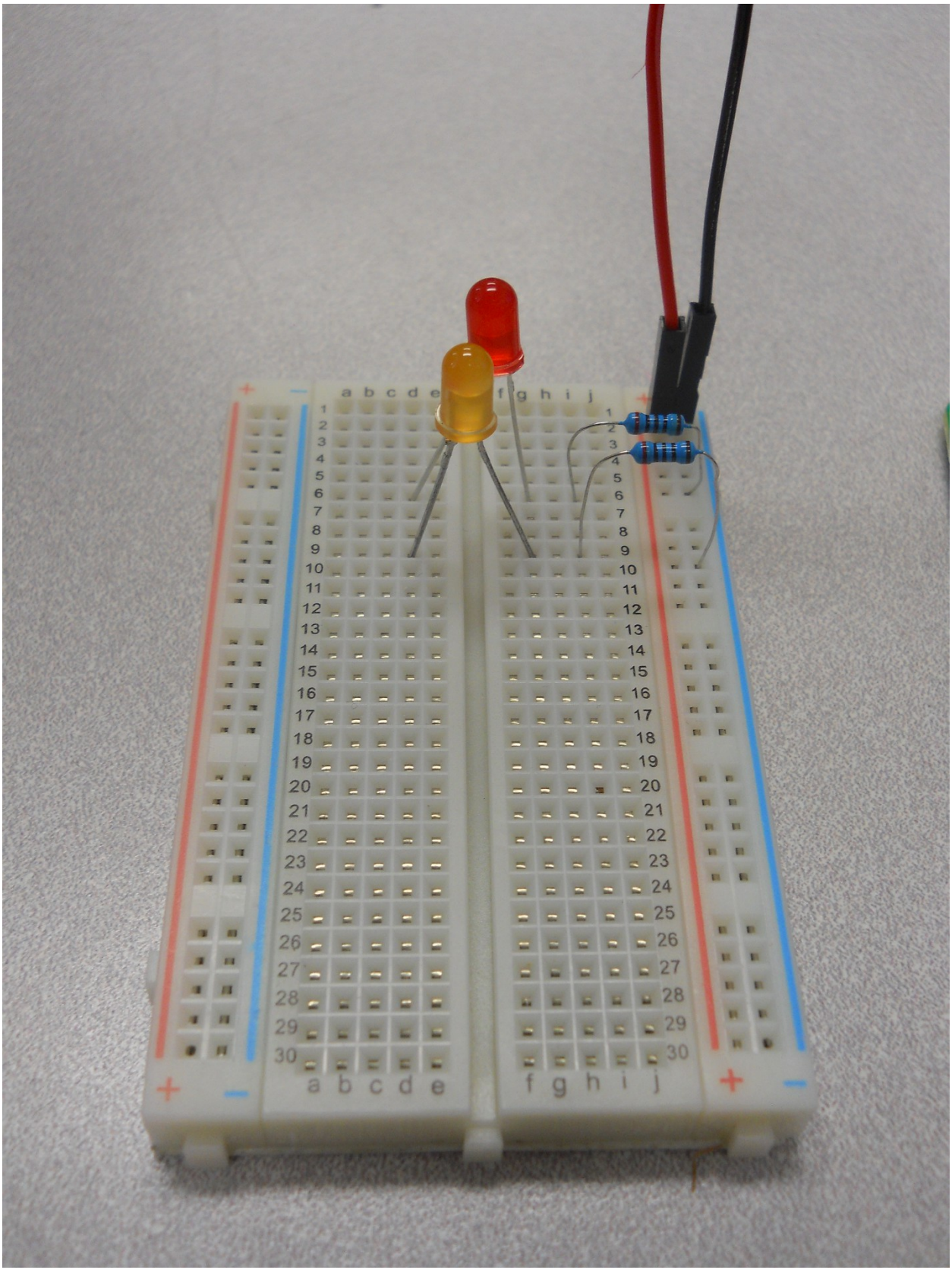

Female Pin
Male Pin

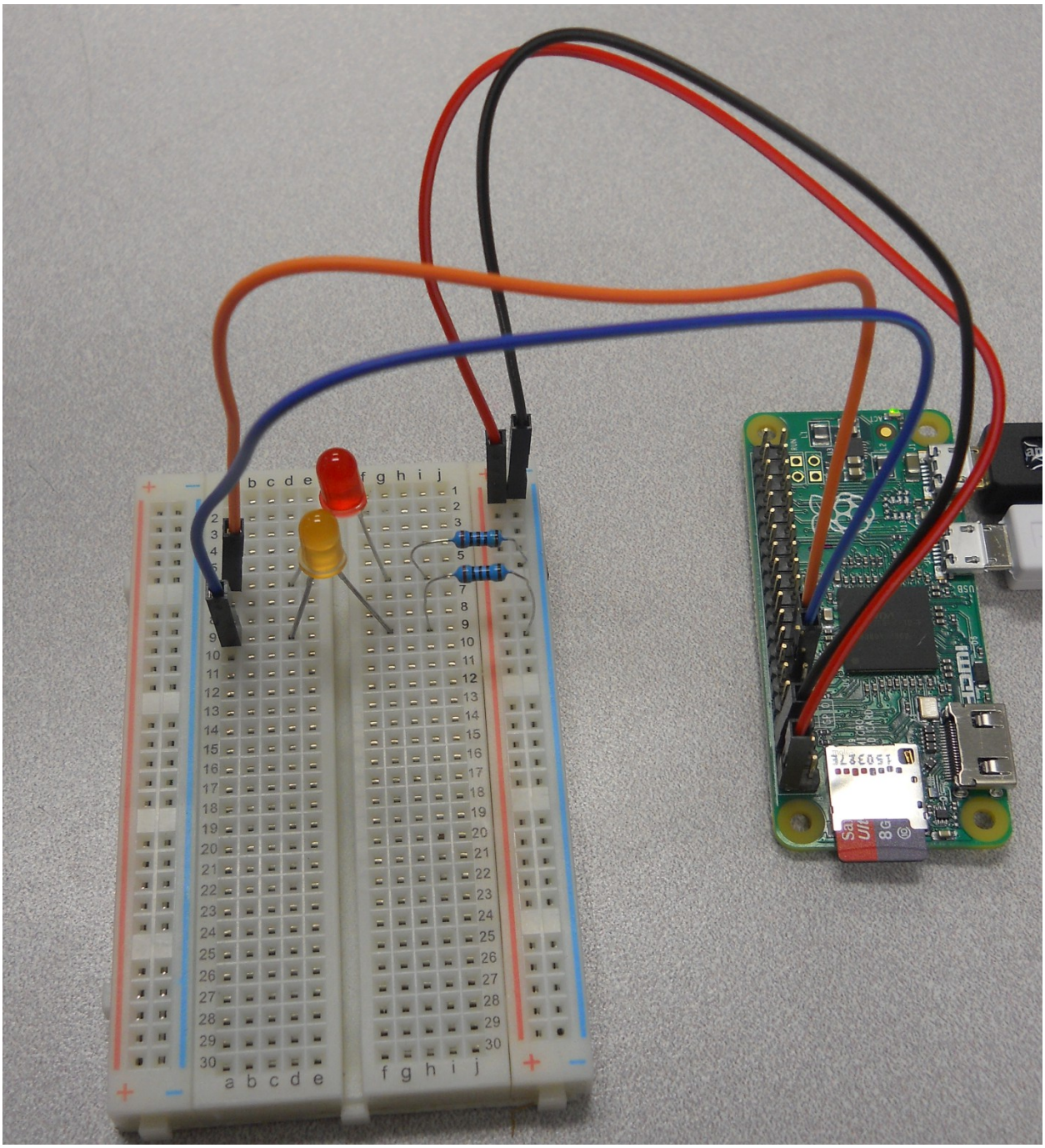


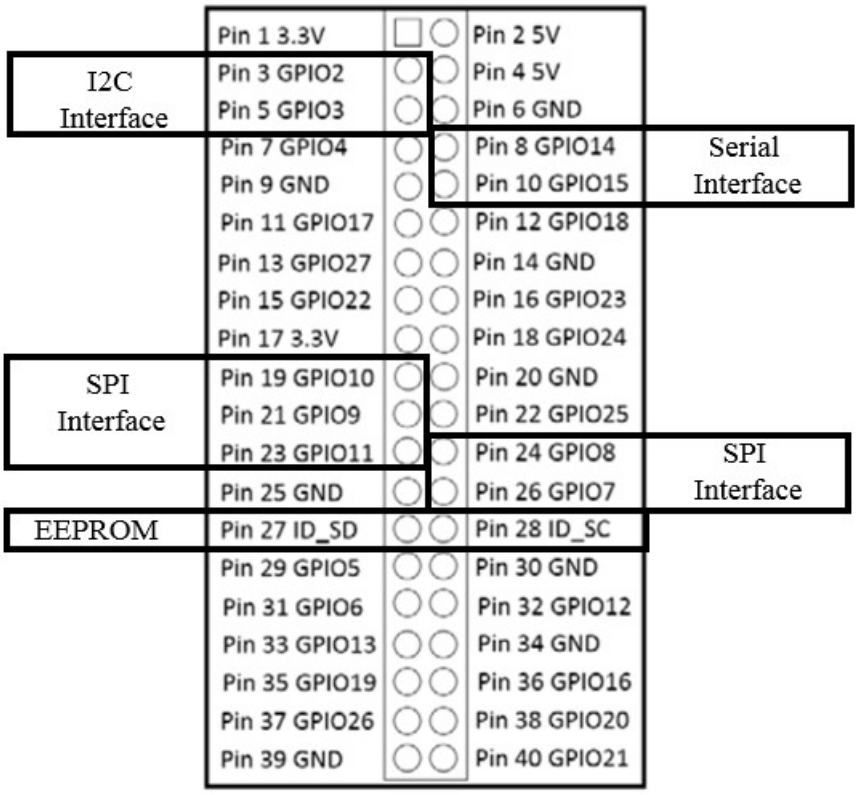



10
11
12
13
14
15
22
23
24
25
26
27


a b c d e
f g h i j
amazon basics

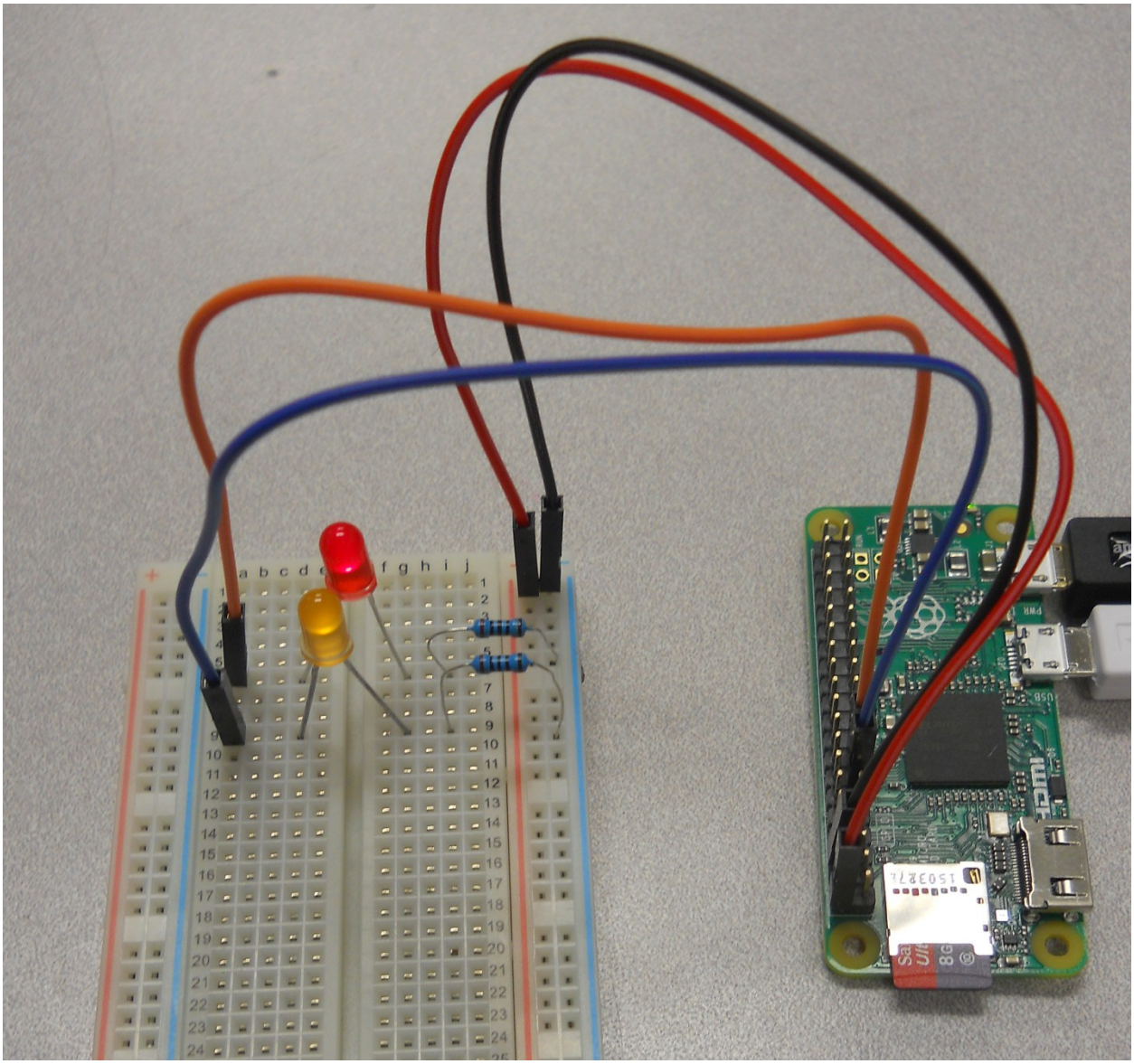




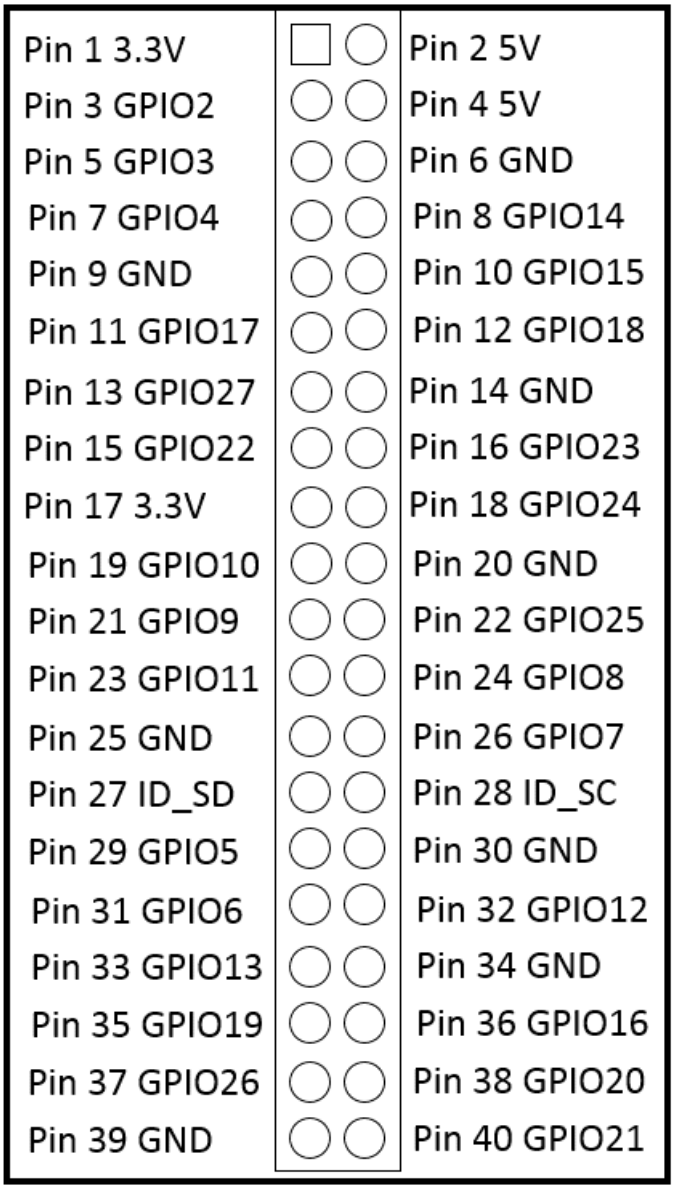


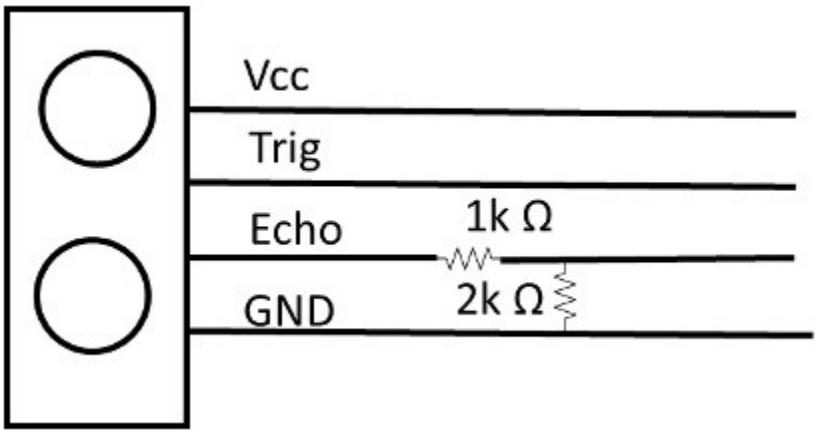
pi@raspberrypi: ~

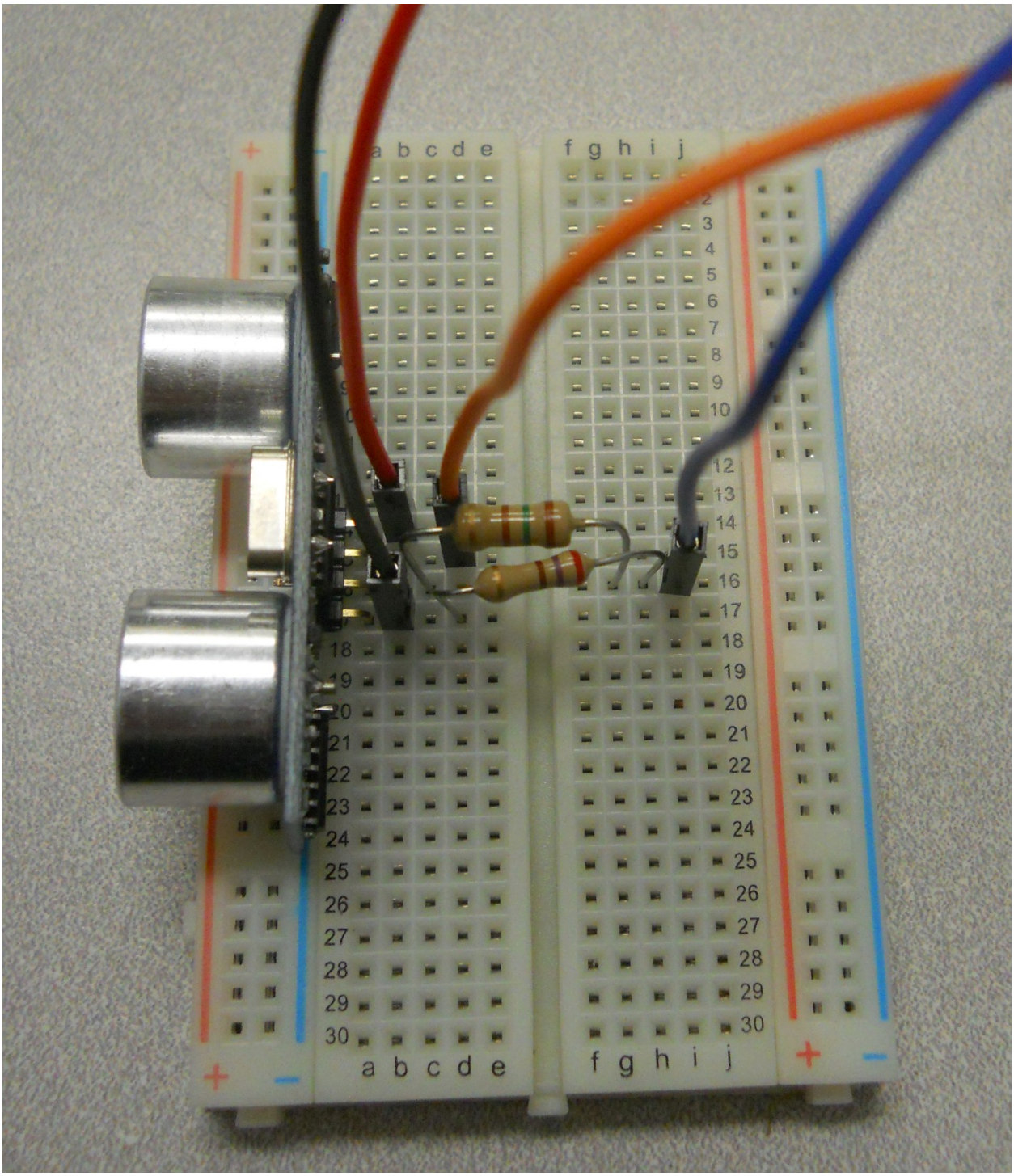
```
File Edit Options Buffers Tools Python Help
#!/user/bin/python

import RPi.GPIO as io
import time

io.setmode(io.BCM)

led1 = 27
led2 = 22

io.setup(led1,io.OUT)
io.setup(led2,io.OUT)
while 1:
    io.output(led1, True)
    io.output(led2, True)
    time.sleep(1)
    io.output(led1, False)
    io.output(led2, False)
    time.sleep(1)

-UU-:----F1  led.py          All L1      (Python) ----------------------------------
For information about GNU Emacs and the GNU system, type C-h C-a.
```




HC-SR04
Vcc
Trig
Echo
Gnd


Pin 1 3.3V
Pin 2 5V
Pin 3 GPIO2
Pin 4 5V
Pin 5 GPIO3
Pin 6 GND
Pin 7 GPIO4
Pin 8 GPIO14
Pin 9 GND
Pin 10 GPIO15
Pin 11 GPIO17
Pin 12 GPIO18
Pin 13 GPIO27
Pin 14 GND
Pin 15 GPIO22
Pin 16 GPIO23
Pin 17 3.3V
Pin 18 GPIO24
Pin 19 GPIO10
Pin 20 GND
Pin 21 GPIO9
Pin 22 GPIO25
Pin 23 GPIO11
Pin 24 GPIO8
Pin 25 GND
Pin 26 GPIO7
Pin 27 ID_SD
Pin 28 ID_SC
Pin 29 GPIO5
Pin 30 GND
Pin 31 GPIO6
Pin 32 GPIO12
Pin 33 GPIO13
Pin 34 GND
Pin 35 GPIO19
Pin 36 GPIO16
Pin 37 GPIO26
Pin 38 GPIO20
Pin 39 GND
Pin 40 GPIO21


Vcc
Trig
Echo
1k Ω
2k Ω
GND


a b c d e
f g h i j
1
2
3
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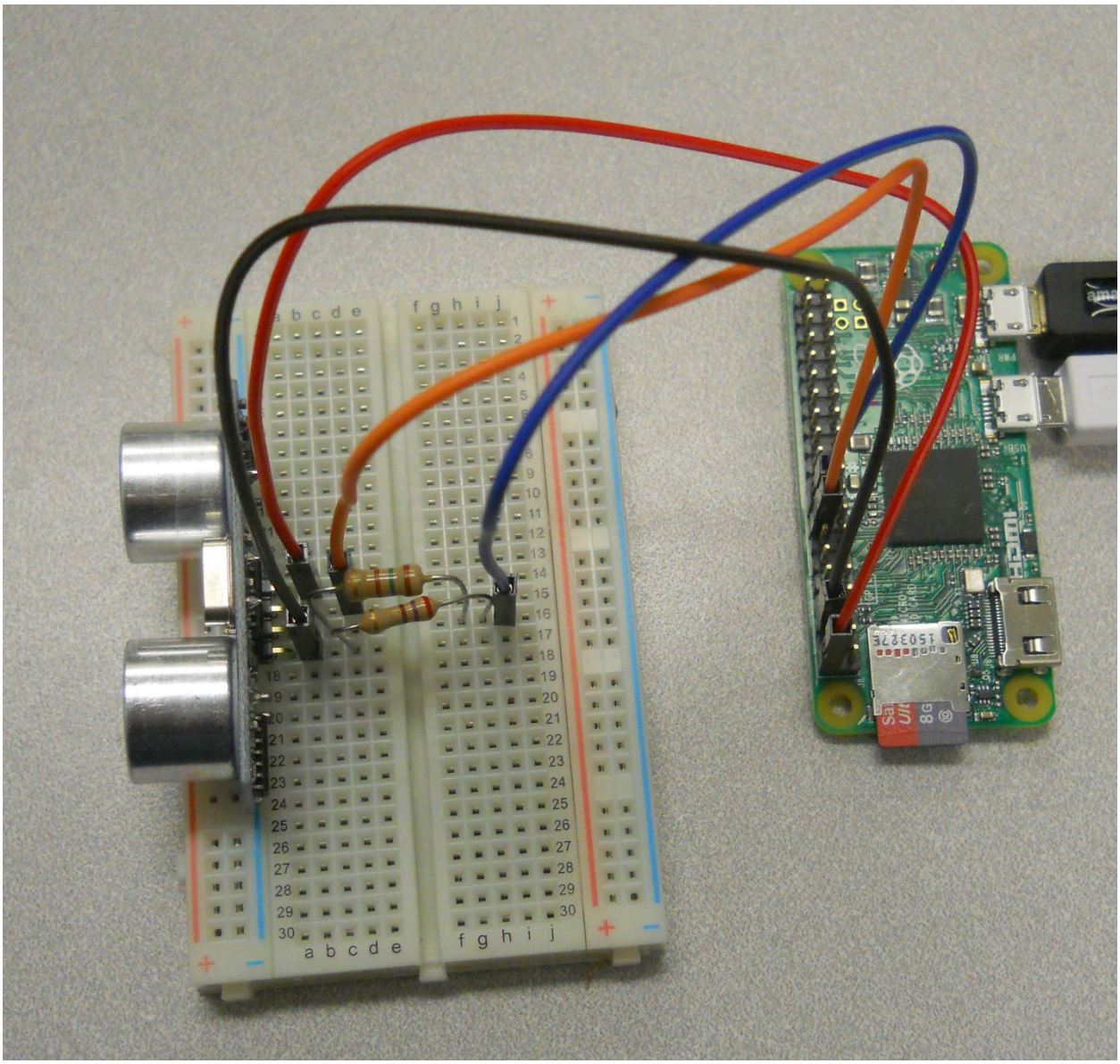
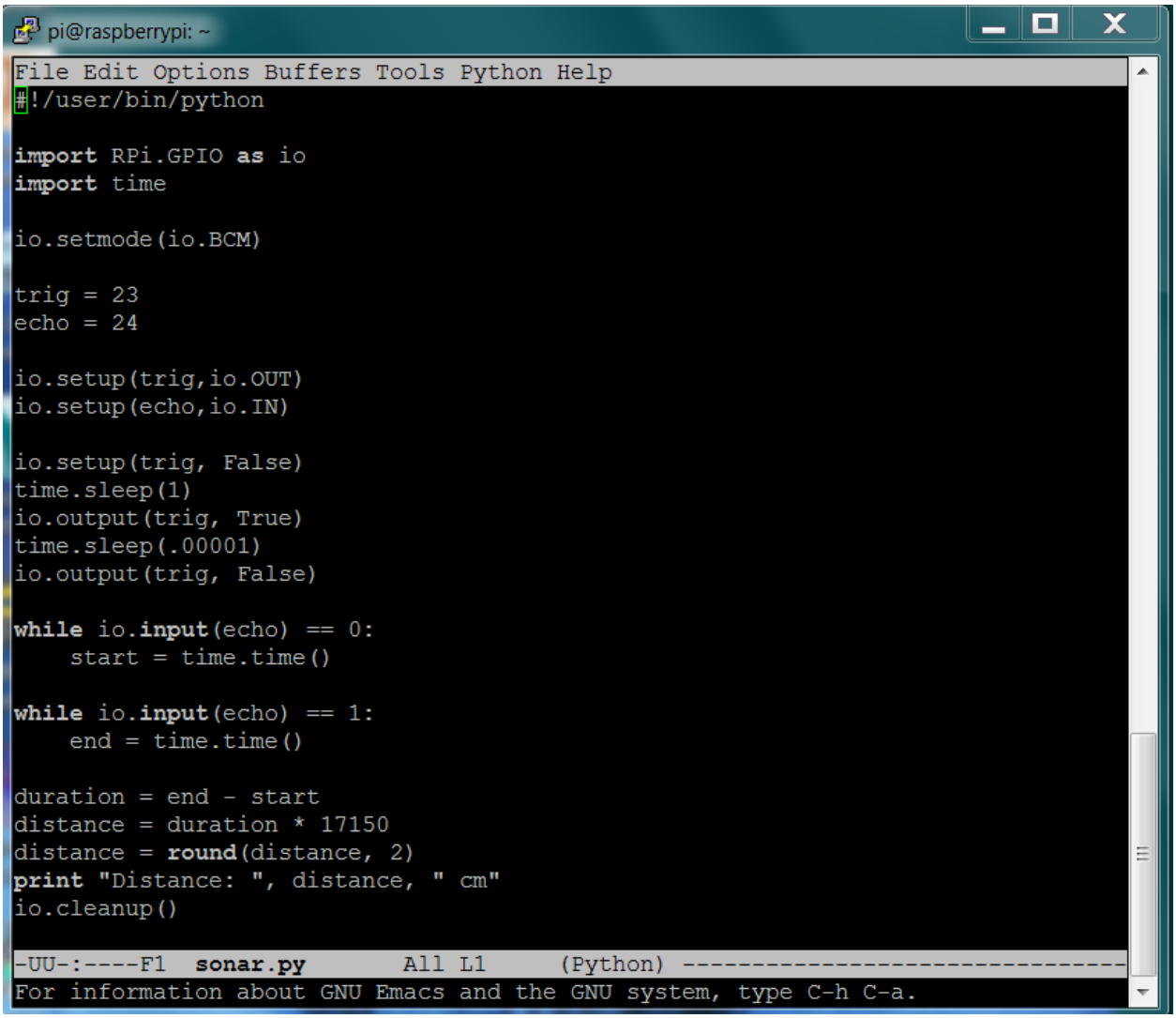
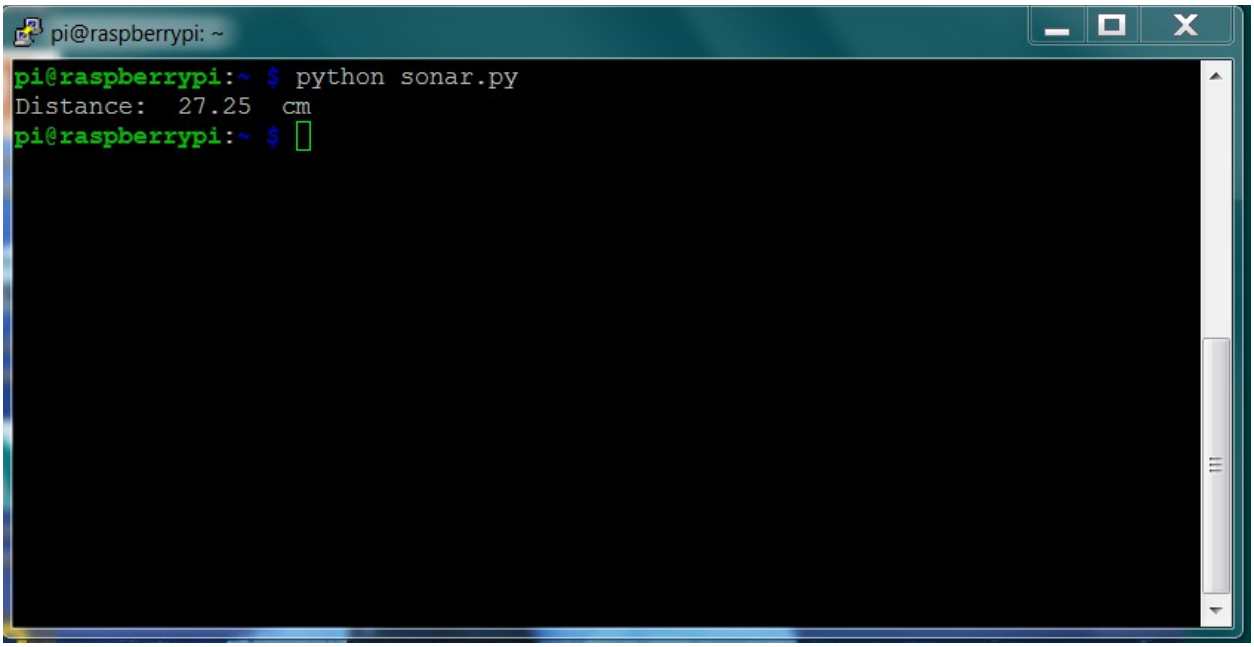
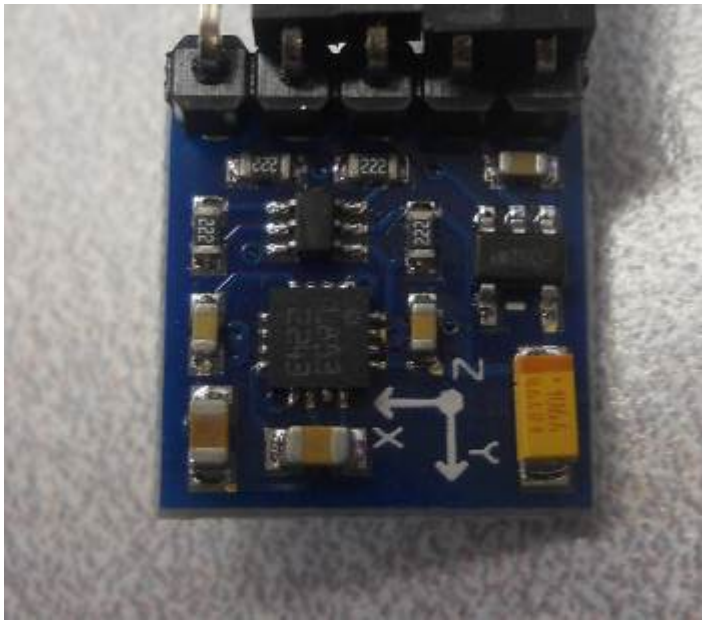
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
a b c d e
f g h i j

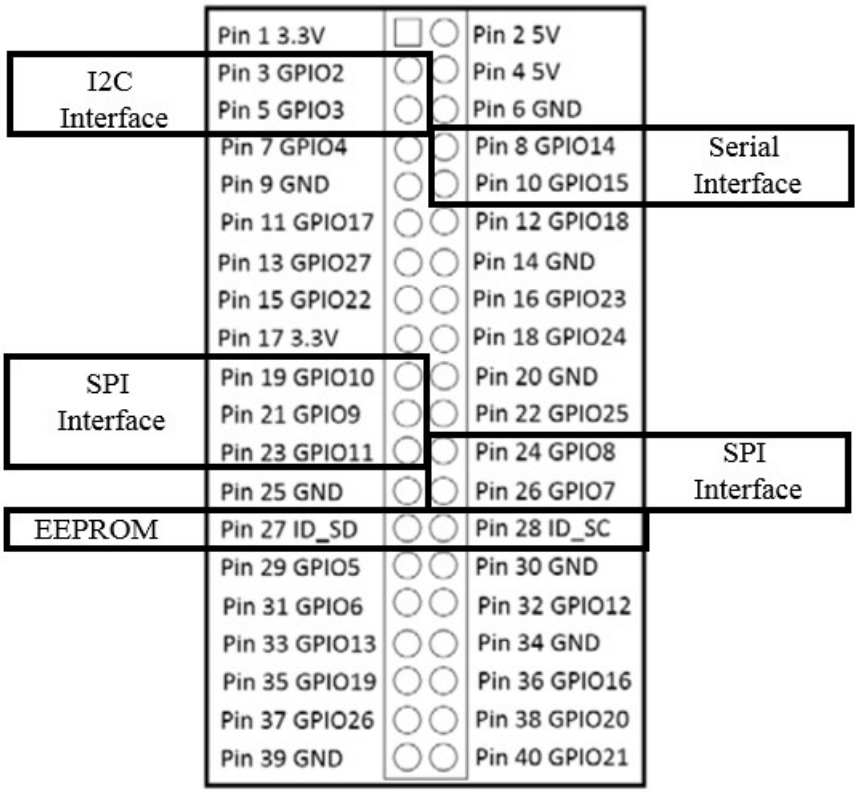


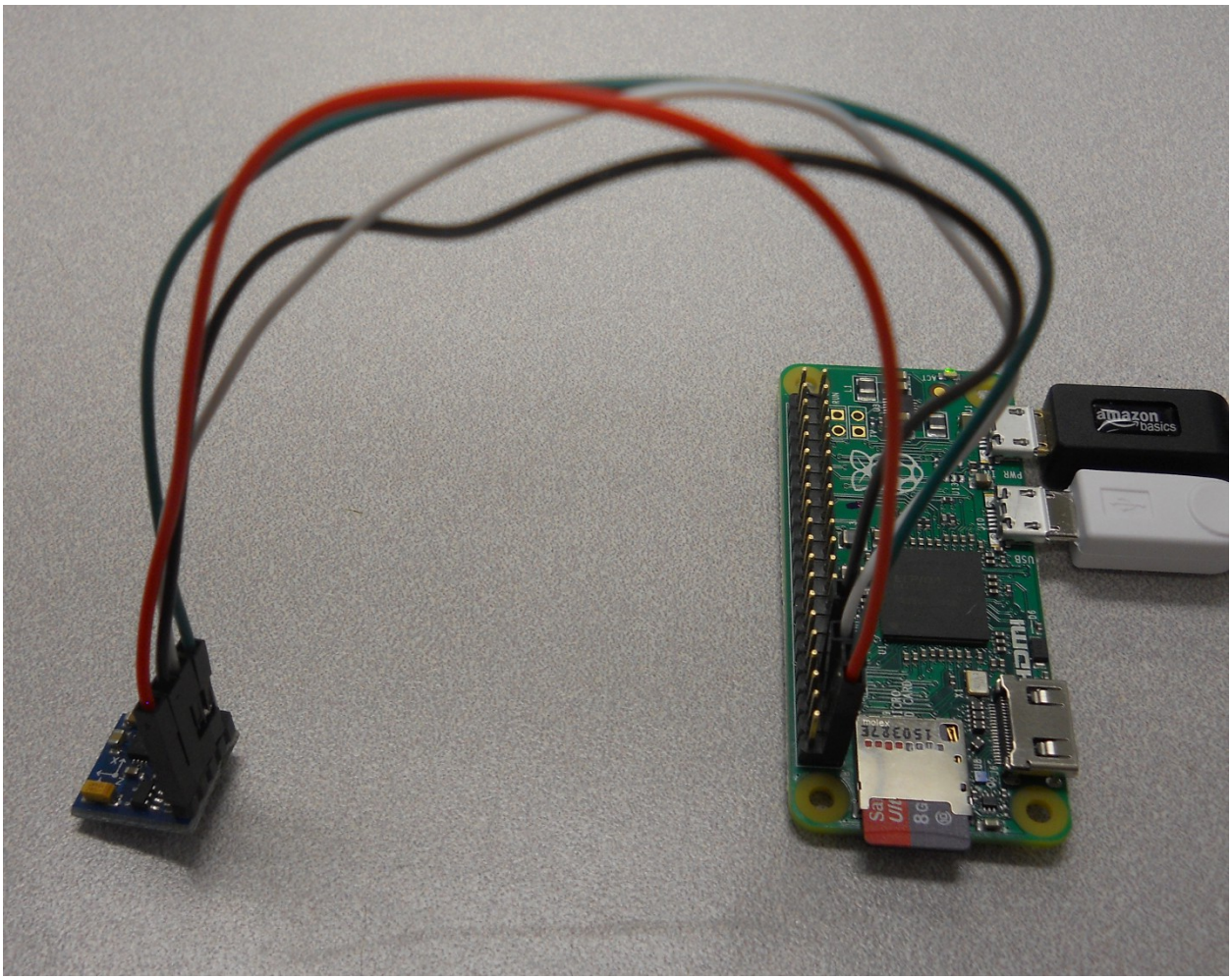

pi@raspberrypi: ~
File Edit Options Buffers Tools Python Help
#!/user/bin/python
import RPi.GPIO as io
import time
io.setmode(io.BCM)
trig = 23
echo = 24
io.setup(trig,io.OUT)
io.setup(echo,io.IN)
io.setup(trig, False)
time.sleep(1)
io.output(trig, True)
time.sleep(.00001)
io.output(trig, False)
while io.input(echo) == 0:
start = time.time()
while io.input(echo) == 1:
end = time.time()
duration = end - start
distance = duration * 17150
distance = round(distance, 2)
print "Distance: ", distance, " cm"
io.cleanup()
-UU-:----F1 sonar.py All L1 (Python)
For information about GNU Emacs and the GNU system, type C-h C-a.

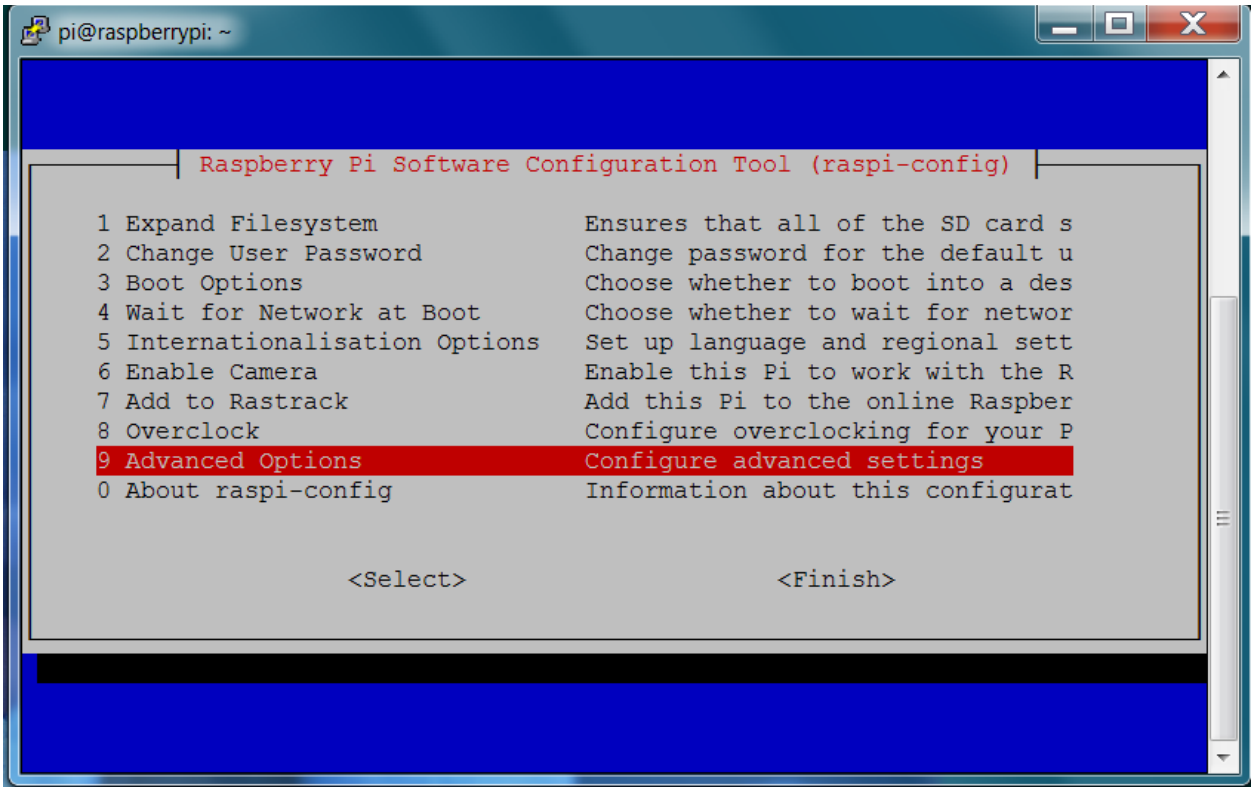

pi@raspberrypi: ~
pi@raspberrypi:~ $ python sonar.py
Distance: 27.25 cm
pi@raspberrypi:~ $

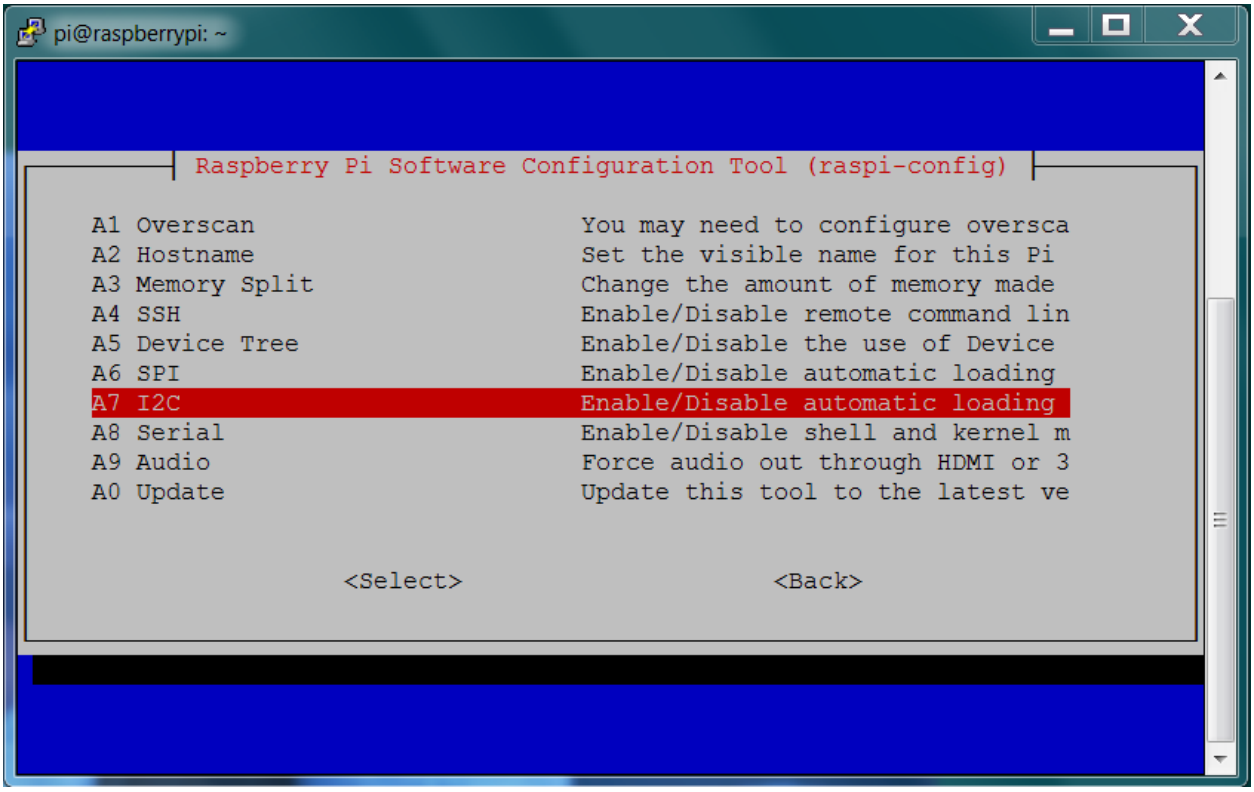

Z
X
Y

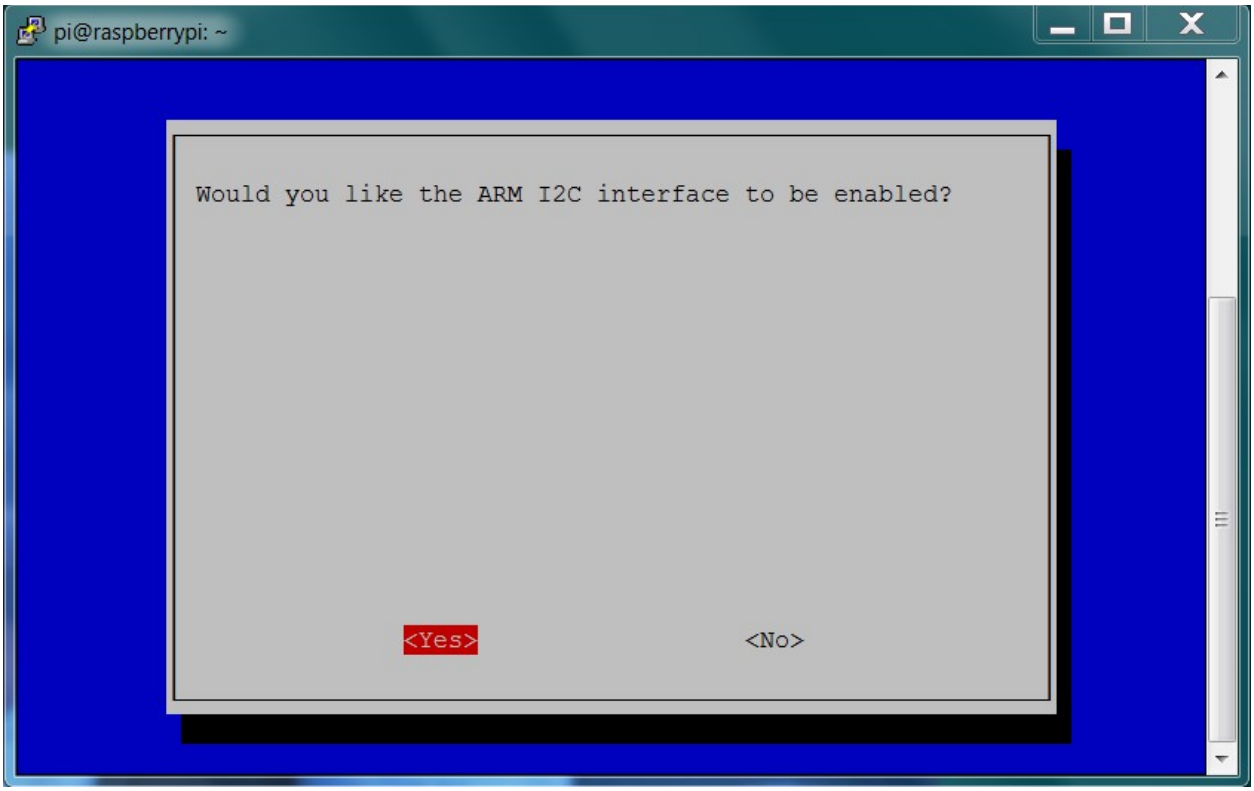

VCC
GND
SCL
SDA
DRDY
GY-271

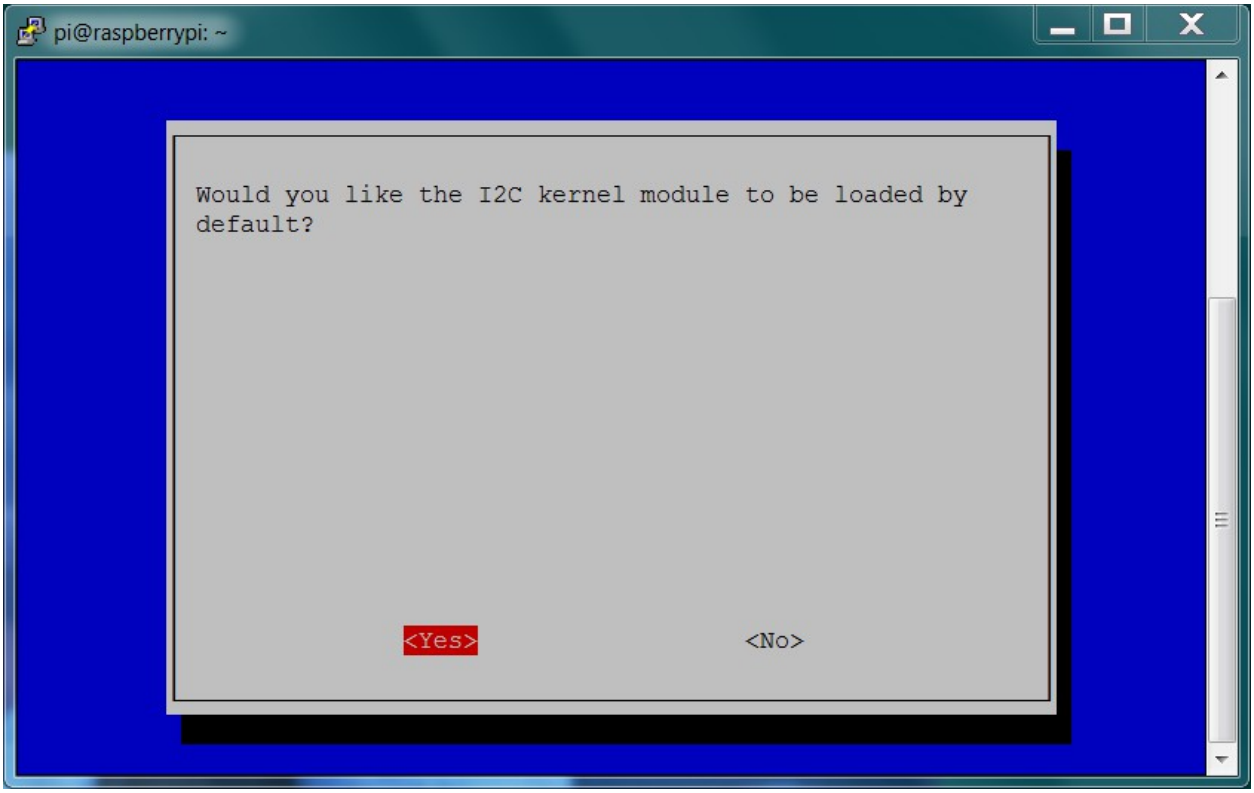

Pin 1 3.3V
Pin 2 5V
I2C Interface
Pin 3 GPIO2
Pin 4 5V
Pin 5 GPIO3
Pin 6 GND
Pin 7 GPIO4
Pin 8 GPIO14
Serial Interface
Pin 9 GND
Pin 10 GPIO15
Pin 11 GPIO17
Pin 12 GPIO18
Pin 13 GPIO27
Pin 14 GND
Pin 15 GPIO22
Pin 16 GPIO23
Pin 17 3.3V
Pin 18 GPIO24
SPI Interface
Pin 19 GPIO10
Pin 20 GND
Pin 21 GPIO9
Pin 22 GPIO25
Pin 23 GPIO11
Pin 24 GPIO8
SPI Interface
Pin 25 GND
Pin 26 GPIO7
EEPROM
Pin 27 ID_SD
Pin 28 ID_SC
Pin 29 GPIO5
Pin 30 GND
Pin 31 GPIO6
Pin 32 GPIO12
Pin 33 GPIO13
Pin 34 GND
Pin 35 GPIO19
Pin 36 GPIO16
Pin 37 GPIO26
Pin 38 GPIO20
Pin 39 GND
Pin 40 GPIO21

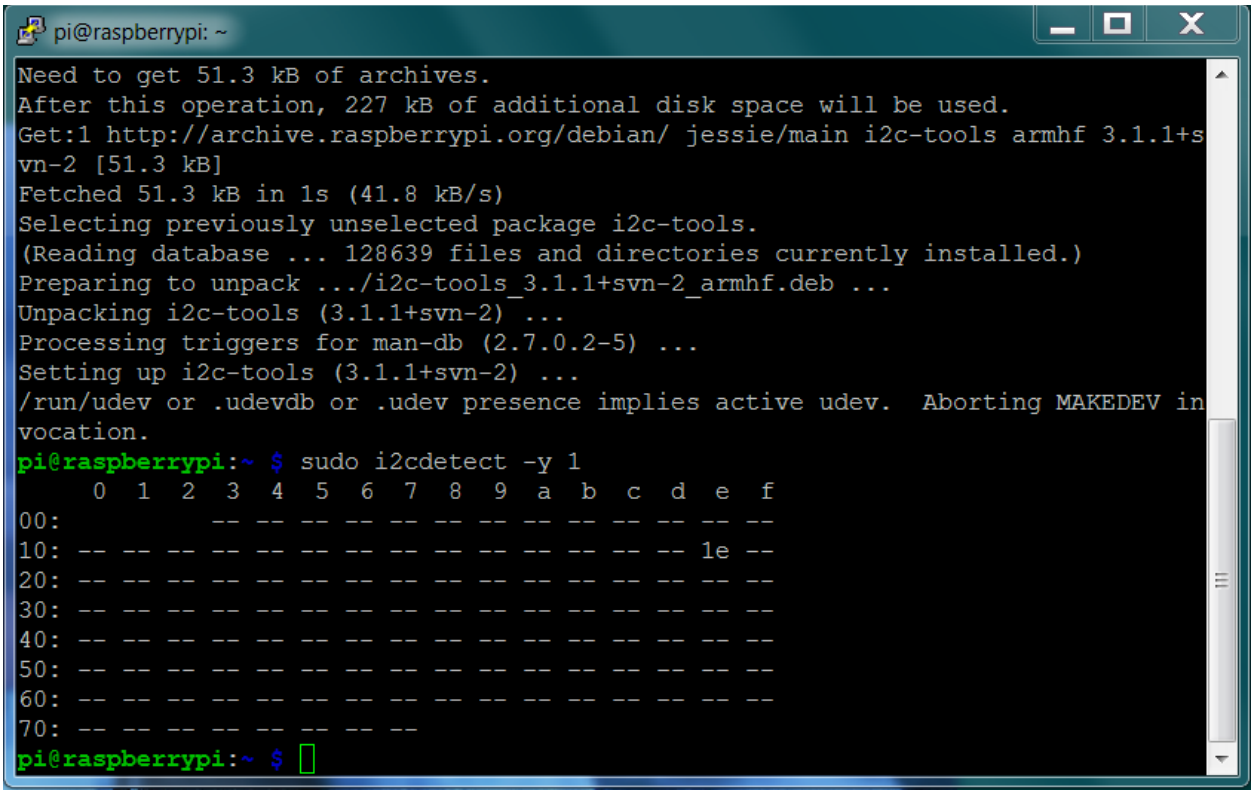

amazon
basics
PWR
USB

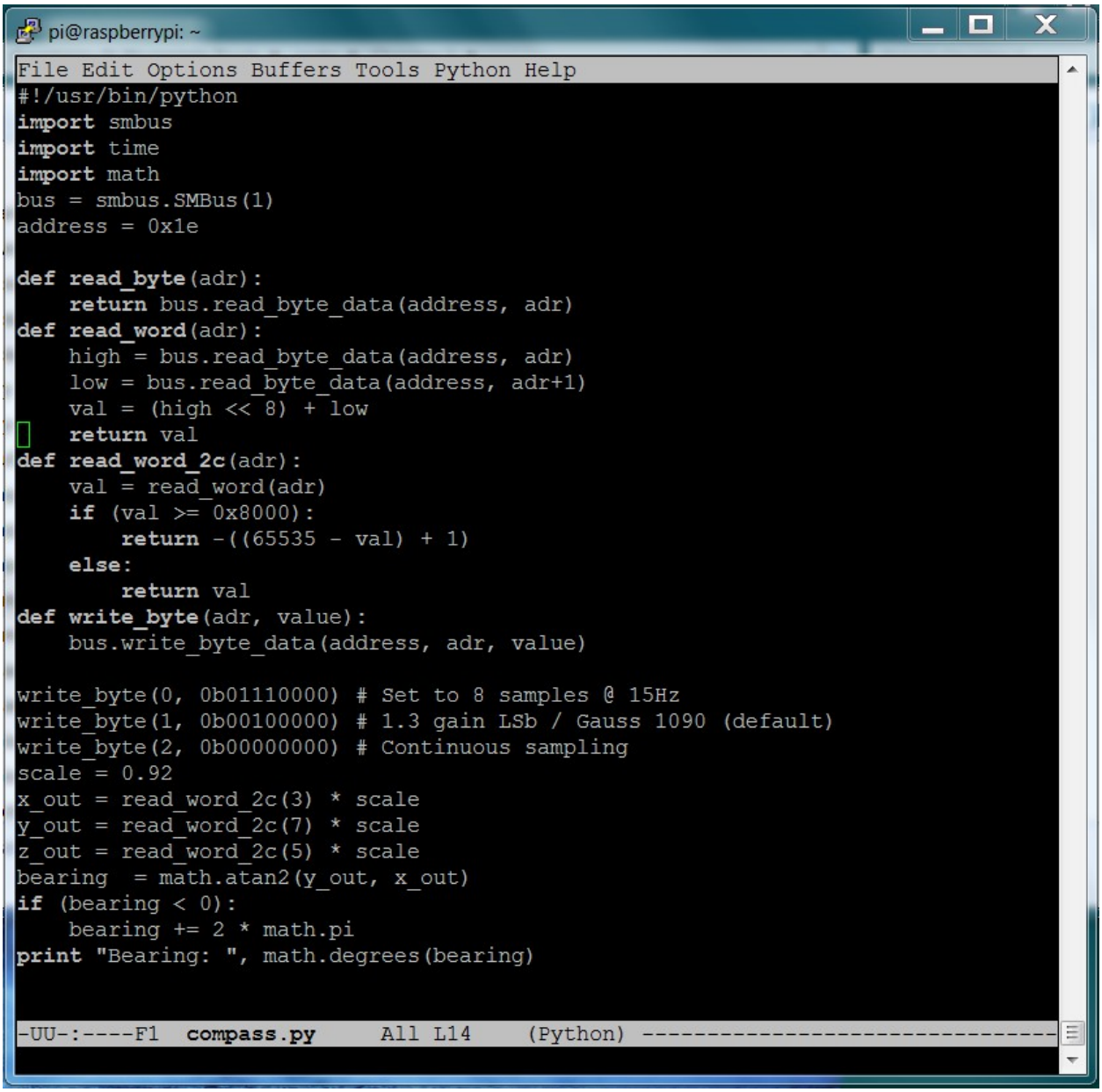

pi@raspberrypi: ~
Raspberry Pi Software Configuration Tool (raspi-config)
1 Expand Filesystem Ensures that all of the SD card s
2 Change User Password Change password for the default u
3 Boot Options Choose whether to boot into a des
4 Wait for Network at Boot Choose whether to wait for networ
5 Internationalisation Options Set up language and regional sett
6 Enable Camera Enable this Pi to work with the R
7 Add to Rastrack Add this Pi to the online Raspber
8 Overclock Configure overclocking for your P
9 Advanced Options Configure advanced settings
0 About raspi-config Information about this configurat
<Select>
<Finish>

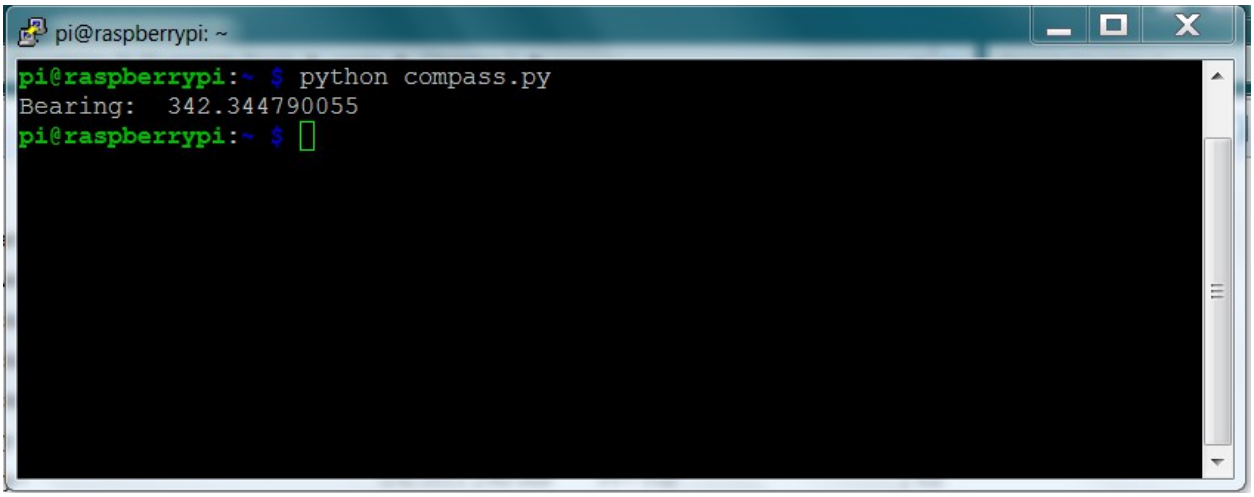

pi@raspberrypi: ~
Raspberry Pi Software Configuration Tool (raspi-config)
A1 Overscan You may need to configure oversca
A2 Hostname Set the visible name for this Pi
A3 Memory Split Change the amount of memory made
A4 SSH Enable/Disable remote command lin
A5 Device Tree Enable/Disable the use of Device
A6 SPI Enable/Disable automatic loading
A7 I2C Enable/Disable automatic loading
A8 Serial Enable/Disable shell and kernel m
A9 Audio Force audio out through HDMI or 3
A0 Update Update this tool to the latest ve
<Select>
<Back>


pi@raspberrypi: ~
Would you like the ARM I2C interface to be enabled?
<Yes>
<No>

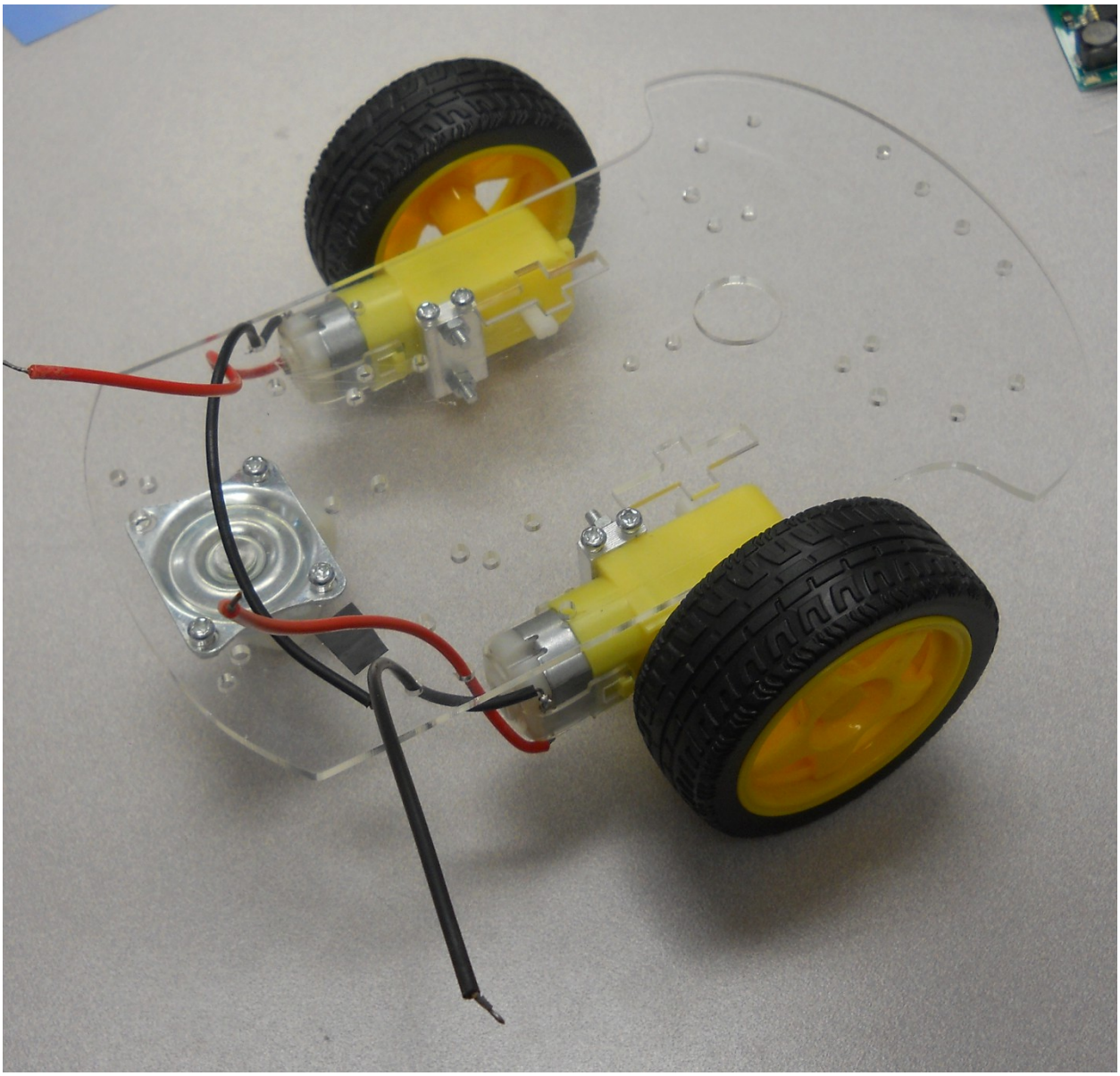

pi@raspberrypi: ~
Would you like the I2C kernel module to be loaded by default?
<Yes>
<No>

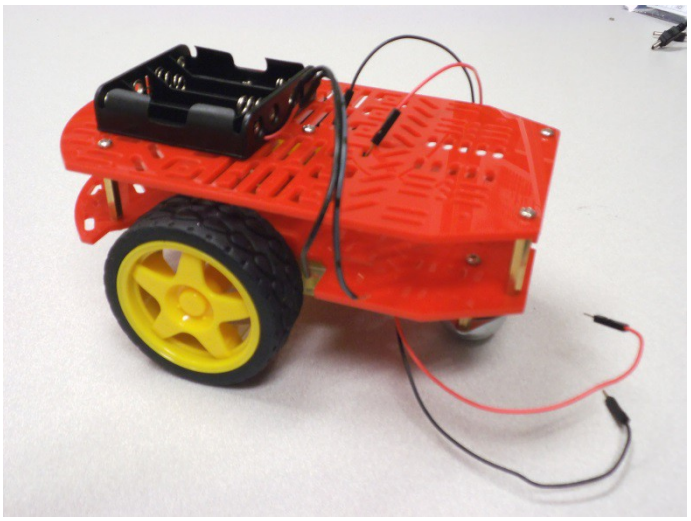

pi@raspberrypi: ~
Need to get 51.3 kB of archives.
After this operation, 227 kB of additional disk space will be used.
Get:1 http://archive.raspberrypi.org/debian/ jessie/main i2c-tools armhf 3.1.1+svn-2 [51.3 kB]
Fetched 51.3 kB in 1s (41.8 kB/s)
Selecting previously unselected package i2c-tools.
(Reading database ... 128639 files and directories currently installed.)
Preparing to unpack .../i2c-tools_3.1.1+svn-2_armhf.deb ...
Unpacking i2c-tools (3.1.1+svn-2) ...
Processing triggers for man-db (2.7.0.2-5) ...
Setting up i2c-tools (3.1.1+svn-2) ...
/run/udev or .udevdb or .udev presence implies active udev. Aborting MAKEDEV invocation.
pi@raspberrypi:~ $ sudo i2cdetect -y 1
0 1 2 3 4 5 6 7 8 9 a b c d e f
00: -- -- -- -- -- -- -- -- -- -- -- -- --
10: -- -- -- -- -- -- -- -- -- -- -- -- -- 1e --
20: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
30: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
40: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
50: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
60: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
70: -- -- -- -- -- -- -- --
pi@raspberrypi:~ $

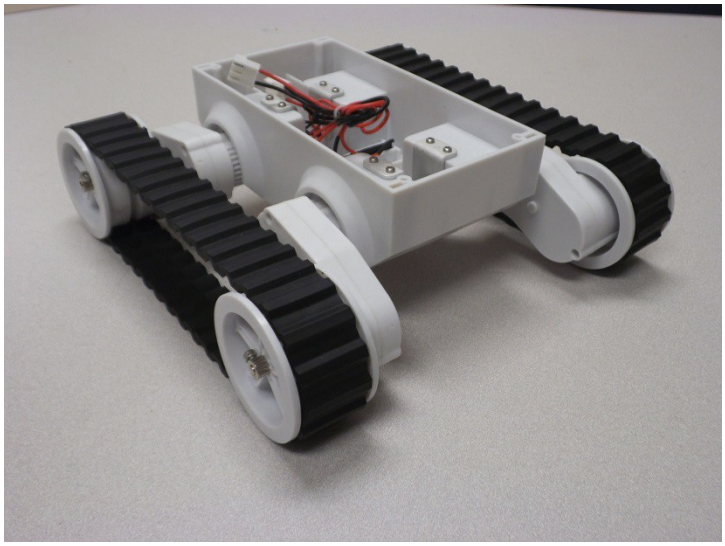

pi@raspberrypi: ~
File Edit Options Buffers Tools Python Help
#!/usr/bin/python
import smbus
import time
import math
bus = smbus.SMBus(1)
address = 0x1e
def read_byte(adr):
return bus.read_byte_data(address, adr)
def read_word(adr):
high = bus.read_byte_data(address, adr)
low = bus.read_byte_data(address, adr+1)
val = (high << 8) + low
return val
def read_word_2c(adr):
val = read_word(adr)
if (val >= 0x8000):
return -((65535 - val) + 1)
else:
return val
def write_byte(adr, value):
bus.write_byte_data(address, adr, value)
write_byte(0, 0b01110000) # Set to 8 samples @ 15Hz
write_byte(1, 0b00100000) # 1.3 gain LSb / Gauss 1090 (default)
write_byte(2, 0b00000000) # Continuous sampling
scale = 0.92
x_out = read_word_2c(3) * scale
y_out = read_word_2c(7) * scale
z_out = read_word_2c(5) * scale
bearing = math.atan2(y_out, x_out)
if (bearing < 0):
bearing += 2 * math.pi
print "Bearing: ", math.degrees(bearing)
-UU-:----F1 compass.py All L14 (Python)


pi@raspberrypi: ~
pi@raspberrypi:~ $ python compass.py
Bearing: 342.344790055
pi@raspberrypi:~ $

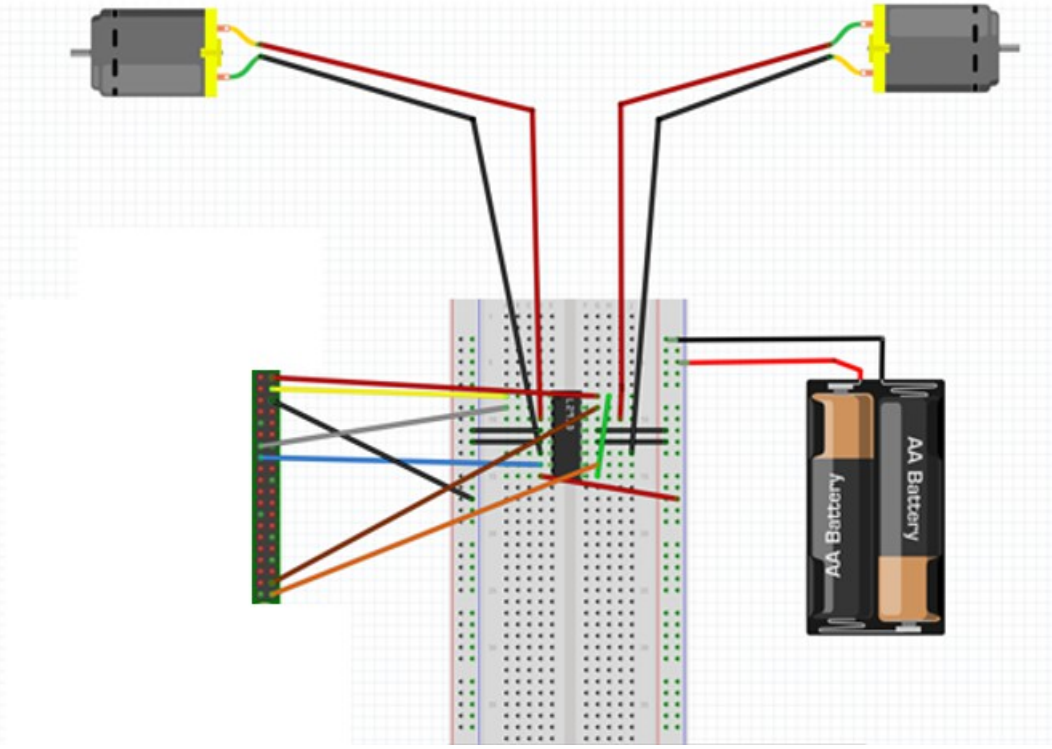
Chapter 4: Building and Controlling a Simple Wheeled Robot

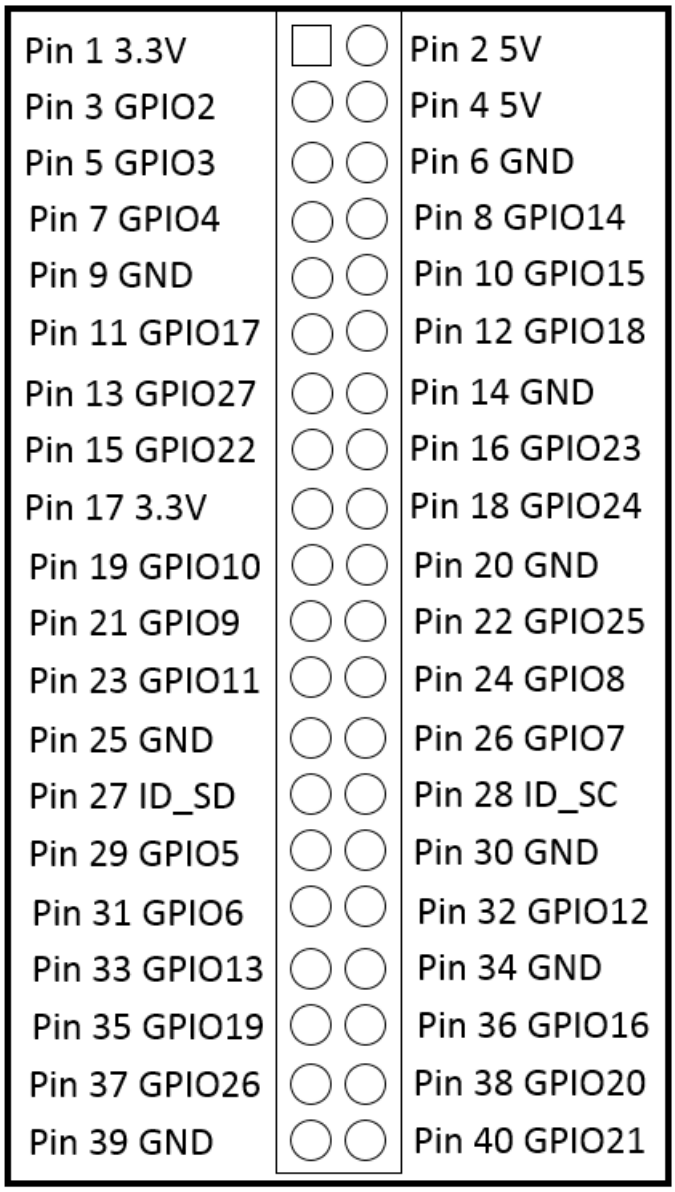


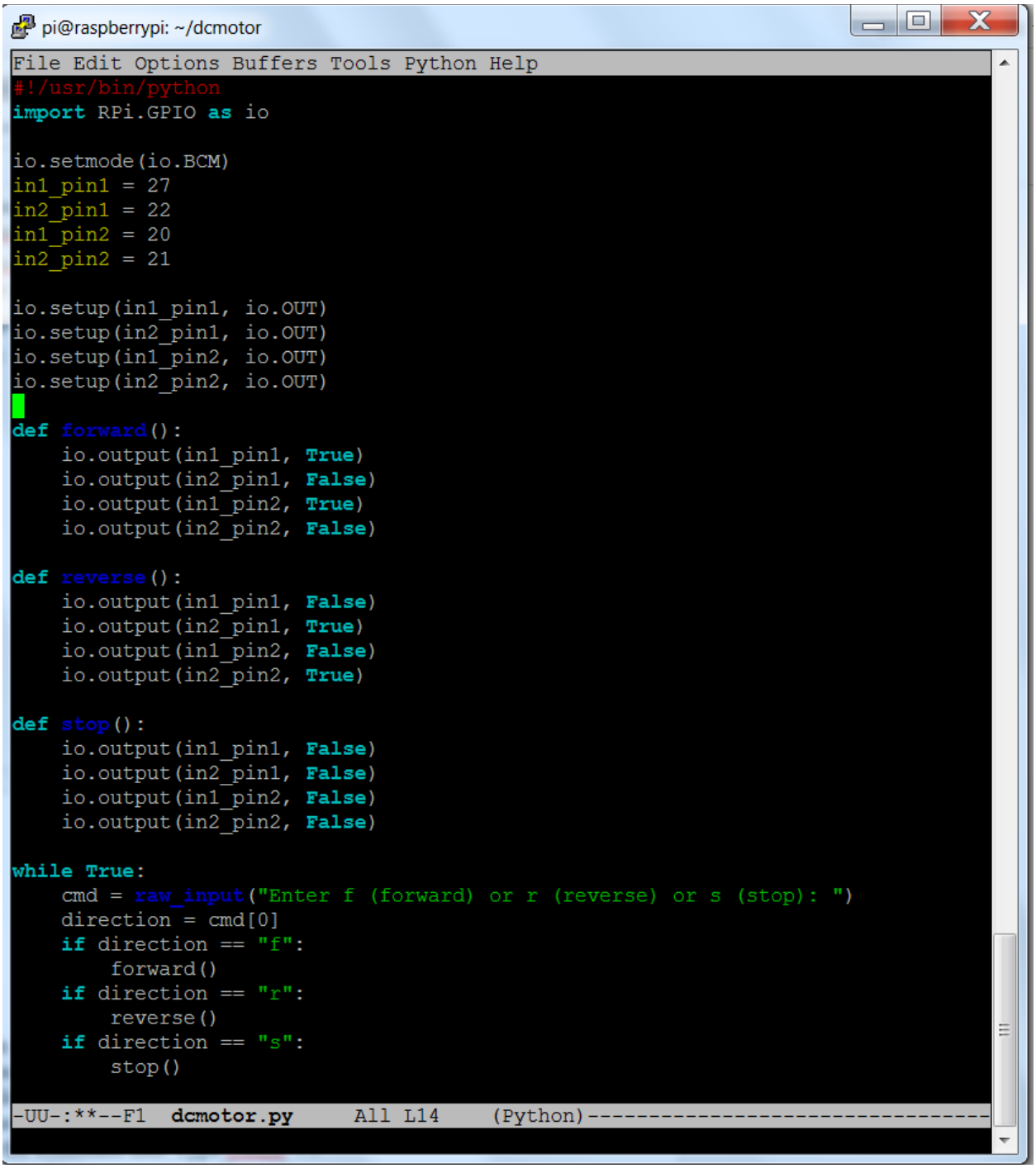


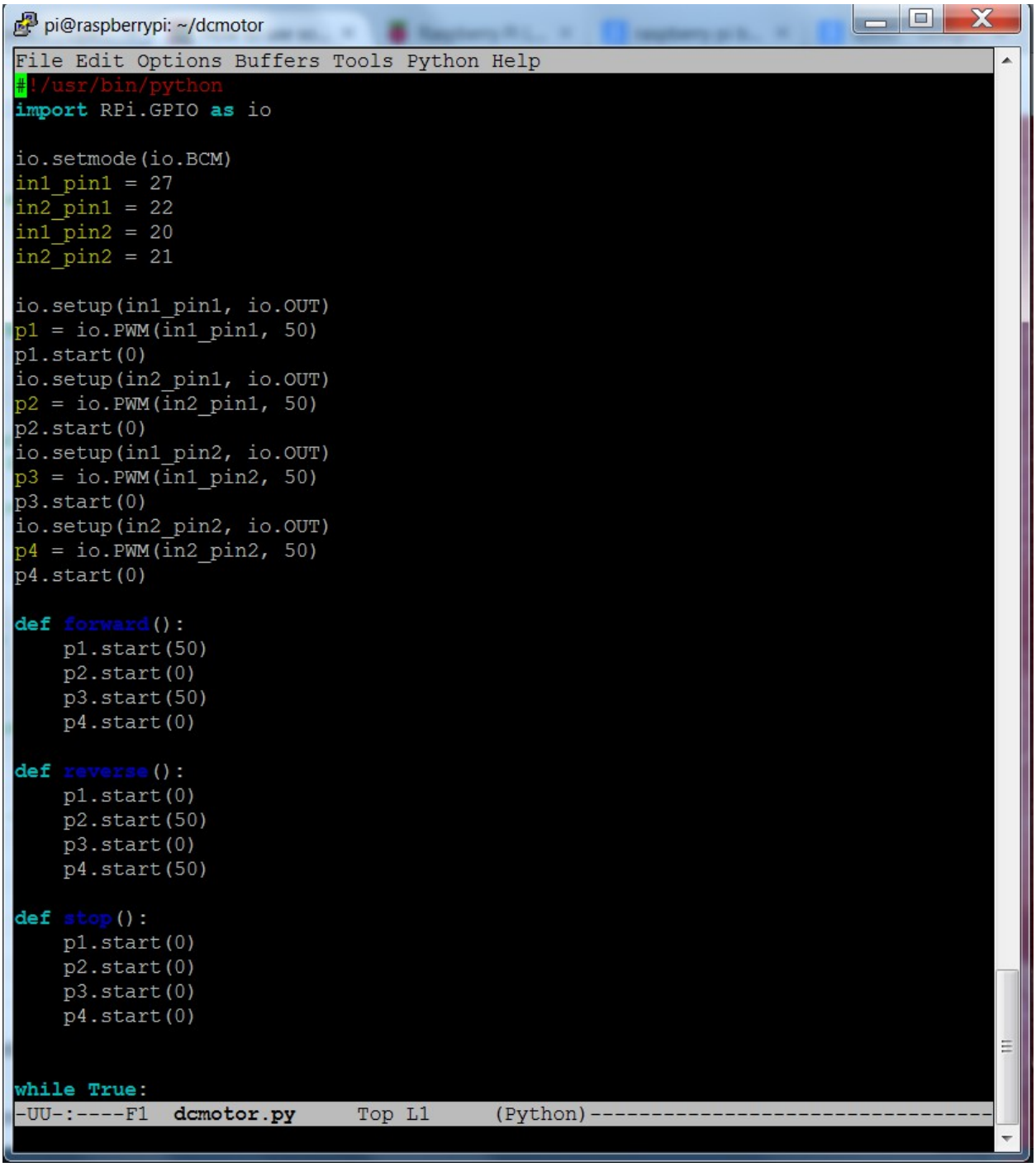


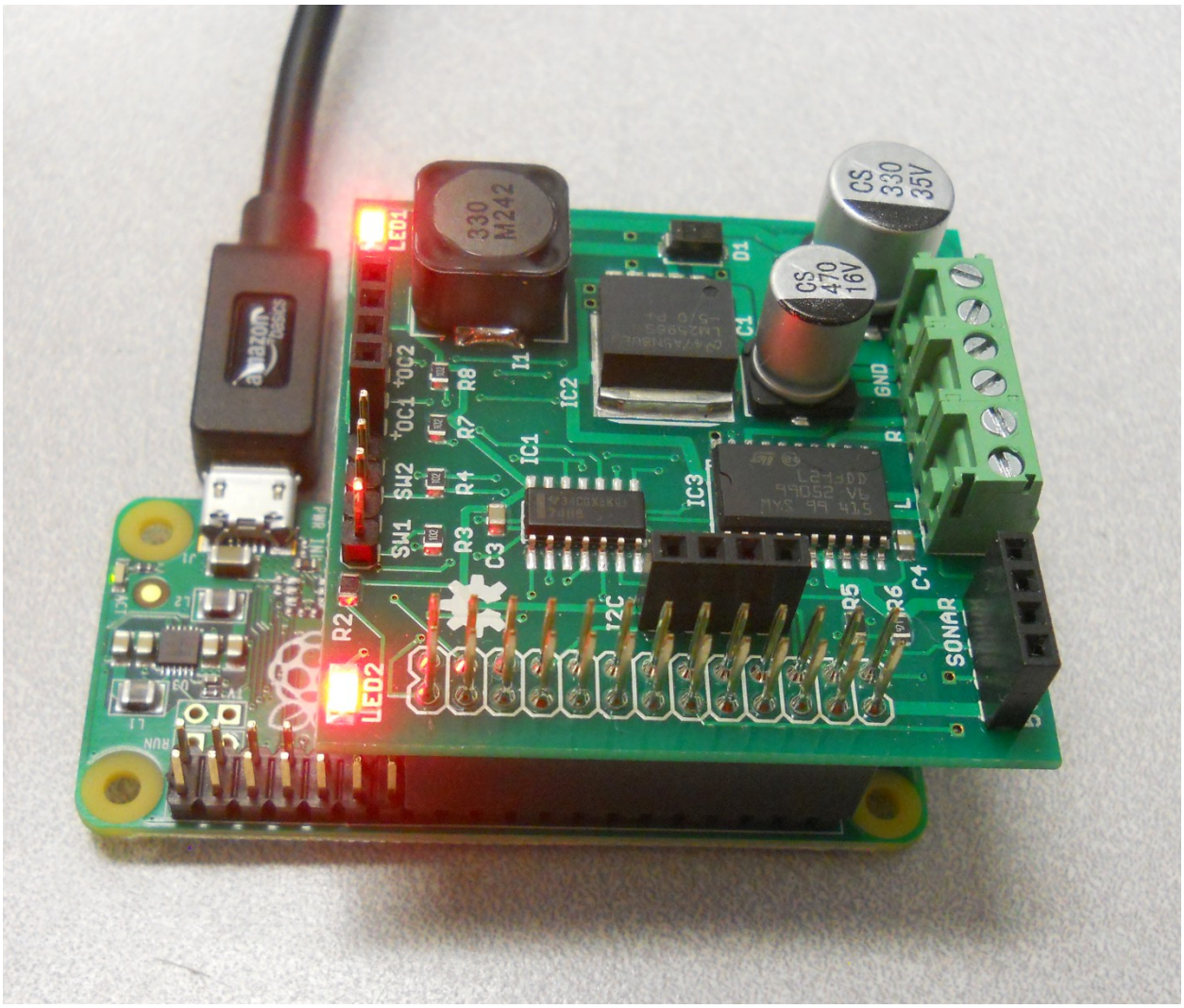

POWERPACKS

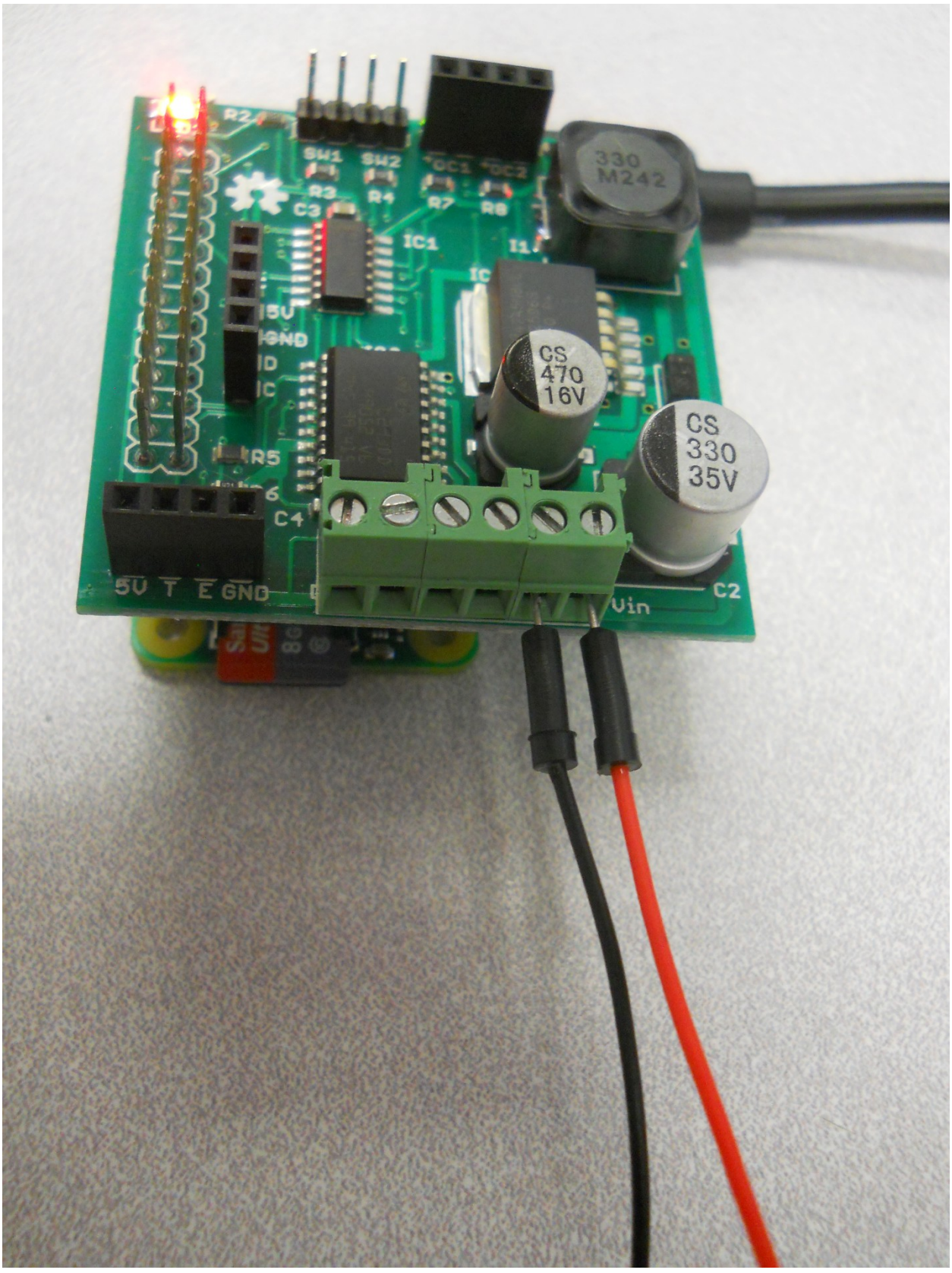

AA Battery
AA Battery

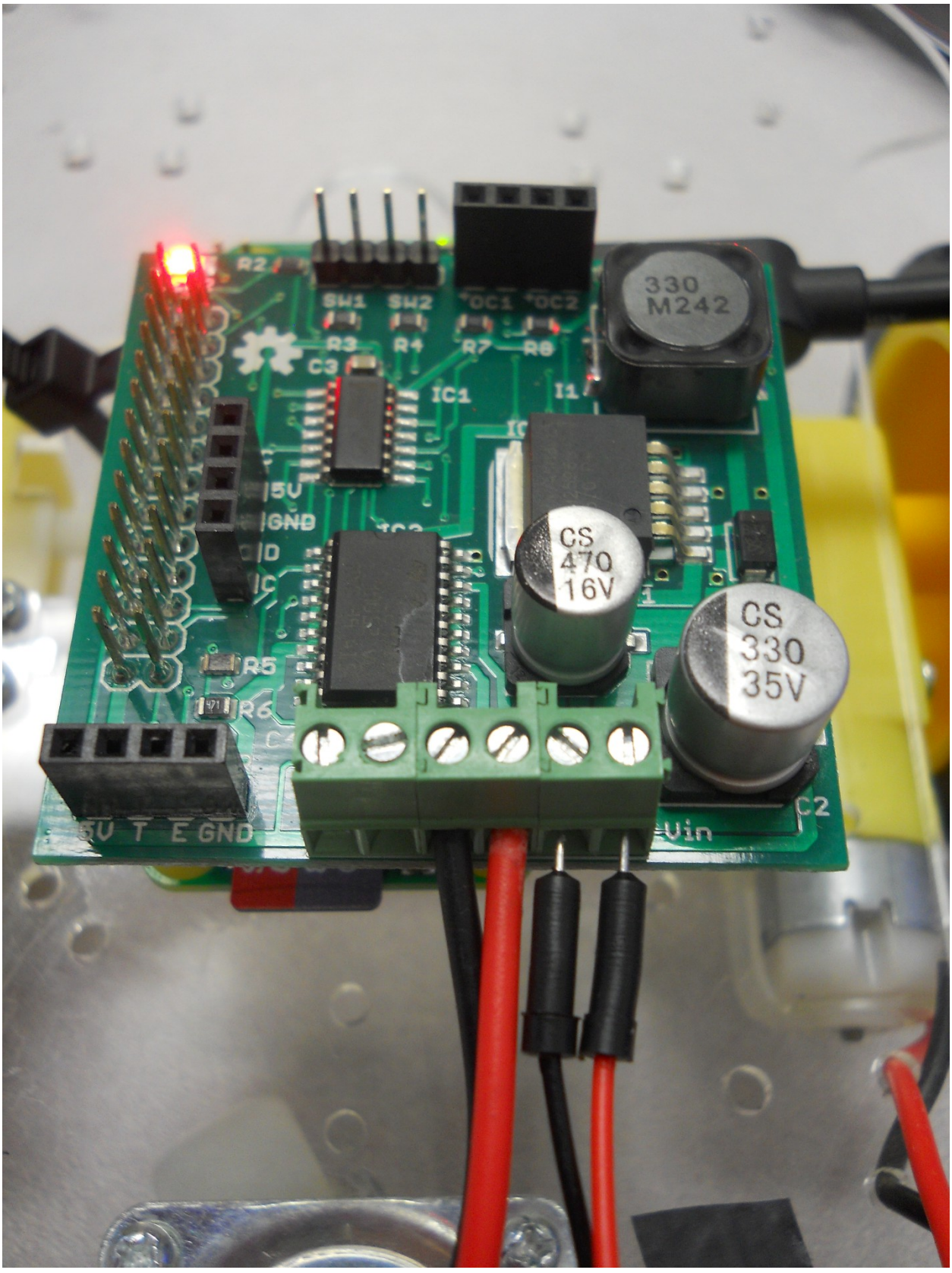

Pin 1 3.3V
Pin 2 5V
Pin 3 GPIO2
Pin 4 5V
Pin 5 GPIO3
Pin 6 GND
Pin 7 GPIO4
Pin 8 GPIO14
Pin 9 GND
Pin 10 GPIO15
Pin 11 GPIO17
Pin 12 GPIO18
Pin 13 GPIO27
Pin 14 GND
Pin 15 GPIO22
Pin 16 GPIO23
Pin 17 3.3V
Pin 18 GPIO24
Pin 19 GPIO10
Pin 20 GND
Pin 21 GPIO9
Pin 22 GPIO25
Pin 23 GPIO11
Pin 24 GPIO8
Pin 25 GND
Pin 26 GPIO7
Pin 27 ID_SD
Pin 28 ID_SC
Pin 29 GPIO5
Pin 30 GND
Pin 31 GPIO6
Pin 32 GPIO12
Pin 33 GPIO13
Pin 34 GND
Pin 35 GPIO19
Pin 36 GPIO16
Pin 37 GPIO26
Pin 38 GPIO20
Pin 39 GND
Pin 40 GPIO21

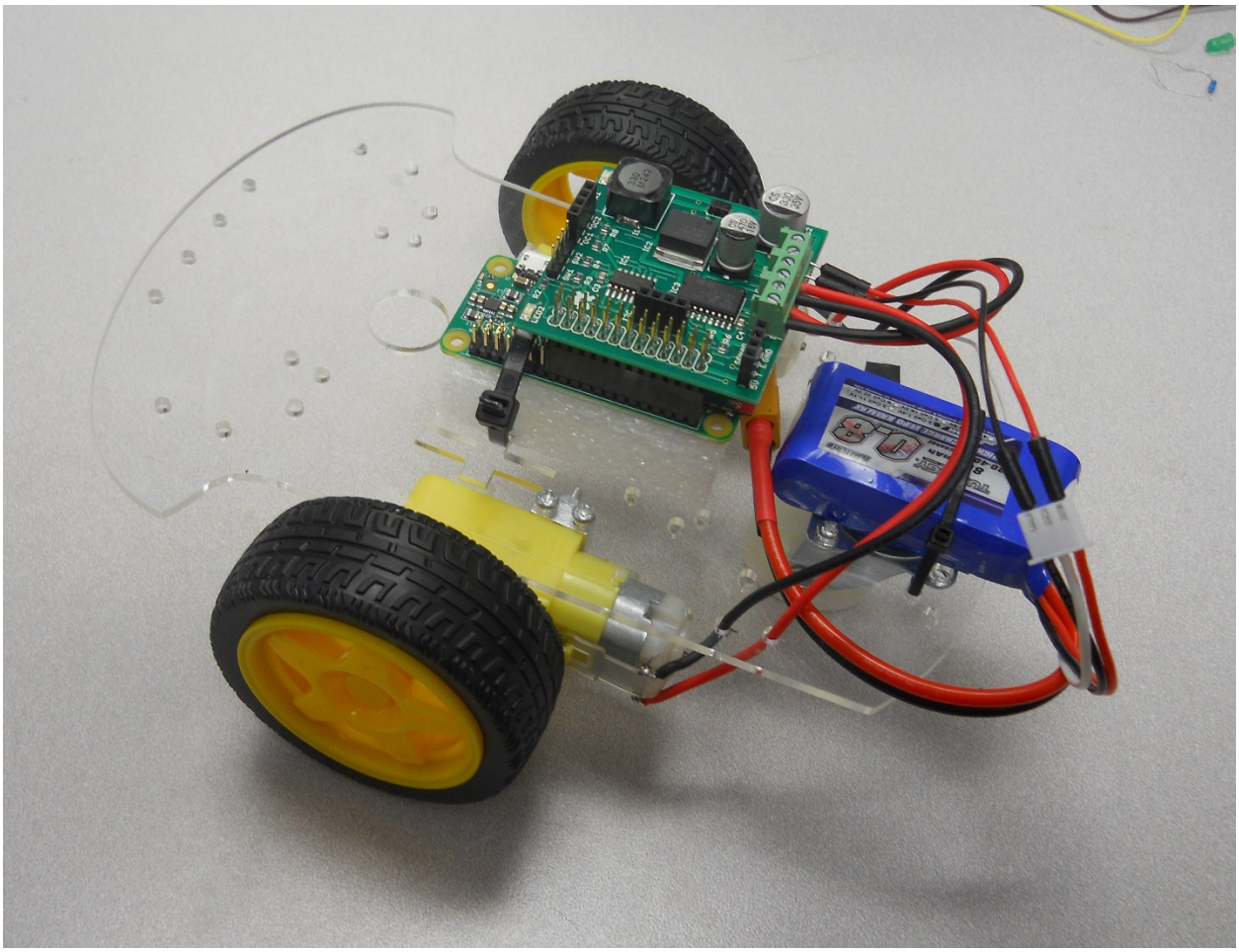

pi@raspberrypi: ~/dcmotor
File Edit Options Buffers Tools Python Help
#!/usr/bin/python
import RPi.GPIO as io
io.setmode(io.BCM)
in1_pin1 = 27
in2_pin1 = 22
in1_pin2 = 20
in2_pin2 = 21
io.setup(in1_pin1, io.OUT)
io.setup(in2_pin1, io.OUT)
io.setup(in1_pin2, io.OUT)
io.setup(in2_pin2, io.OUT)
def forward():
io.output(in1_pin1, True)
io.output(in2_pin1, False)
io.output(in1_pin2, True)
io.output(in2_pin2, False)
def reverse():
io.output(in1_pin1, False)
io.output(in2_pin1, True)
io.output(in1_pin2, False)
io.output(in2_pin2, True)
def stop():
io.output(in1_pin1, False)
io.output(in2_pin1, False)
io.output(in1_pin2, False)
io.output(in2_pin2, False)
while True:
cmd = raw_input("Enter f (forward) or r (reverse) or s (stop): ")
direction = cmd[0]
if direction == "f":
forward()
if direction == "r":
reverse()
if direction == "s":
stop()
-UU-:**--F1 dcmotor.py All L14 (Python)

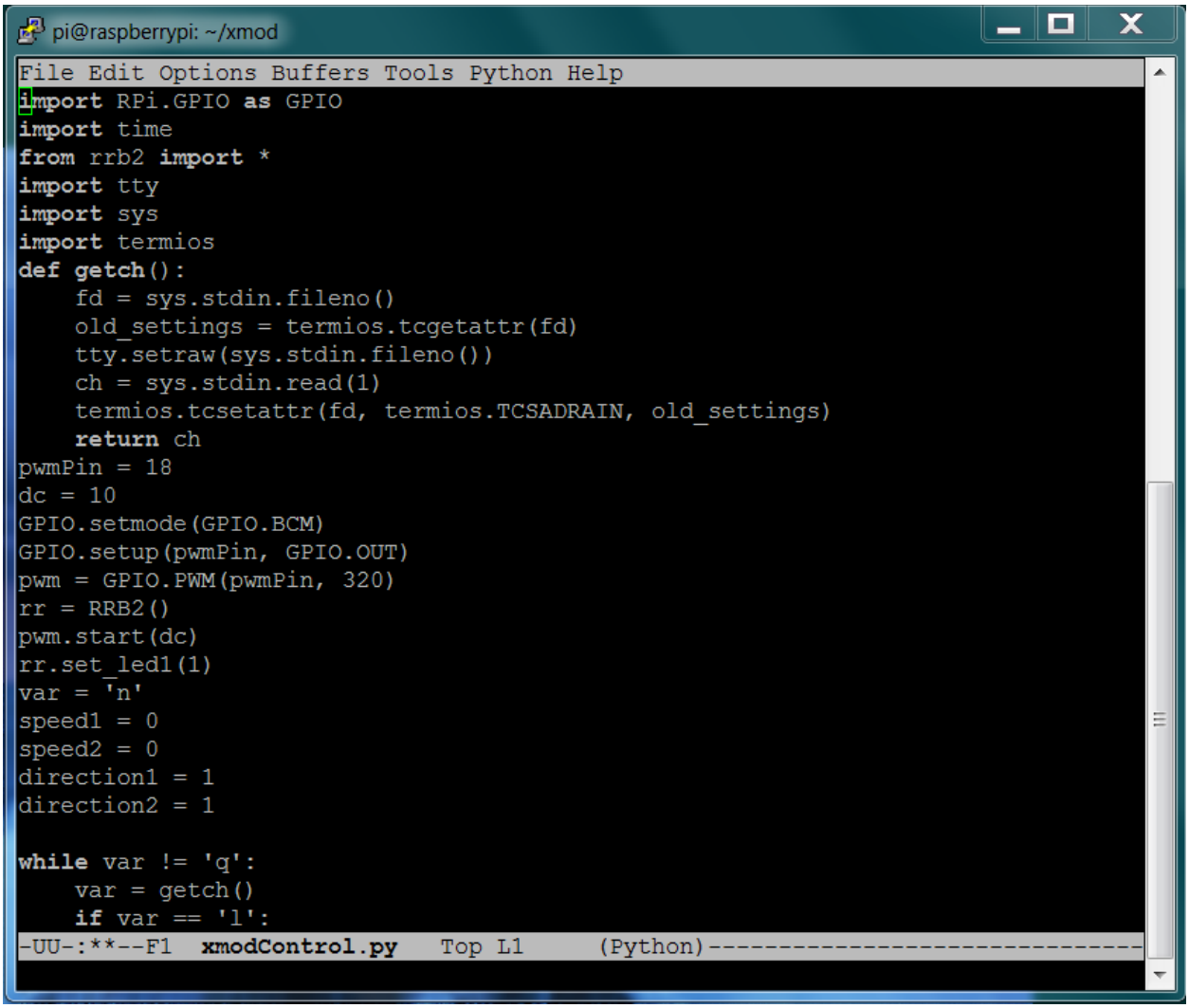

pi@raspberrypi: ~/dcmotor
File Edit Options Buffers Tools Python Help
#!/usr/bin/python
import RPi.GPIO as io
io.setmode(io.BCM)
in1_pin1 = 27
in2_pin1 = 22
in1_pin2 = 20
in2_pin2 = 21
io.setup(in1_pin1, io.OUT)
p1 = io.PWM(in1_pin1, 50)
p1.start(0)
io.setup(in2_pin1, io.OUT)
p2 = io.PWM(in2_pin1, 50)
p2.start(0)
io.setup(in1_pin2, io.OUT)
p3 = io.PWM(in1_pin2, 50)
p3.start(0)
io.setup(in2_pin2, io.OUT)
p4 = io.PWM(in2_pin2, 50)
p4.start(0)
def forward():
p1.start(50)
p2.start(0)
p3.start(50)
p4.start(0)
def reverse():
p1.start(0)
p2.start(50)
p3.start(0)
p4.start(50)
def stop():
p1.start(0)
p2.start(0)
p3.start(0)
p4.start(0)
while True:
-UU-:----F1 dcmotor.py Top L1 (Python)

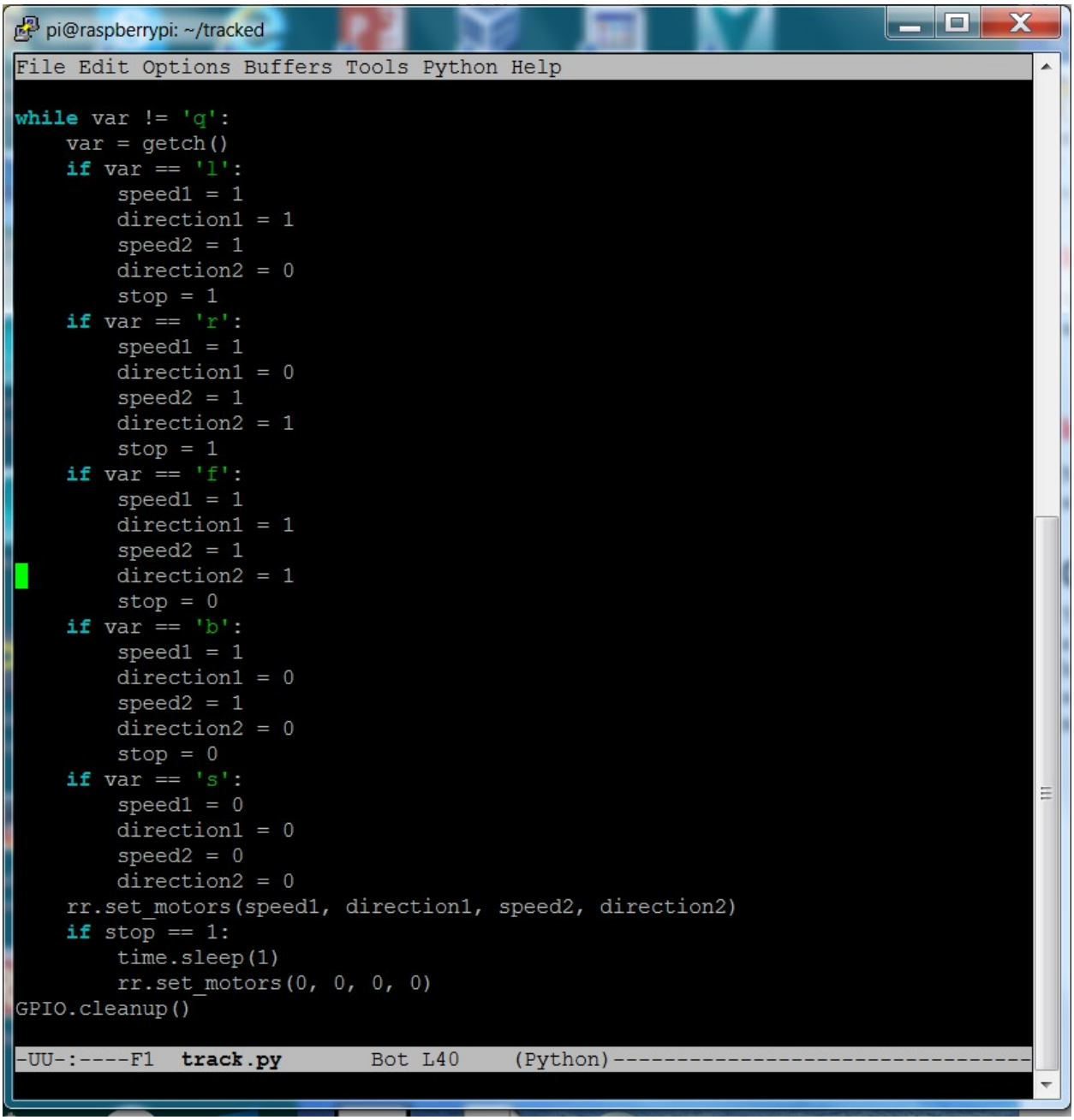

330
M242
CS
330
35V
CS
470
16V
LED1
LED2
D1
C1
GND
R
L
IC1
IC2
IC3
SW1
SW2
R1
R2
R3
R4
R5
R6
R7
R8
C3
C4
I2C
SONAR

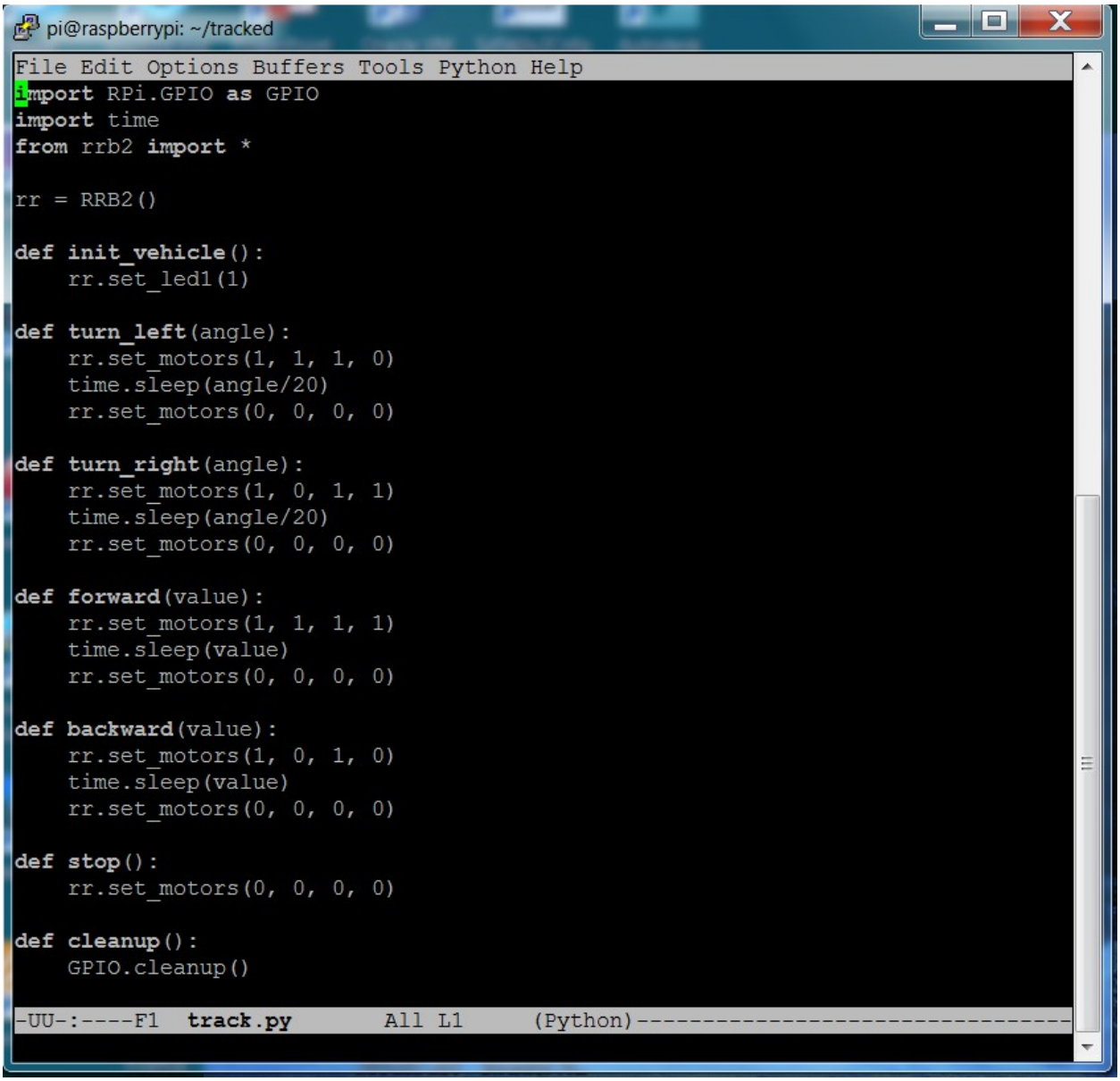

330
M242
CS
470
16V
CS
330
35V
SW1
SW2
R2
R3
R4
R5
R7
R8
C3
C4
IC1
5V
GND
5V T E GND
Vin
C2

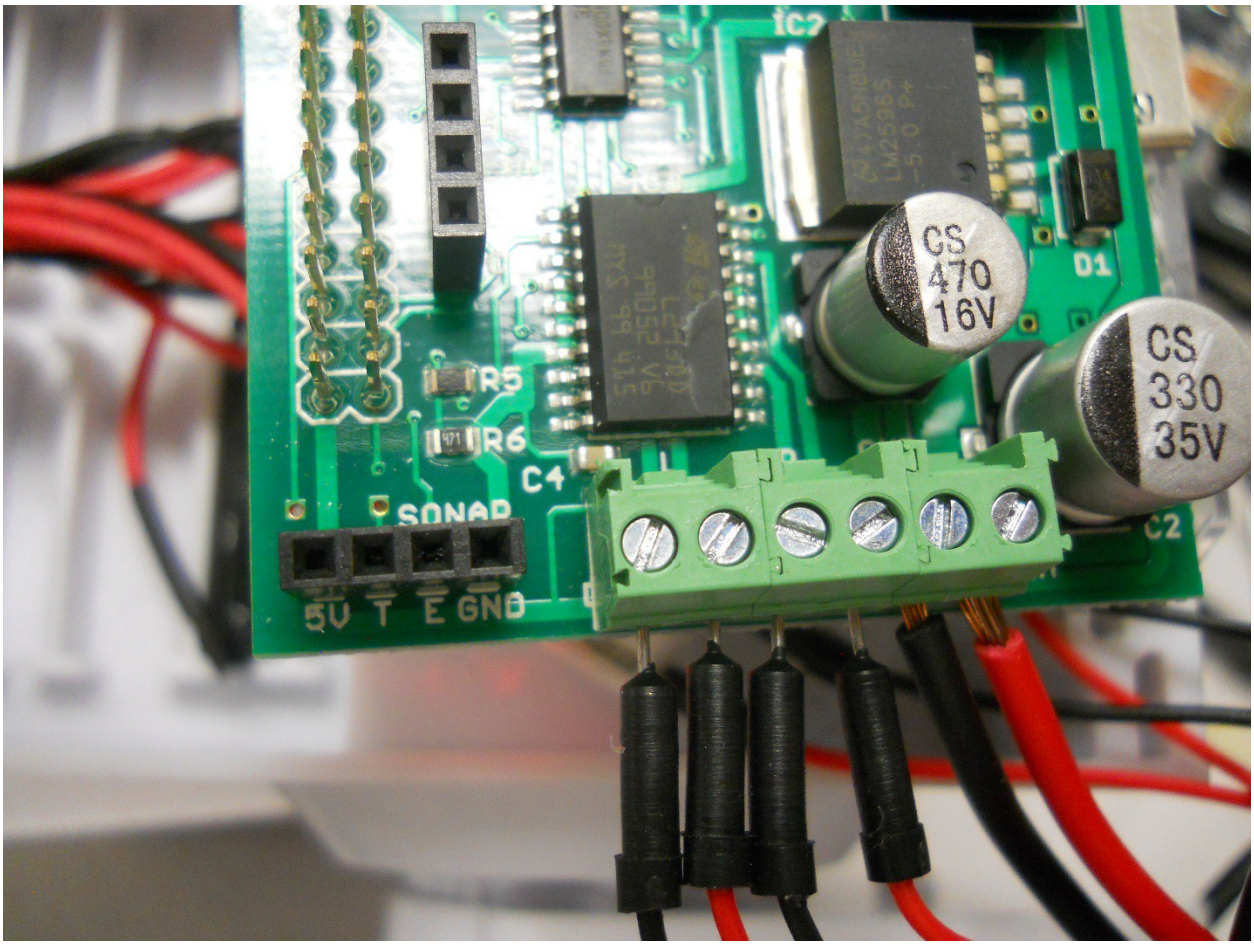

330
M242
CS
470
16V
CS
330
35V
R2
SW1
SW2
*OC1
*OC2
R3
R4
R7
R8
C3
IC1
I1
5V
GND
ID
IC
R5
R6
C2
5V T E GND
Vin



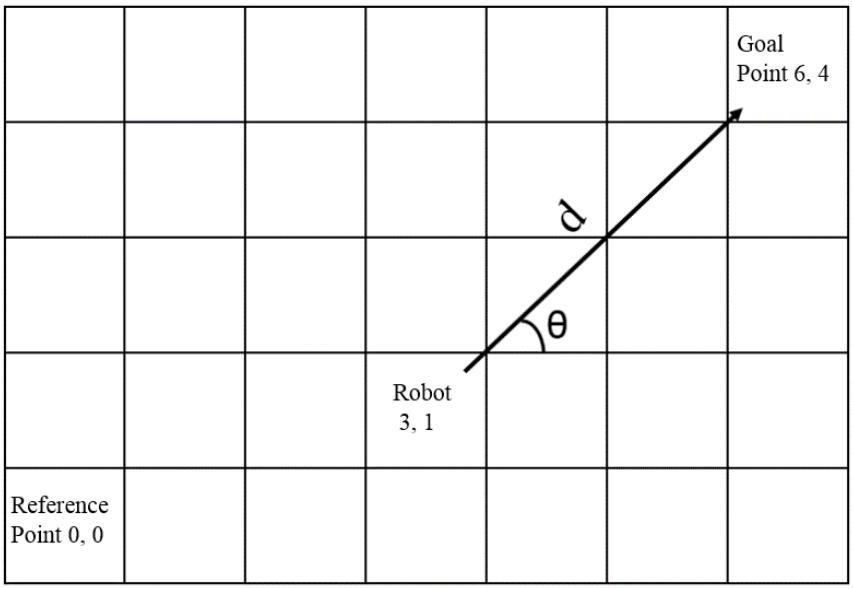

pi@raspberrypi: ~/xmod
File Edit Options Buffers Tools Python Help
import RPi.GPIO as GPIO
import time
from rrb2 import *
import tty
import sys
import termios
def getch():
fd = sys.stdin.fileno()
old_settings = termios.tcgetattr(fd)
tty.setraw(sys.stdin.fileno())
ch = sys.stdin.read(1)
termios.tcsetattr(fd, termios.TCSADRAIN, old_settings)
return ch
pwmPin = 18
dc = 10
GPIO.setmode(GPIO.BCM)
GPIO.setup(pwmPin, GPIO.OUT)
pwm = GPIO.PWM(pwmPin, 320)
rr = RRB2()
pwm.start(dc)
rr.set_led1(1)
var = 'n'
speed1 = 0
speed2 = 0
direction1 = 1
direction2 = 1
while var != 'q':
var = getch()
if var == '1':
-UU-:**--F1 xmodControl.py Top L1 (Python)


pi@raspberrypi: ~/tracked
File Edit Options Buffers Tools Python Help
while var != 'q':
var = getch()
if var == 'l':
speed1 = 1
direction1 = 1
speed2 = 1
direction2 = 0
stop = 1
if var == 'r':
speed1 = 1
direction1 = 0
speed2 = 1
direction2 = 1
stop = 1
if var == 'f':
speed1 = 1
direction1 = 1
speed2 = 1
direction2 = 1
stop = 0
if var == 'b':
speed1 = 1
direction1 = 0
speed2 = 1
direction2 = 0
stop = 0
if var == 's':
speed1 = 0
direction1 = 0
speed2 = 0
direction2 = 0
rr.set_motors(speed1, direction1, speed2, direction2)
if stop == 1:
time.sleep(1)
rr.set_motors(0, 0, 0, 0)
GPIO.cleanup()
-UU-:----F1 track.py Bot L40 (Python)


pi@raspberrypi: ~/tracked
File Edit Options Buffers Tools Python Help
import RPi.GPIO as GPIO
import time
from rrb2 import *
rr = RRB2()
def init_vehicle():
rr.set_led1(1)
def turn_left(angle):
rr.set_motors(1, 1, 1, 0)
time.sleep(angle/20)
rr.set_motors(0, 0, 0, 0)
def turn_right(angle):
rr.set_motors(1, 0, 1, 1)
time.sleep(angle/20)
rr.set_motors(0, 0, 0, 0)
def forward(value):
rr.set_motors(1, 1, 1, 1)
time.sleep(value)
rr.set_motors(0, 0, 0, 0)
def backward(value):
rr.set_motors(1, 0, 1, 0)
time.sleep(value)
rr.set_motors(0, 0, 0, 0)
def stop():
rr.set_motors(0, 0, 0, 0)
def cleanup():
GPIO.cleanup()
-UU-:----F1 track.py All L1 (Python)



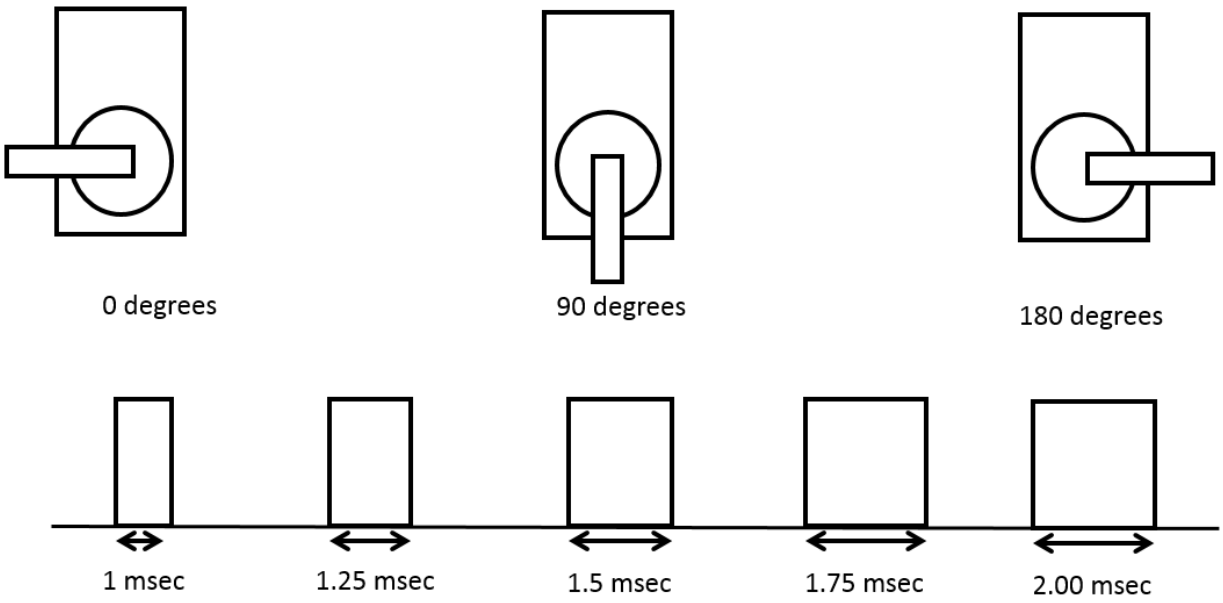
						Goal Point 6, 4
			Robot 3, 1			
Reference Point 0, 0						

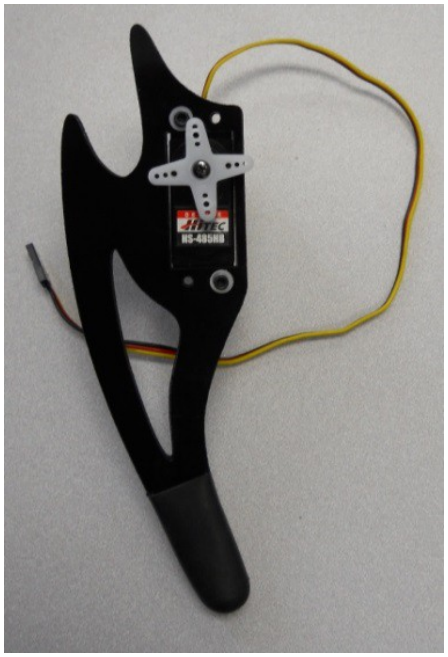


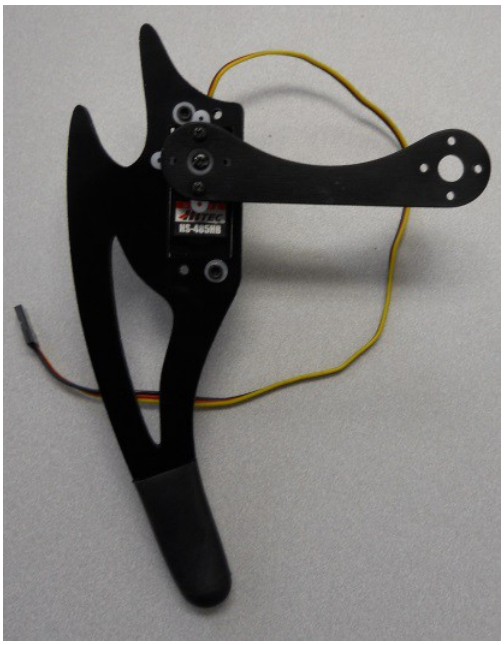
pi@raspberrypi: ~/tracked

```
File Edit Options Buffers Tools Python Help
#!/usr/bin/python
import time
from track import *
import math

xpos_robot = int(raw_input("Robot X Position: "))
ypos_robot = int(raw_input("Robot Y Position: "))
xpos_goal = int(raw_input("Goal X Position: "))
ypos_goal = int(raw_input("Goal Y Position: "))

distance = math.sqrt((xpos_goal - ypos_robot)**2 + (ypos_goal - ypos_robot)**2)
angle = round(math.degrees(math.atan2((ypos_goal - ypos_robot), (xpos_goal - xpos_robot))))
if angle < 0:
    angle = angle + 360
print (angle)
# Turn to the right bearing
if (angle) < 180:
    turn_right(angle)
else:
    turn_left(angle)
print (distance)
forward(distance)



-UU-:----F1  robotGoal.py    All L1      (Python)----------------------------------------------
For information about GNU Emacs and the GNU system, type C-h C-a.
```

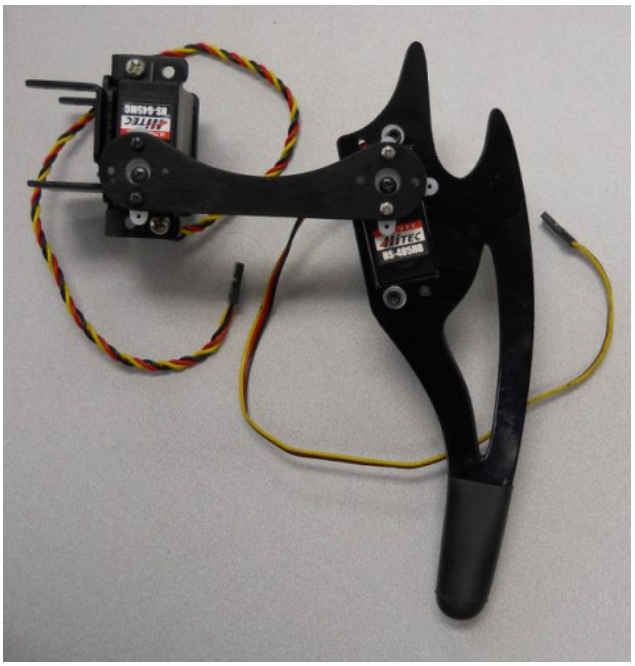
Chapter 5: Building a Robot That Can Walk

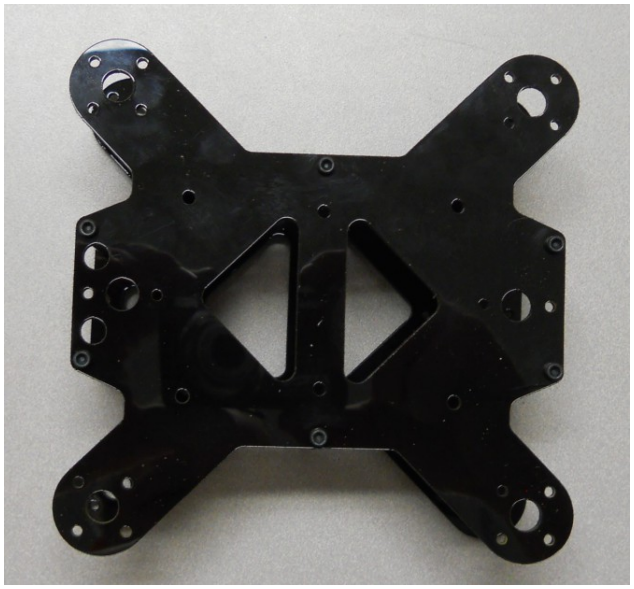


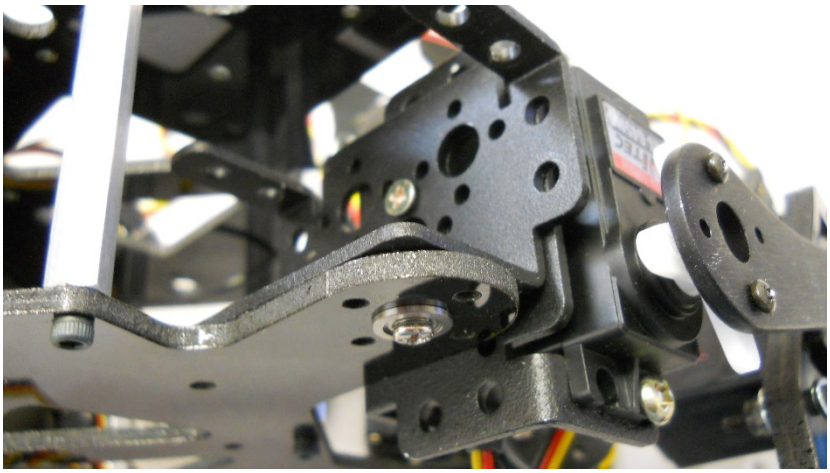


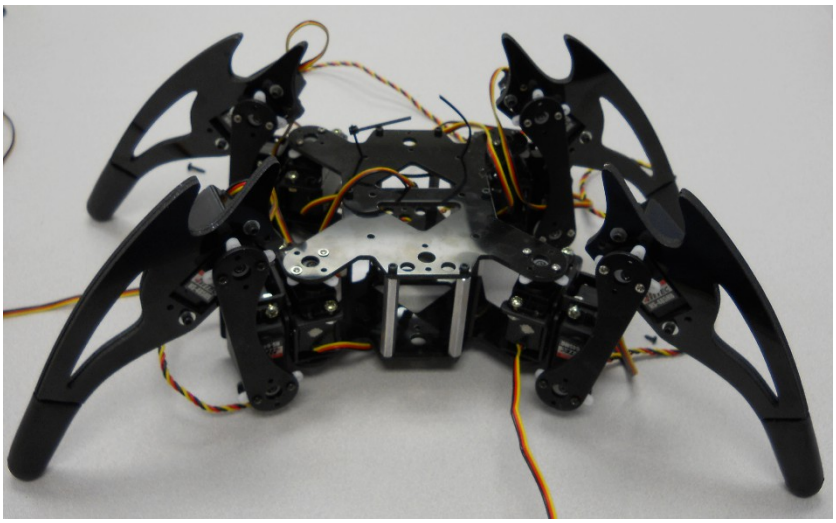

HS-485HB


HS-485HB

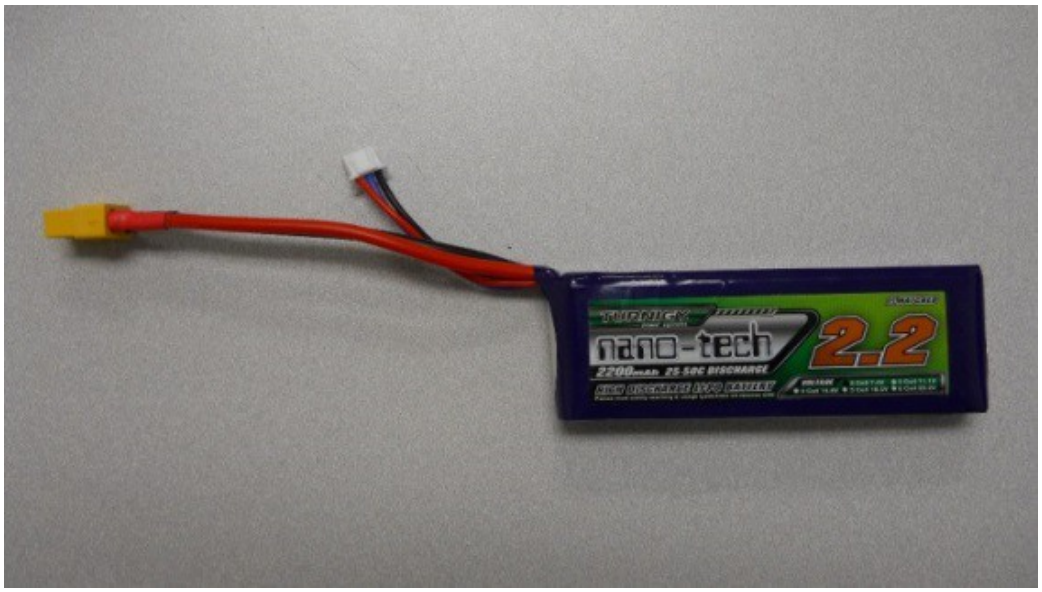

HITEC
HS-65MG
HITEC
HS-485HB

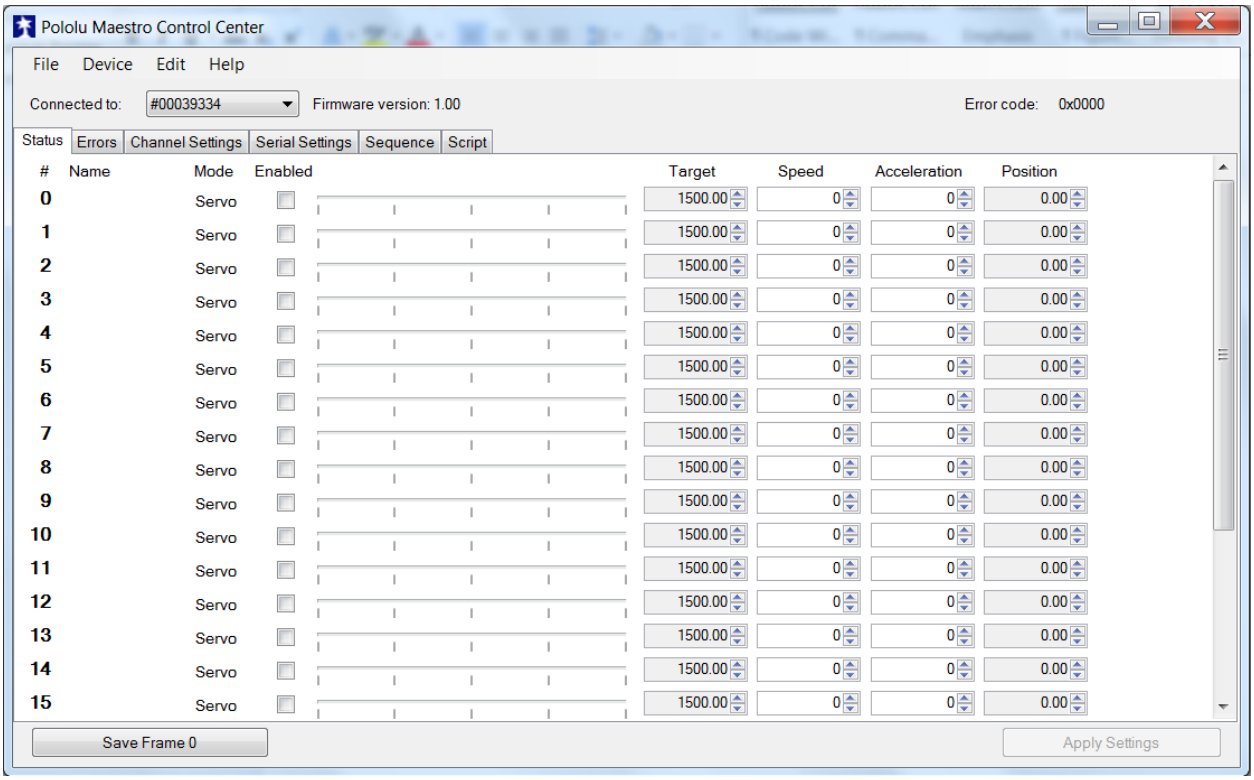


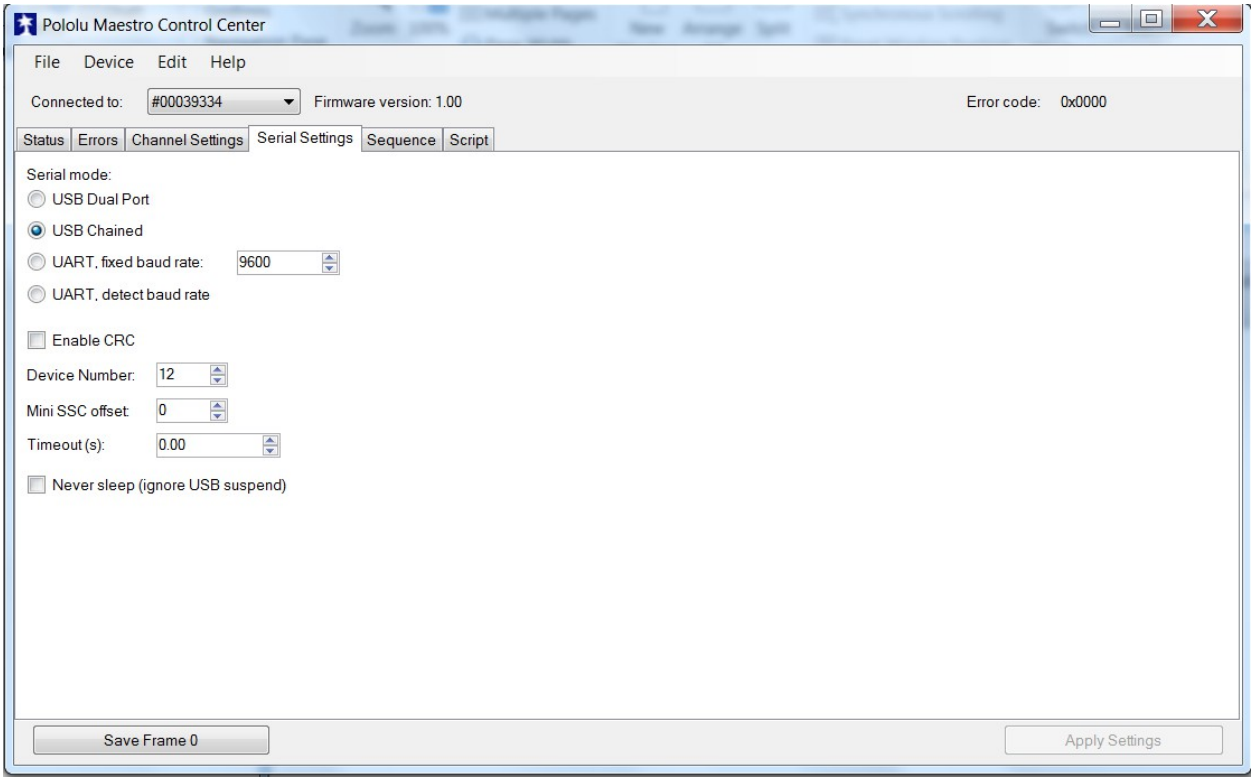


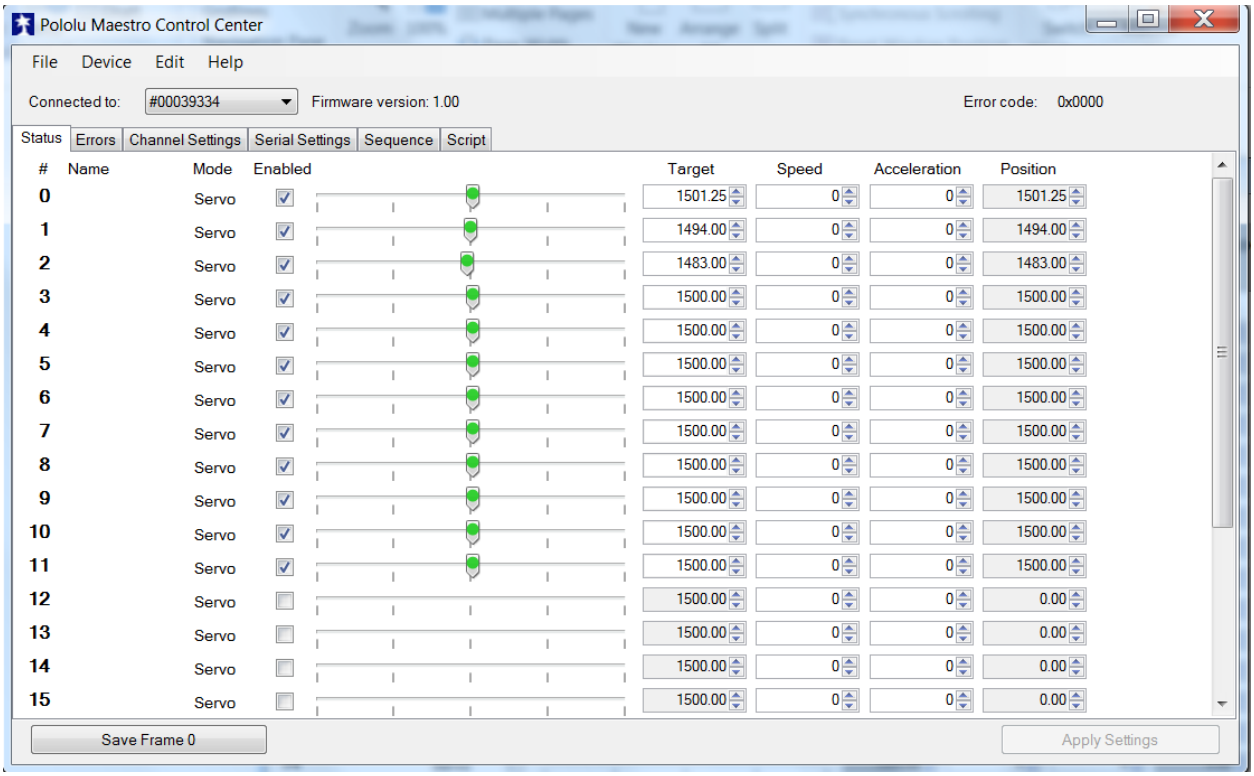


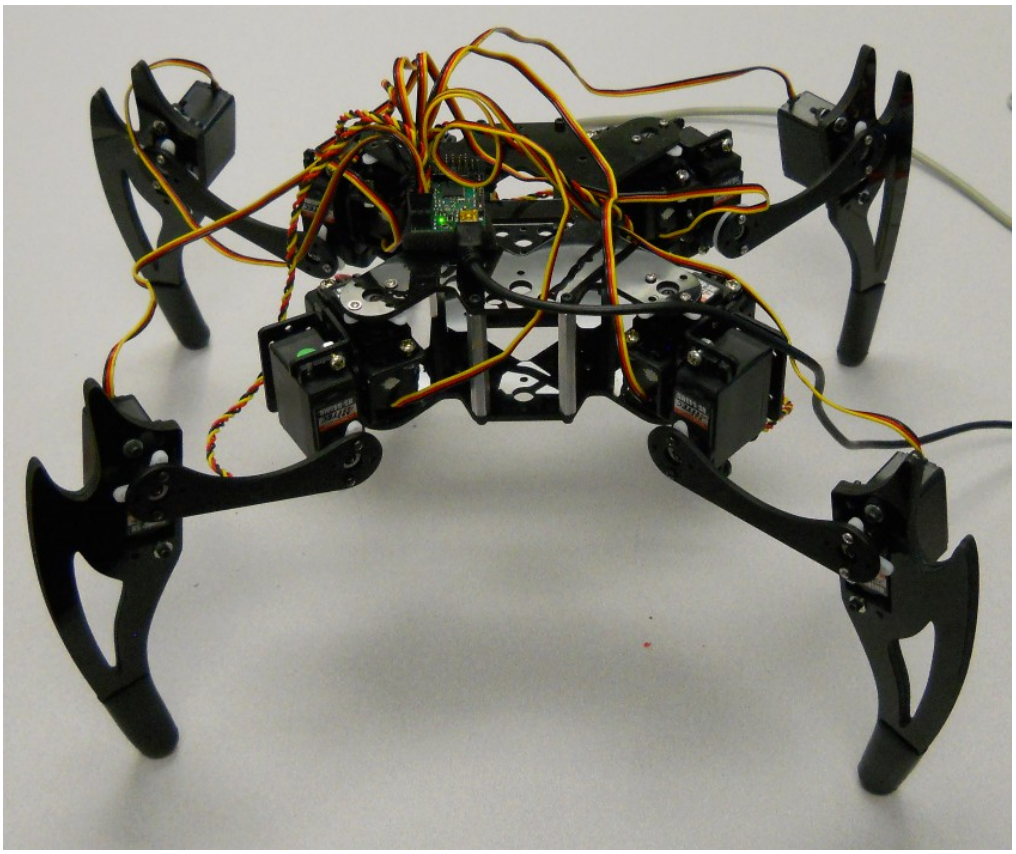

0
1
2
3
4
5
+5V (out)
6
7
8
9
10
11
S
+5V (out)
GND
Pololu ©2010
Engage Your Brain
www.pololu.com
GND
VIN
RX
TX
RST
ERR
TXIN (chain)
VSRV=VIN
12 13 14 15 16 17
S
+
−

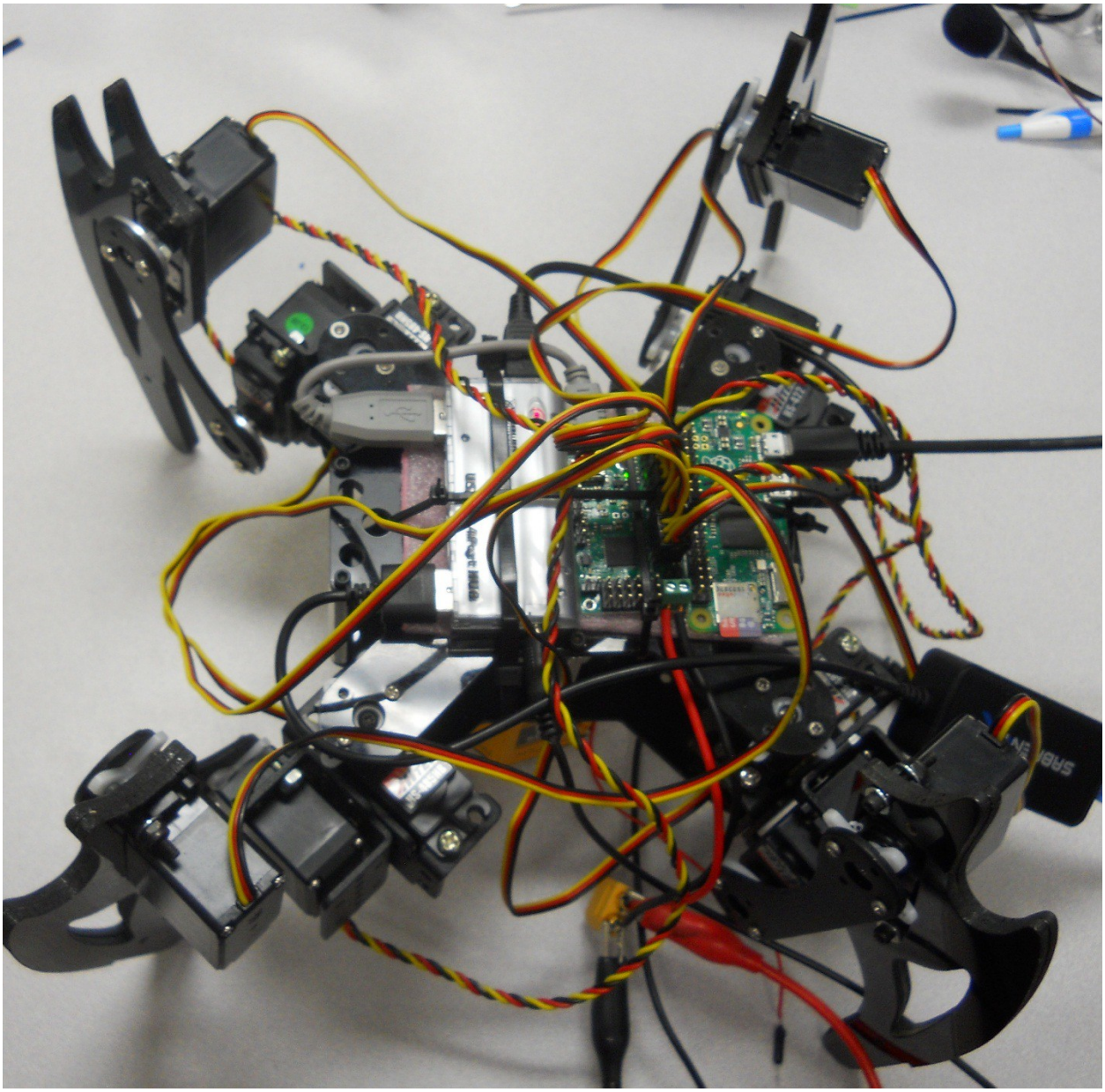

nano-tech
2.2

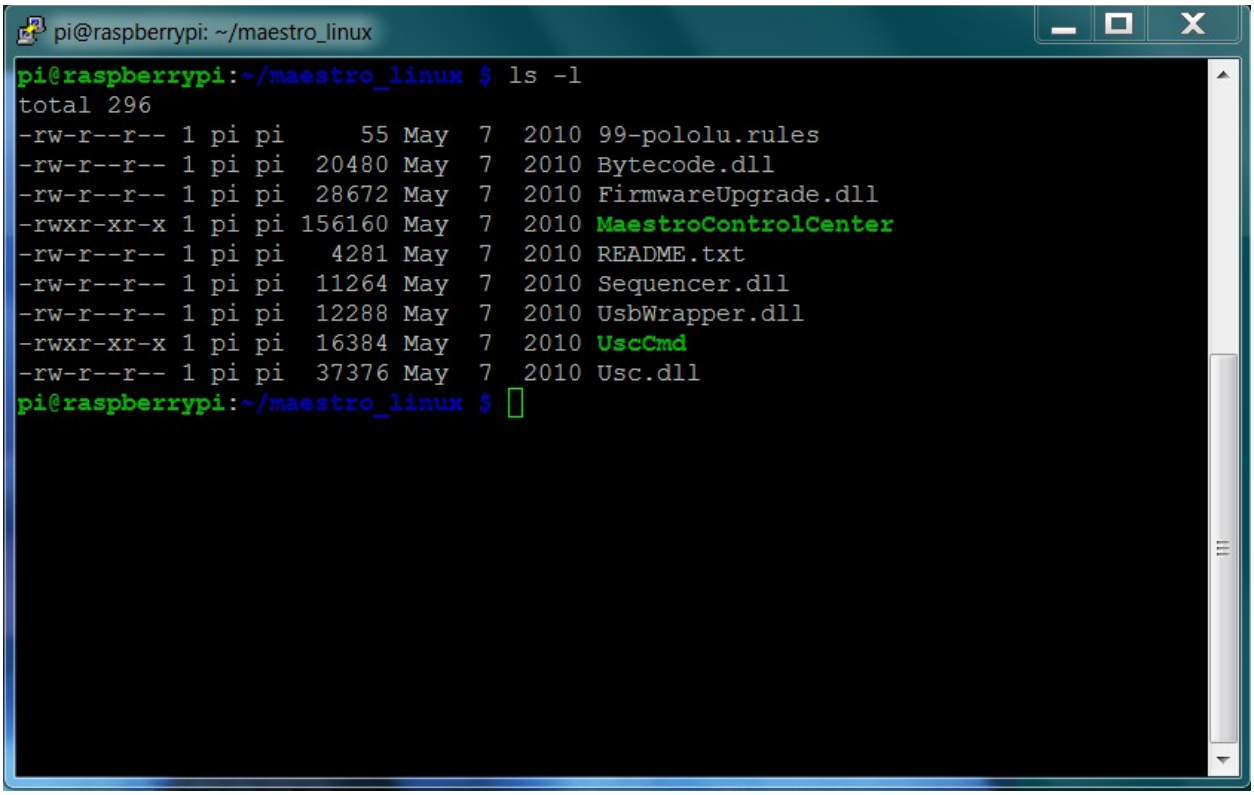

Pololu Maestro Control Center
File Device Edit Help
Connected to: #00039334 Firmware version: 1.00 Error code: 0x0000
Status Errors Channel Settings Serial Settings Sequence Script
Name Mode Enabled Target Speed Acceleration Position
0 Servo 1500.00 0 0 0.00
1 Servo 1500.00 0 0 0.00
2 Servo 1500.00 0 0 0.00
3 Servo 1500.00 0 0 0.00
4 Servo 1500.00 0 0 0.00
5 Servo 1500.00 0 0 0.00
6 Servo 1500.00 0 0 0.00
7 Servo 1500.00 0 0 0.00
8 Servo 1500.00 0 0 0.00
9 Servo 1500.00 0 0 0.00
10 Servo 1500.00 0 0 0.00
11 Servo 1500.00 0 0 0.00
12 Servo 1500.00 0 0 0.00
13 Servo 1500.00 0 0 0.00
14 Servo 1500.00 0 0 0.00
15 Servo 1500.00 0 0 0.00
Save Frame 0
Apply Settings

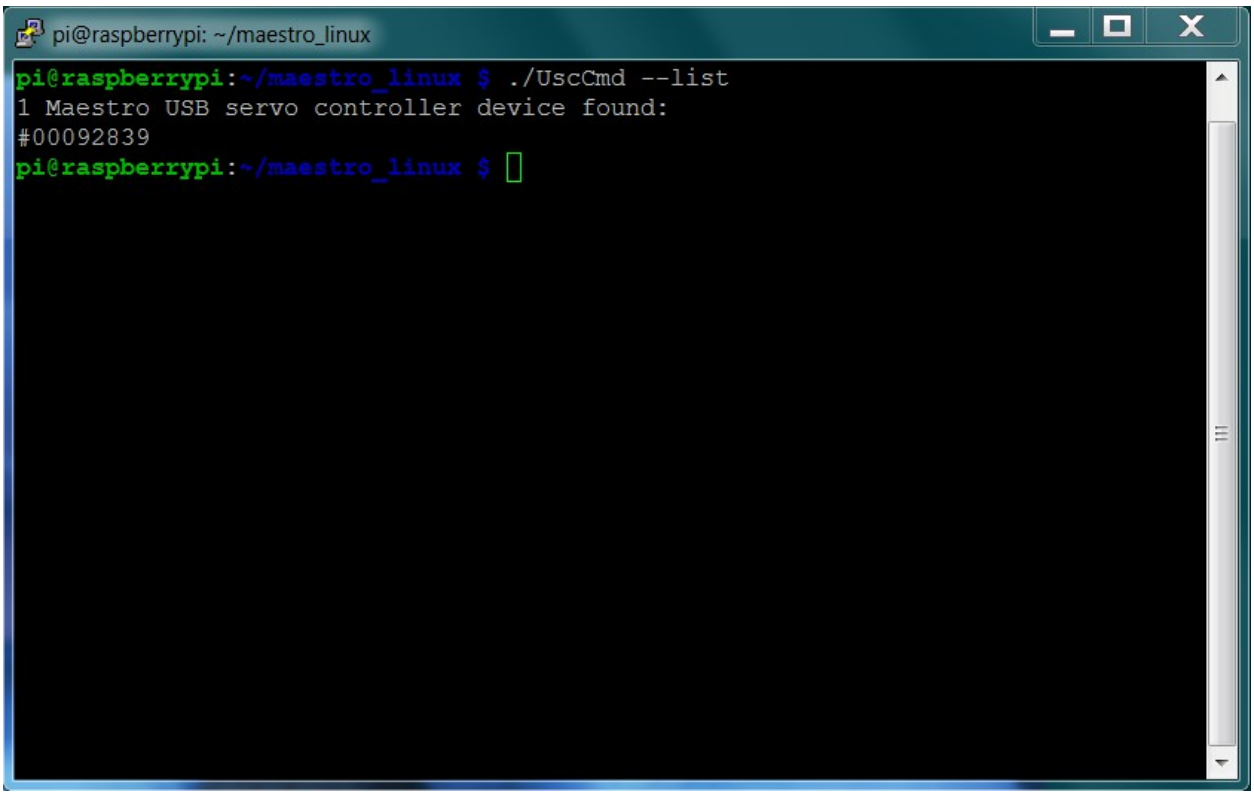

Pololu Maestro Control Center
File Device Edit Help
Connected to: #00039334 Firmware version: 1.00 Error code: 0x0000
Status Errors Channel Settings Serial Settings Sequence Script
Serial mode:
USB Dual Port
USB Chained
UART, fixed baud rate: 9600
UART, detect baud rate
Enable CRC
Device Number: 12
Mini SSC offset: 0
Timeout (s): 0.00
Never sleep (ignore USB suspend)
Save Frame 0
Apply Settings

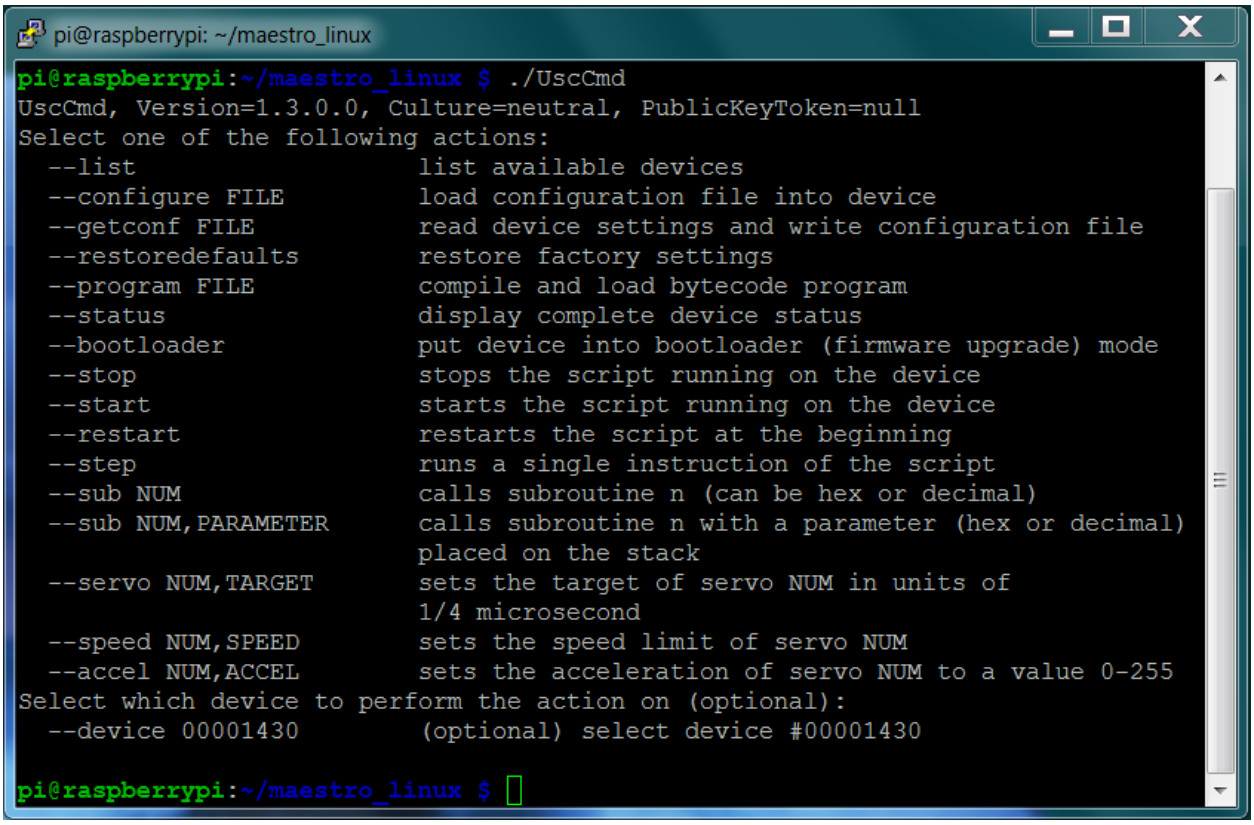

Pololu Maestro Control Center
File Device Edit Help
Connected to: #00039334 Firmware version: 1.00 Error code: 0x0000
Status Errors Channel Settings Serial Settings Sequence Script
Name Mode Enabled Target Speed Acceleration Position
0 Servo 1501.25 0 0 1501.25
1 Servo 1494.00 0 0 1494.00
2 Servo 1483.00 0 0 1483.00
3 Servo 1500.00 0 0 1500.00
4 Servo 1500.00 0 0 1500.00
5 Servo 1500.00 0 0 1500.00
6 Servo 1500.00 0 0 1500.00
7 Servo 1500.00 0 0 1500.00
8 Servo 1500.00 0 0 1500.00
9 Servo 1500.00 0 0 1500.00
10 Servo 1500.00 0 0 1500.00
11 Servo 1500.00 0 0 1500.00
12 Servo 1500.00 0 0 0.00
13 Servo 1500.00 0 0 0.00
14 Servo 1500.00 0 0 0.00
15 Servo 1500.00 0 0 0.00
Save Frame 0
Apply Settings

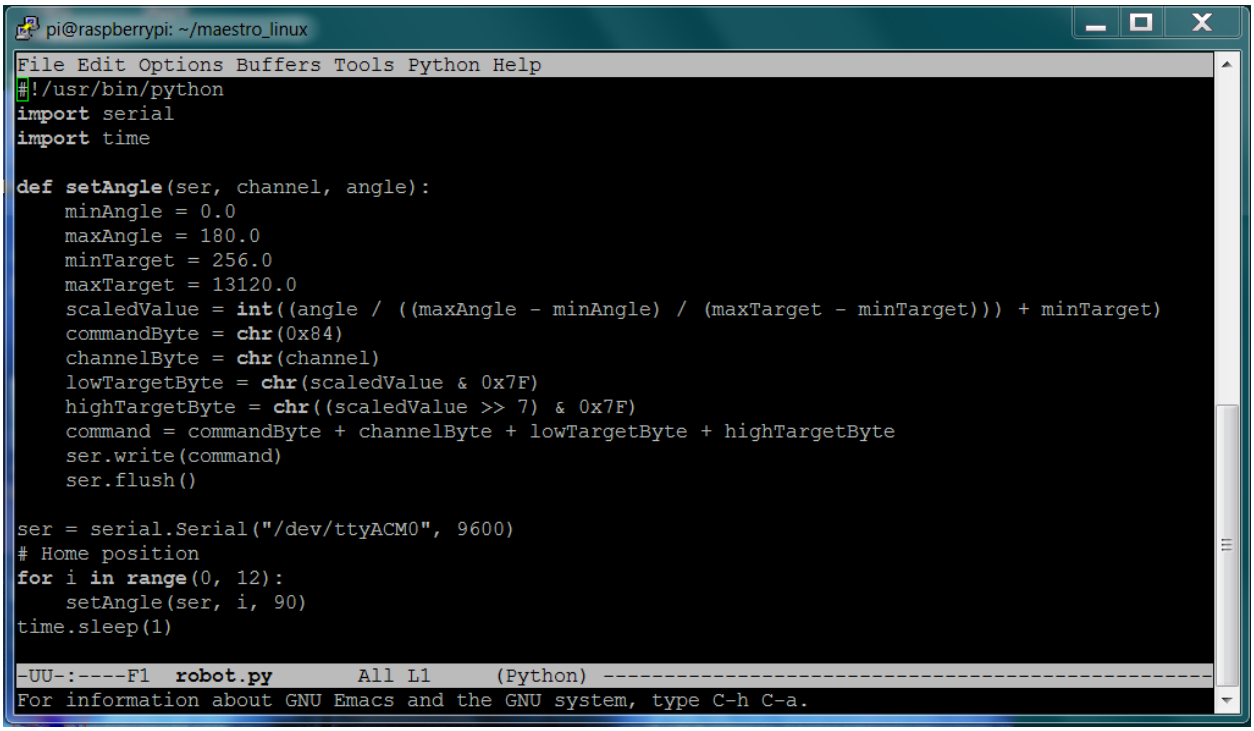


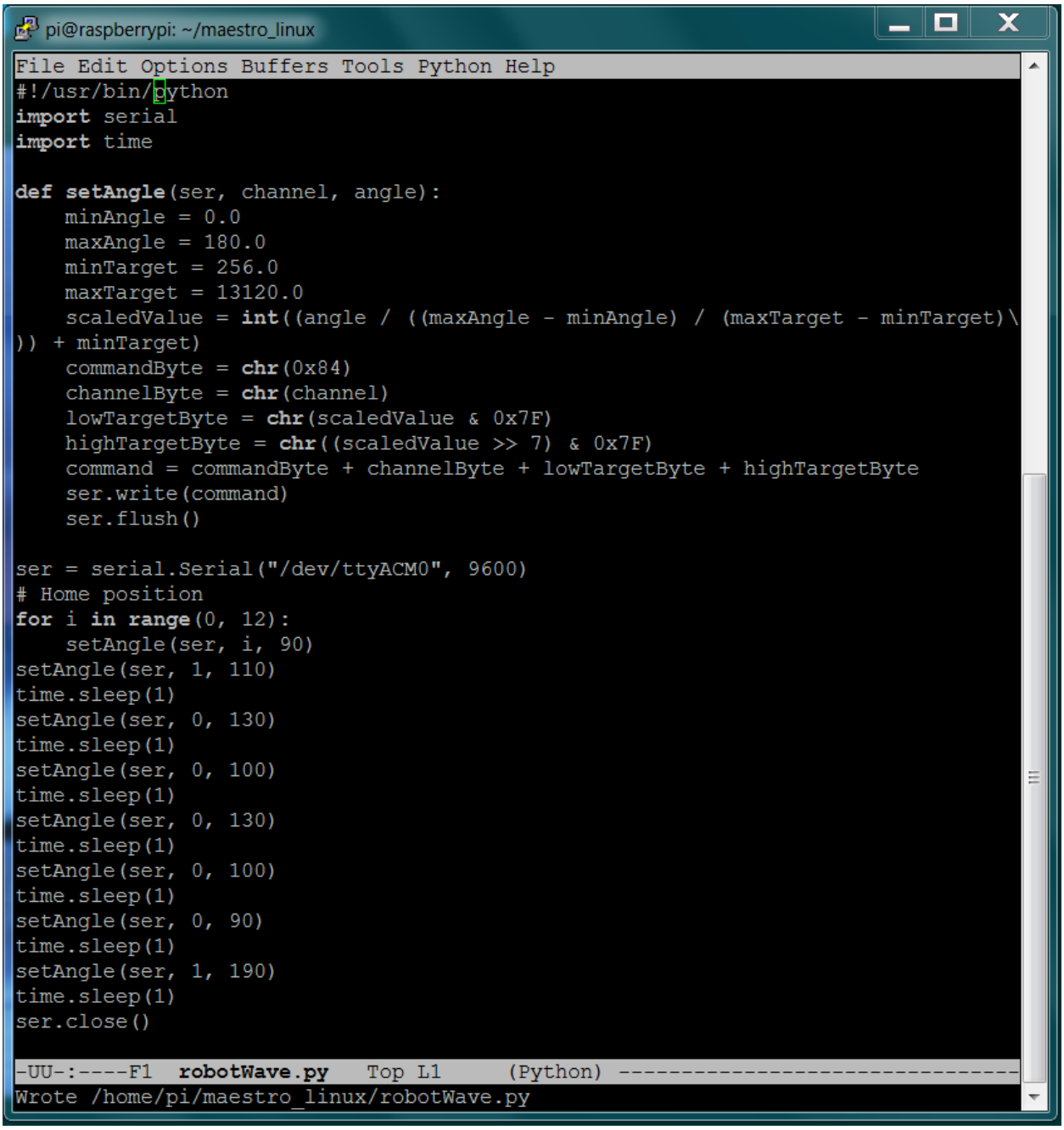


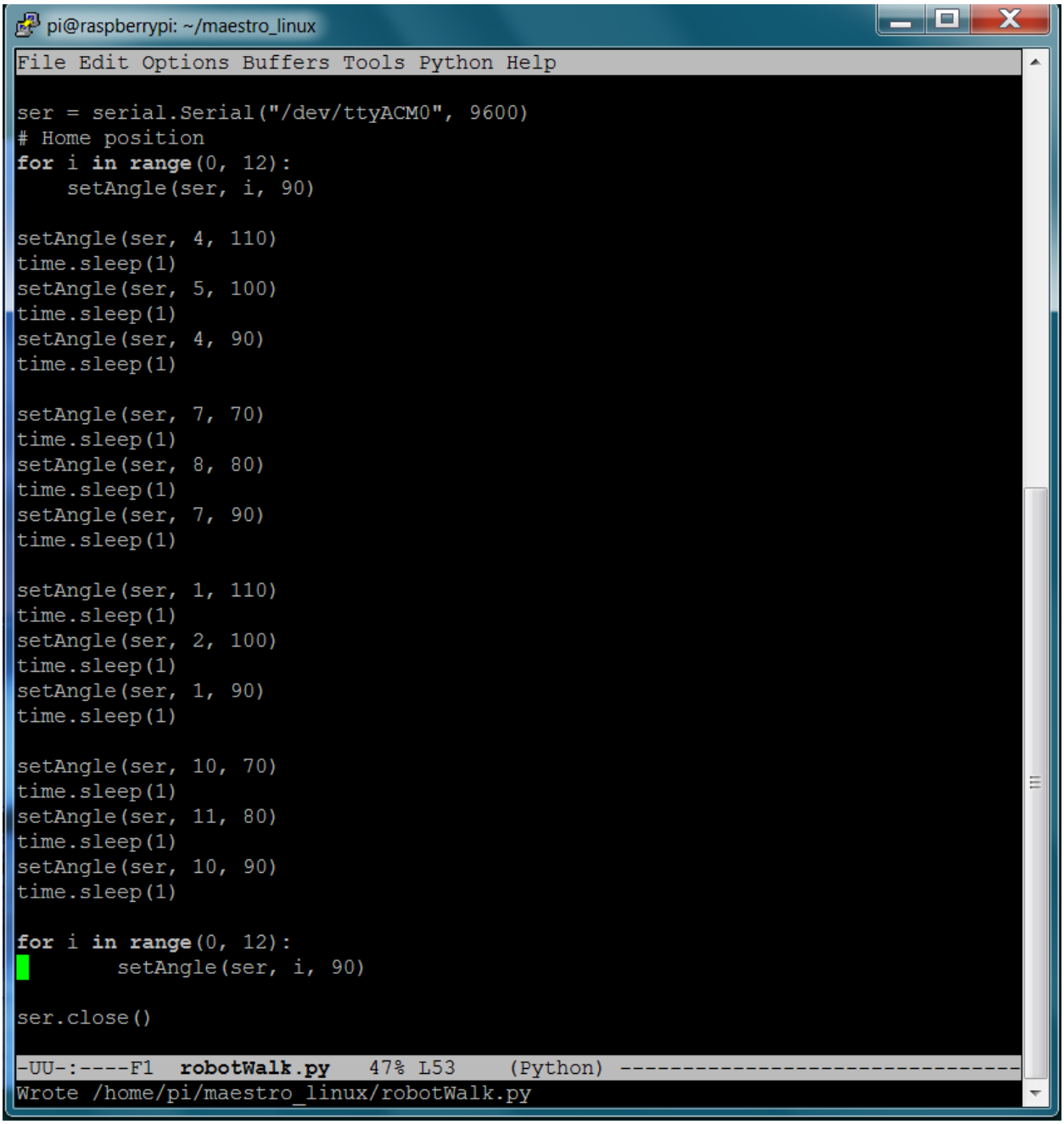

pi@raspberrypi: ~/maestro_linux
pi@raspberrypi:~/maestro_linux $ ls -l
total 296
-rw-r--r-- 1 pi pi   55 May 7 2010 99-pololu.rules
-rw-r--r-- 1 pi pi 20480 May 7 2010 Bytecode.dll
-rw-r--r-- 1 pi pi 28672 May 7 2010 FirmwareUpgrade.dll
-rwxr-xr-x 1 pi pi 156160 May 7 2010 MaestroControlCenter
-rw-r--r-- 1 pi pi   4281 May 7 2010 README.txt
-rw-r--r-- 1 pi pi 11264 May 7 2010 Sequencer.dll
-rw-r--r-- 1 pi pi 12288 May 7 2010 UsbWrapper.dll
-rwxr-xr-x 1 pi pi 16384 May 7 2010 UscCmd
-rw-r--r-- 1 pi pi 37376 May 7 2010 Usc.dll
pi@raspberrypi:~/maestro_linux $


pi@raspberrypi: ~/maestro_linux
pi@raspberrypi:~/maestro_linux $ ./UscCmd --list
1 Maestro USB servo controller device found:
#00092839
pi@raspberrypi:~/maestro_linux $

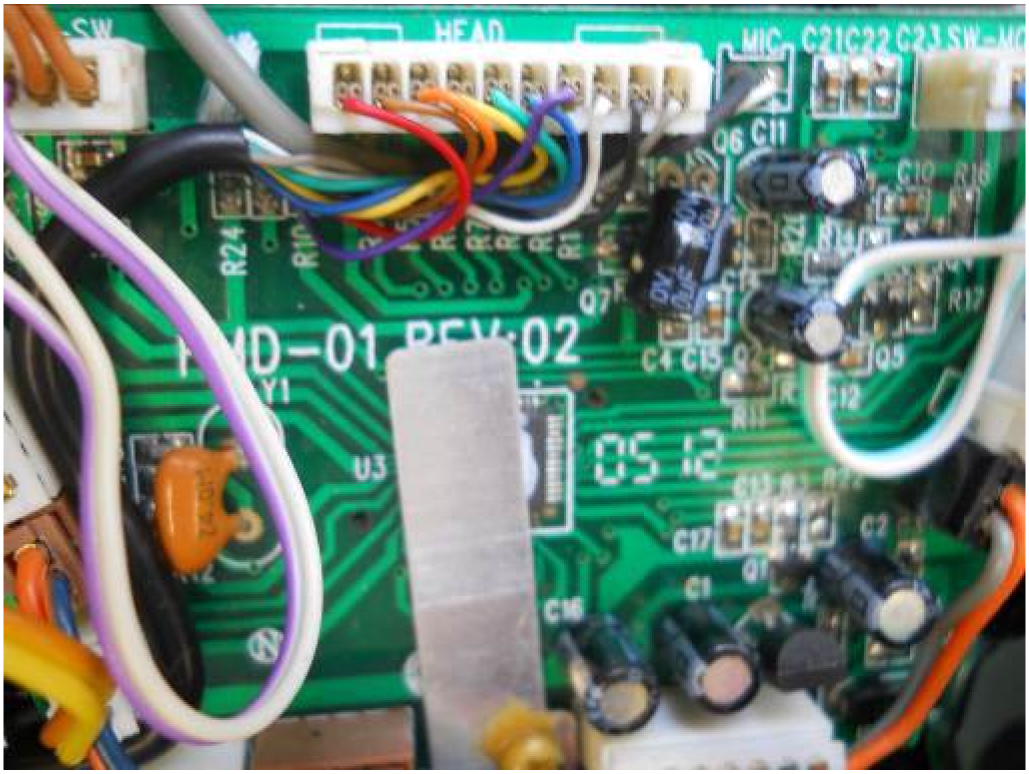

pi@raspberrypi: ~/maestro_linux
pi@raspberrypi:~/maestro_linux $ ./UscCmd
UscCmd, Version=1.3.0.0, Culture=neutral, PublicKeyToken=null
Select one of the following actions:
--list list available devices
--configure FILE load configuration file into device
--getconf FILE read device settings and write configuration file
--restoredefaults restore factory settings
--program FILE compile and load bytecode program
--status display complete device status
--bootloader put device into bootloader (firmware upgrade) mode
--stop stops the script running on the device
--start starts the script running on the device
--restart restarts the script at the beginning
--step runs a single instruction of the script
--sub NUM calls subroutine n (can be hex or decimal)
--sub NUM,PARAMETER calls subroutine n with a parameter (hex or decimal)
placed on the stack
--servo NUM,TARGET sets the target of servo NUM in units of
1/4 microsecond
--speed NUM,SPEED sets the speed limit of servo NUM
--accel NUM,ACCEL sets the acceleration of servo NUM to a value 0-255
Select which device to perform the action on (optional):
--device 00001430 (optional) select device #00001430
pi@raspberrypi:~/maestro_linux $

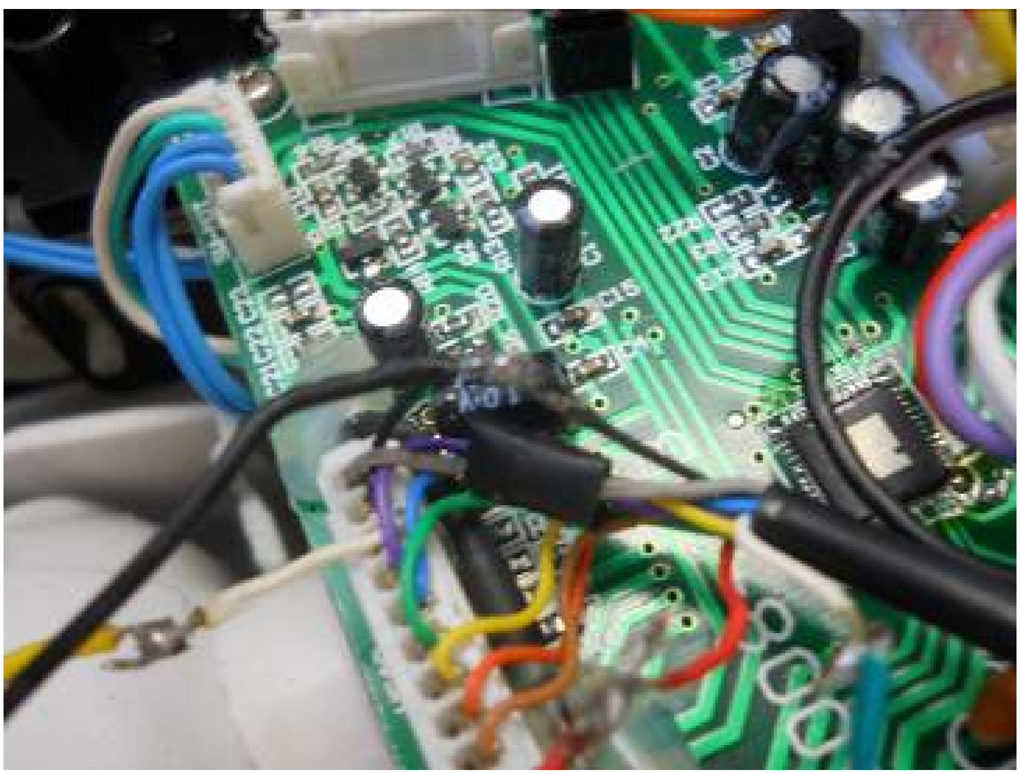

pi@raspberrypi: ~/maestro_linux
File Edit Options Buffers Tools Python Help
#!/usr/bin/python
import serial
import time
def setAngle(ser, channel, angle):
minAngle = 0.0
maxAngle = 180.0
minTarget = 256.0
maxTarget = 13120.0
scaledValue = int((angle / ((maxAngle - minAngle) / (maxTarget - minTarget))) + minTarget)
commandByte = chr(0x84)
channelByte = chr(channel)
lowTargetByte = chr(scaledValue & 0x7F)
highTargetByte = chr((scaledValue >> 7) & 0x7F)
command = commandByte + channelByte + lowTargetByte + highTargetByte
ser.write(command)
ser.flush()
ser = serial.Serial("/dev/ttyACM0", 9600)
# Home position
for i in range(0, 12):
setAngle(ser, i, 90)
time.sleep(1)
-UU-:----F1 robot.py All L1 (Python)
For information about GNU Emacs and the GNU system, type C-h C-a.

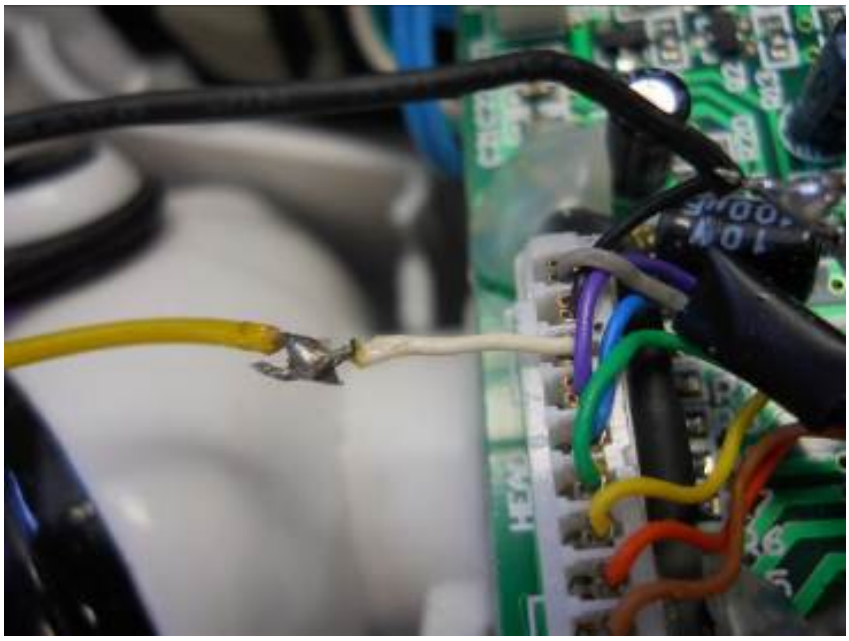

pi@raspberrypi: ~/maestro_linux
File Edit Options Buffers Tools Python Help
#!/usr/bin/python
import serial
import time
def setAngle(ser, channel, angle):
minAngle = 0.0
maxAngle = 180.0
minTarget = 256.0
maxTarget = 13120.0
scaledValue = int((angle / ((maxAngle - minAngle) / (maxTarget - minTarget)\
)) + minTarget)
commandByte = chr(0x84)
channelByte = chr(channel)
lowTargetByte = chr(scaledValue & 0x7F)
highTargetByte = chr((scaledValue >> 7) & 0x7F)
command = commandByte + channelByte + lowTargetByte + highTargetByte
ser.write(command)
ser.flush()
ser = serial.Serial("/dev/ttyACM0", 9600)
# Home position
for i in range(0, 12):
setAngle(ser, i, 90)
setAngle(ser, 1, 110)
time.sleep(1)
setAngle(ser, 0, 130)
time.sleep(1)
setAngle(ser, 0, 100)
time.sleep(1)
setAngle(ser, 0, 130)
time.sleep(1)
setAngle(ser, 0, 100)
time.sleep(1)
setAngle(ser, 0, 90)
time.sleep(1)
setAngle(ser, 1, 190)
time.sleep(1)
ser.close()
-UU-:----F1 robotWave.py Top L1 (Python)
Wrote /home/pi/maestro_linux/robotWave.py

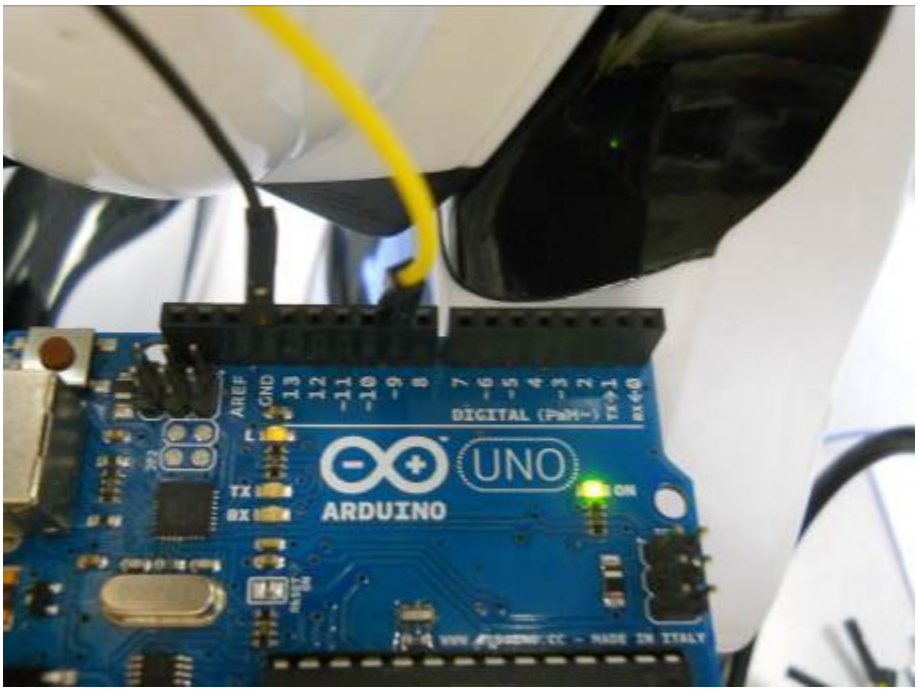

pi@raspberrypi: ~/maestro_linux
File Edit Options Buffers Tools Python Help
ser = serial.Serial("/dev/ttyACM0", 9600)
# Home position
for i in range(0, 12):
setAngle(ser, i, 90)
setAngle(ser, 4, 110)
time.sleep(1)
setAngle(ser, 5, 100)
time.sleep(1)
setAngle(ser, 4, 90)
time.sleep(1)
setAngle(ser, 7, 70)
time.sleep(1)
setAngle(ser, 8, 80)
time.sleep(1)
setAngle(ser, 7, 90)
time.sleep(1)
setAngle(ser, 1, 110)
time.sleep(1)
setAngle(ser, 2, 100)
time.sleep(1)
setAngle(ser, 1, 90)
time.sleep(1)
setAngle(ser, 10, 70)
time.sleep(1)
setAngle(ser, 11, 80)
time.sleep(1)
setAngle(ser, 10, 90)
time.sleep(1)
for i in range(0, 12):
setAngle(ser, i, 90)
ser.close()
-UU-:----F1 robotWalk.py 47% L53 (Python)
Wrote /home/pi/maestro_linux/robotWalk.py

Chapter 6: Adding Voice Recognition and Speech – A Voice Activated Robot


HEAD
MIC
C21C22 C23
0512



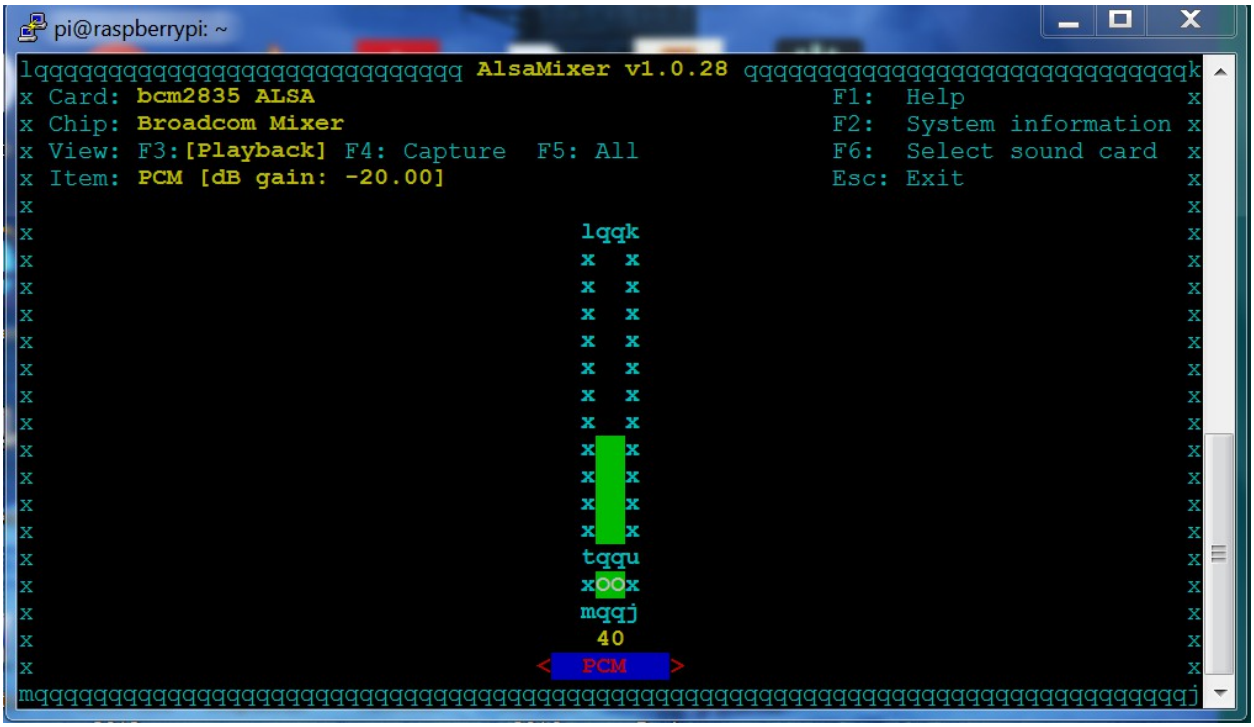


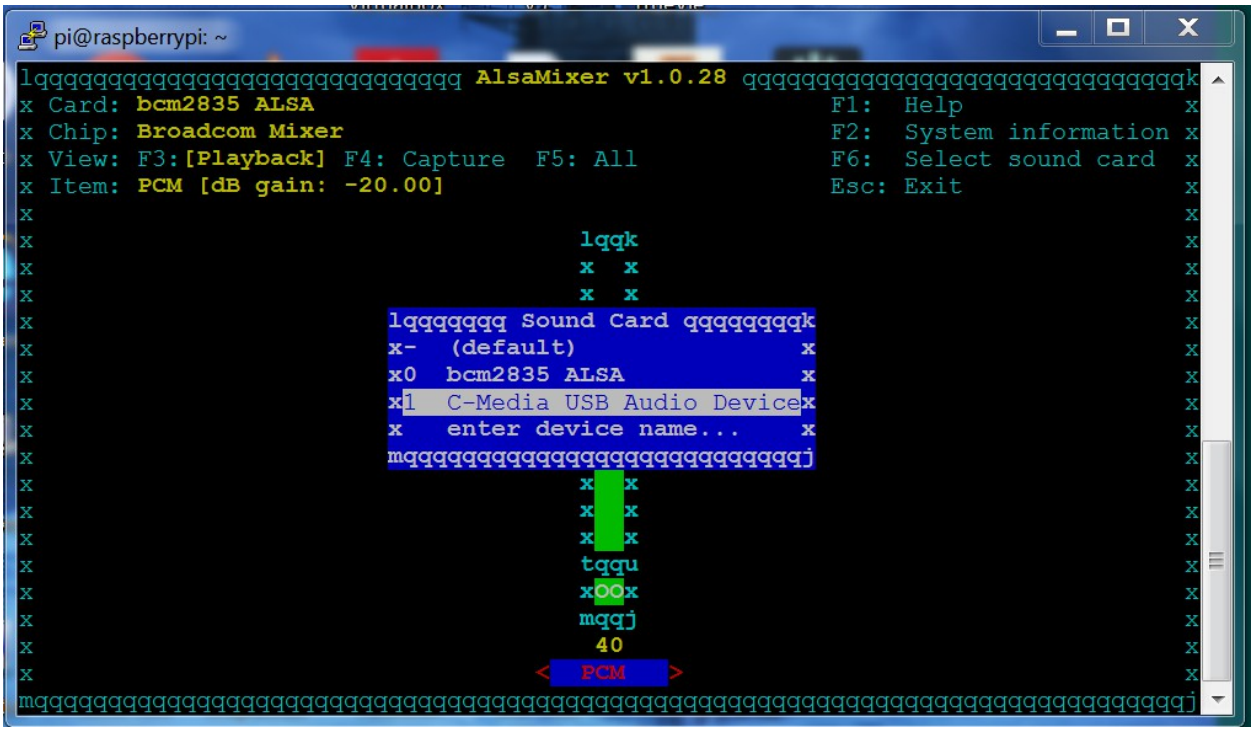


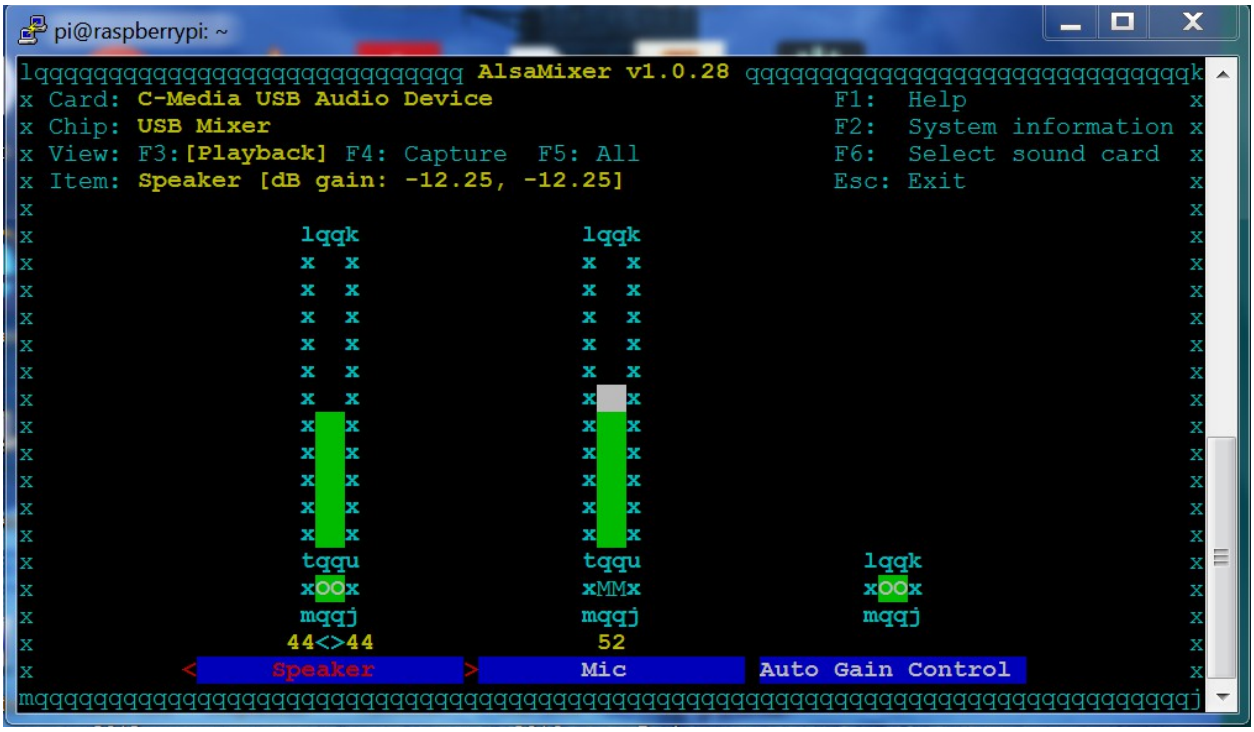
pi@raspberrypi: ~/wowee

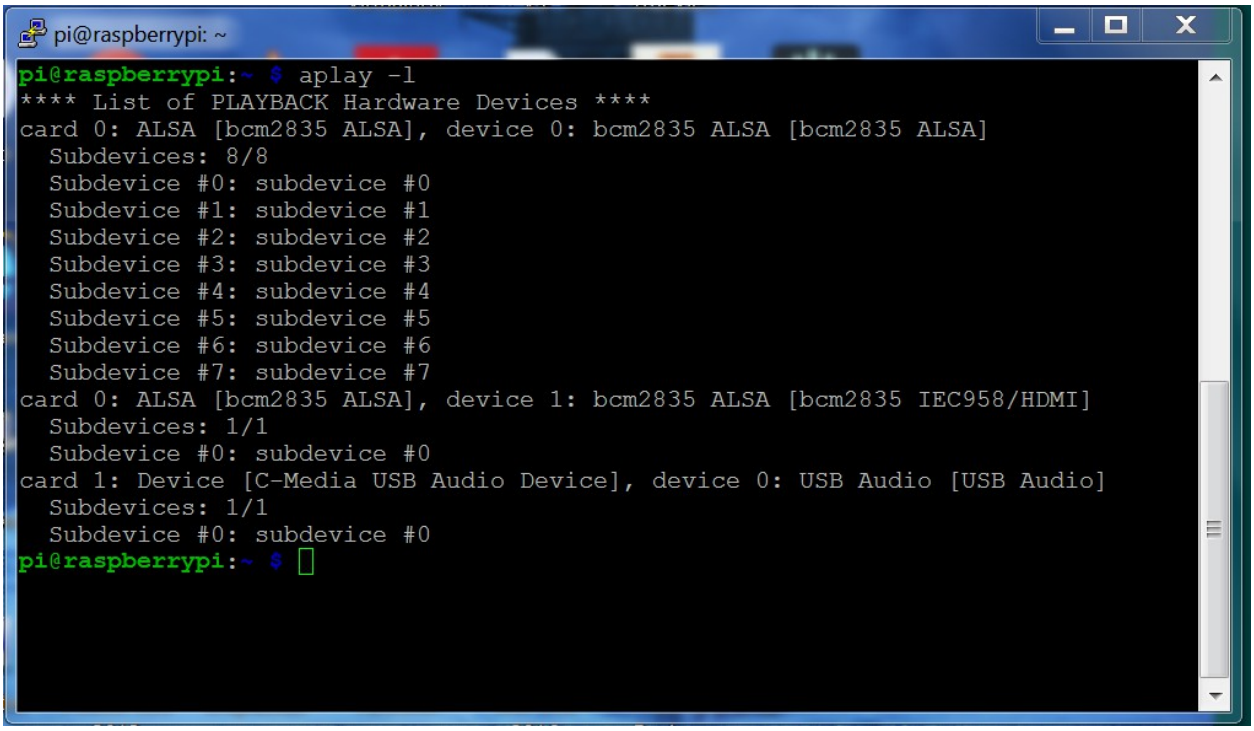
```
File Edit Options Buffers Tools Python Help
#!/usr/bin/python

import serial
import sys

ser = serial.Serial('/dev/ttyACM0', 9600, timeout = 1)
total = len(sys.argv)
cmdargs = str(sys.argv)

if total > 1:
    x = sys.argv[1]
    ser.write(x);
    s = ser.read(100);
#    print s

-UU-:----F1  argControl.py    All L1      (Python)----------------------------------
For information about GNU Emacs and the GNU system, type C-h C-a.
```

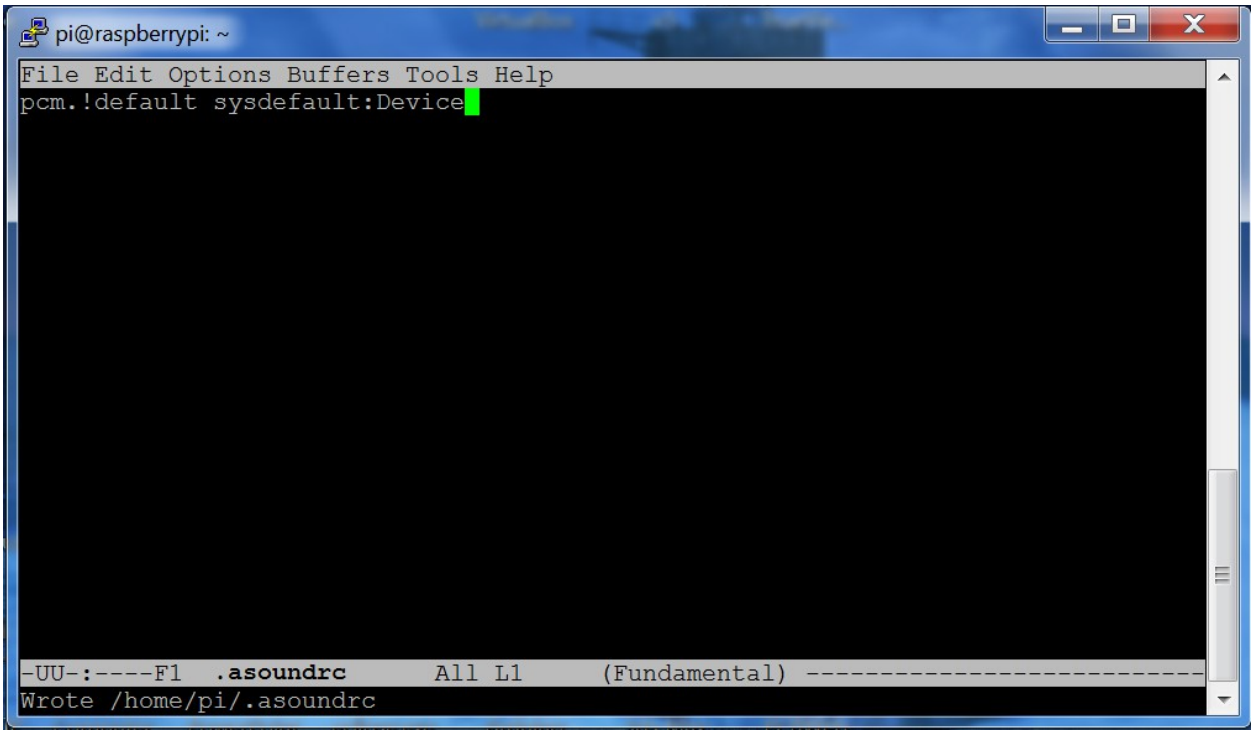
```
pi@raspberrypi: ~
pi@raspberrypi:~ $ cat /proc/asound/cards
 0 [ALSA           ]: bcm2835 - bcm2835 ALSA
                      bcm2835 ALSA
 1 [Device         ]: USB-Audio - C-Media USB Audio Device
                      C-Media USB Audio Device at usb-20980000.usb-1.1, full speed
pi@raspberrypi:~ $
```

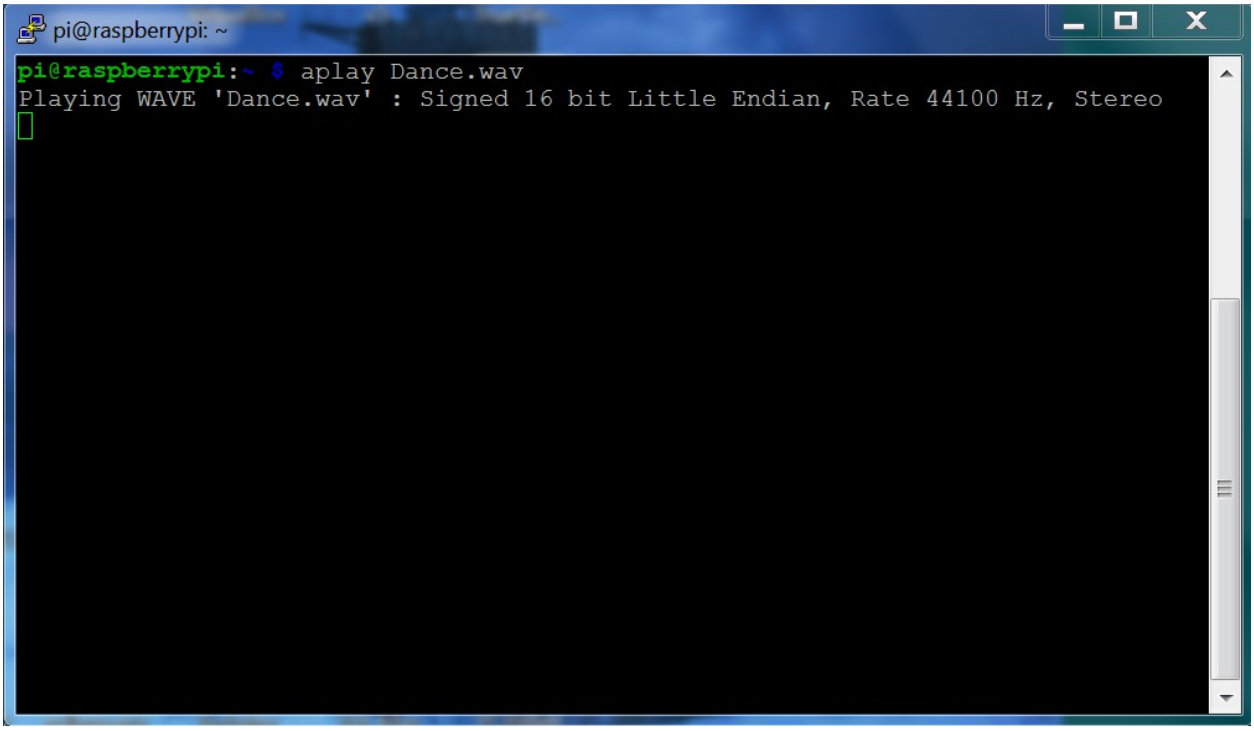

pi@raspberrypi: ~
AlsaMixer v1.0.28
Card: bcm2835 ALSA
Chip: Broadcom Mixer
View: F3:[Playback] F4: Capture F5: All
Item: PCM [dB gain: -20.00]
F1: Help
F2: System information
F6: Select sound card
Esc: Exit
40
PCM

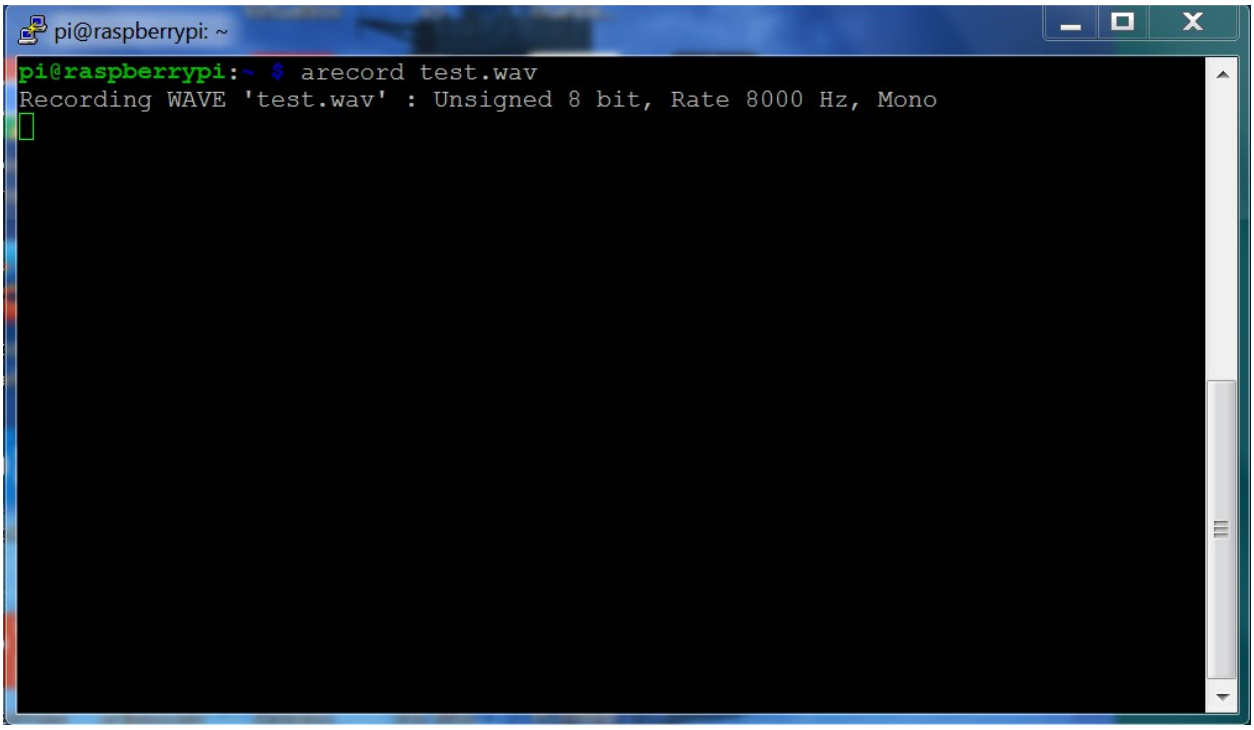

pi@raspberrypi: ~
AlsaMixer v1.0.28
Card: bcm2835 ALSA
Chip: Broadcom Mixer
View: F3:[Playback] F4: Capture F5: All
Item: PCM [dB gain: -20.00]
F1: Help
F2: System information
F6: Select sound card
Esc: Exit
Sound Card
(default)
bcm2835 ALSA
C-Media USB Audio Device
enter device name...
40
PCM

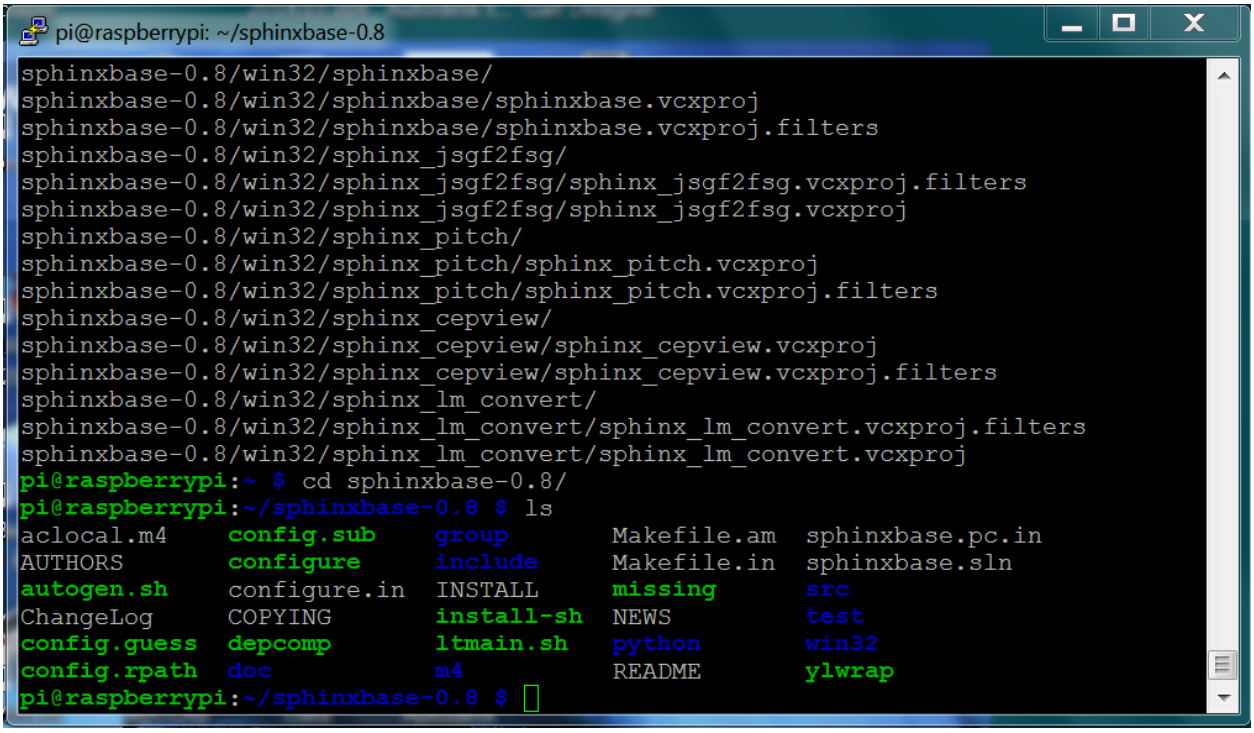

pi@raspberrypi: ~
AlsaMixer v1.0.28
Card: C-Media USB Audio Device
Chip: USB Mixer
View: F3:[Playback] F4: Capture F5: All
Item: Speaker [dB gain: -12.25, -12.25]
F1: Help
F2: System information
F6: Select sound card
Esc: Exit
44<>44
52
Speaker
Mic
Auto Gain Control

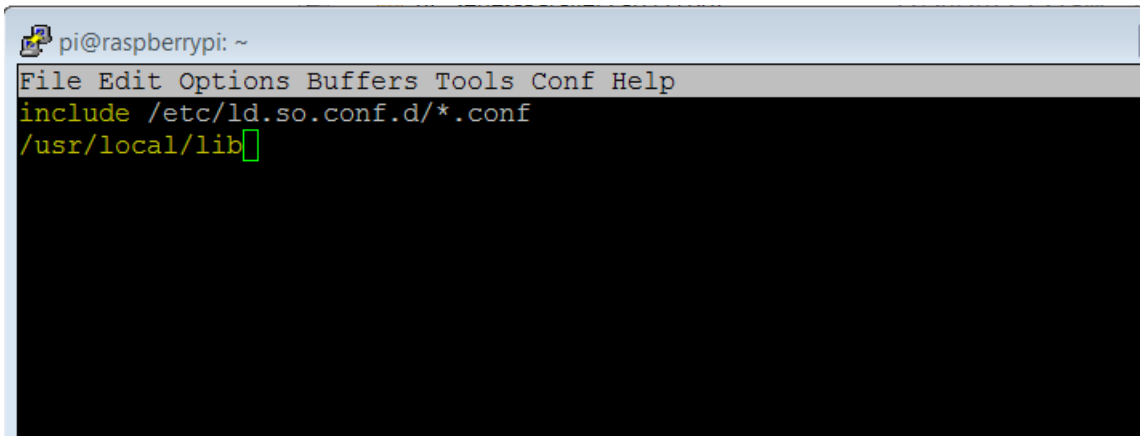

pi@raspberrypi: ~
pi@raspberrypi:~ $ aplay -l
**** List of PLAYBACK Hardware Devices ****
card 0: ALSA [bcm2835 ALSA], device 0: bcm2835 ALSA [bcm2835 ALSA]
Subdevices: 8/8
Subdevice #0: subdevice #0
Subdevice #1: subdevice #1
Subdevice #2: subdevice #2
Subdevice #3: subdevice #3
Subdevice #4: subdevice #4
Subdevice #5: subdevice #5
Subdevice #6: subdevice #6
Subdevice #7: subdevice #7
card 0: ALSA [bcm2835 ALSA], device 1: bcm2835 ALSA [bcm2835 IEC958/HDMI]
Subdevices: 1/1
Subdevice #0: subdevice #0
card 1: Device [C-Media USB Audio Device], device 0: USB Audio [USB Audio]
Subdevices: 1/1
Subdevice #0: subdevice #0
pi@raspberrypi:~ $

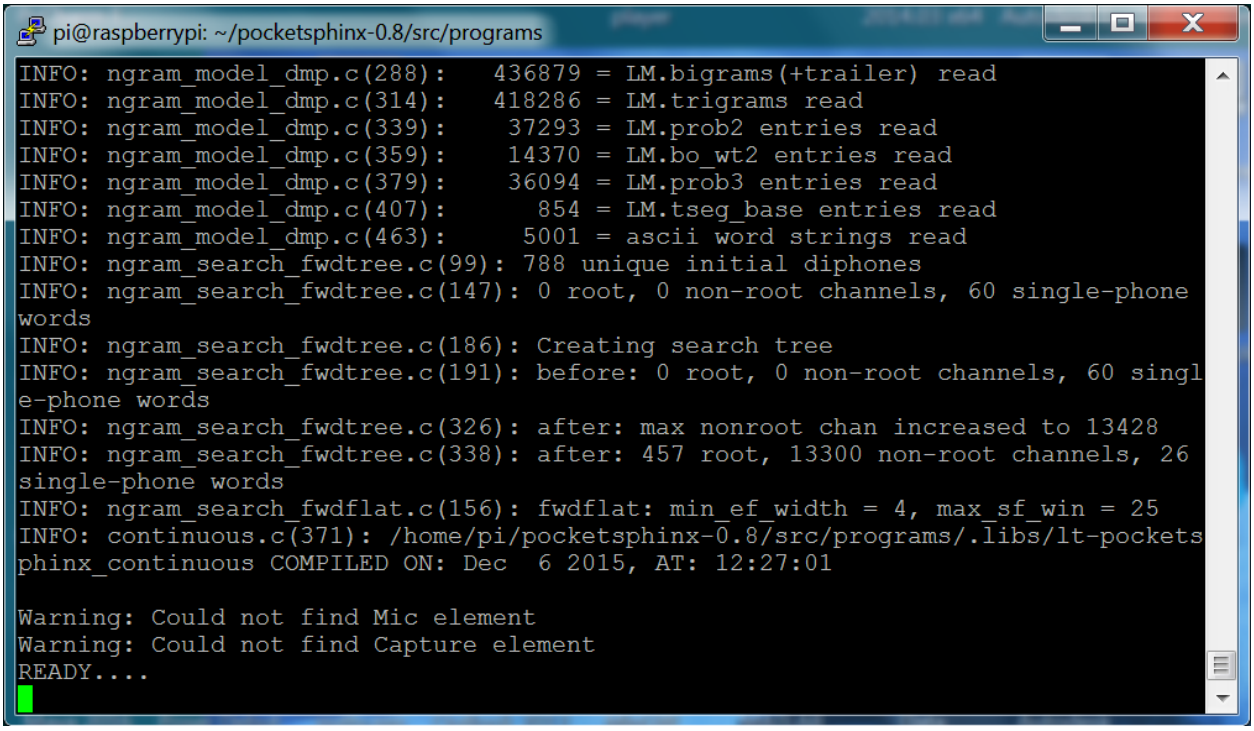

pi@raspberrypi: ~
File Edit Options Buffers Tools Help
pcm.!default sysdefault:Device
-UU-:----F1 .asoundrc All L1 (Fundamental)
Wrote /home/pi/.asoundrc

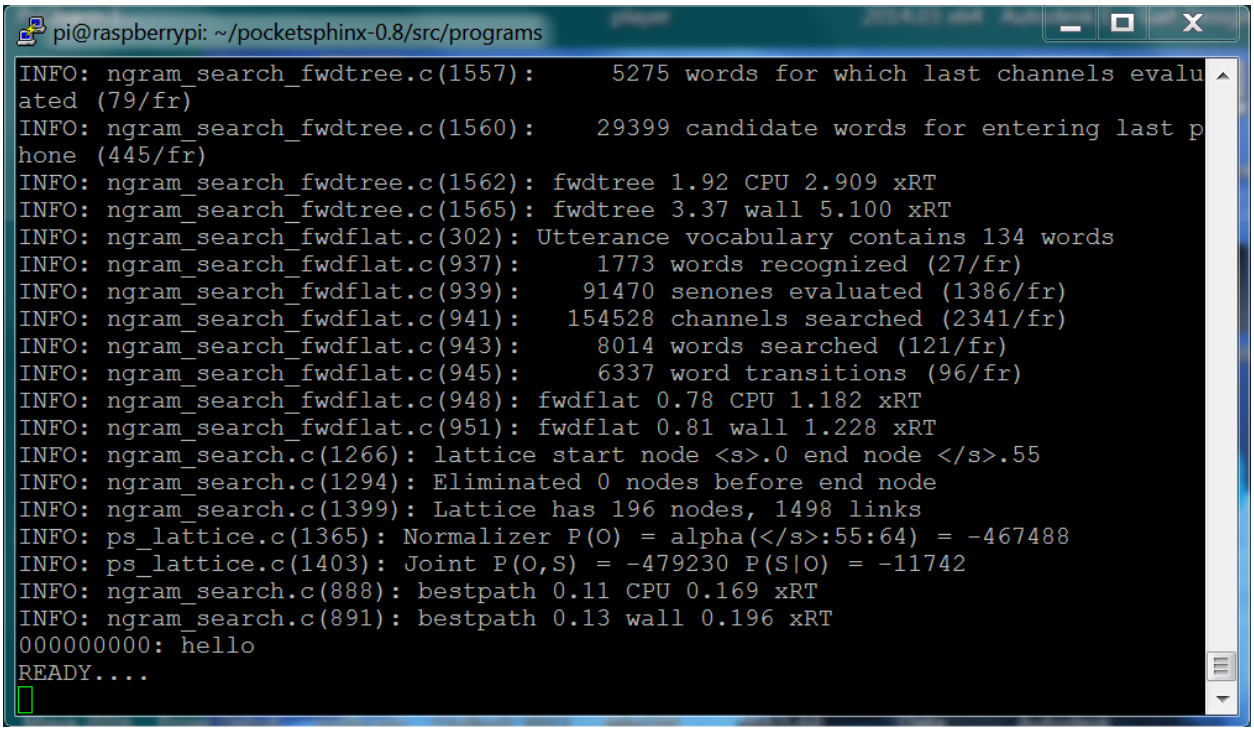

pi@raspberrypi: ~
pi@raspberrypi:~ $ aplay Dance.wav
Playing WAVE 'Dance.wav' : Signed 16 bit Little Endian, Rate 44100 Hz, Stereo

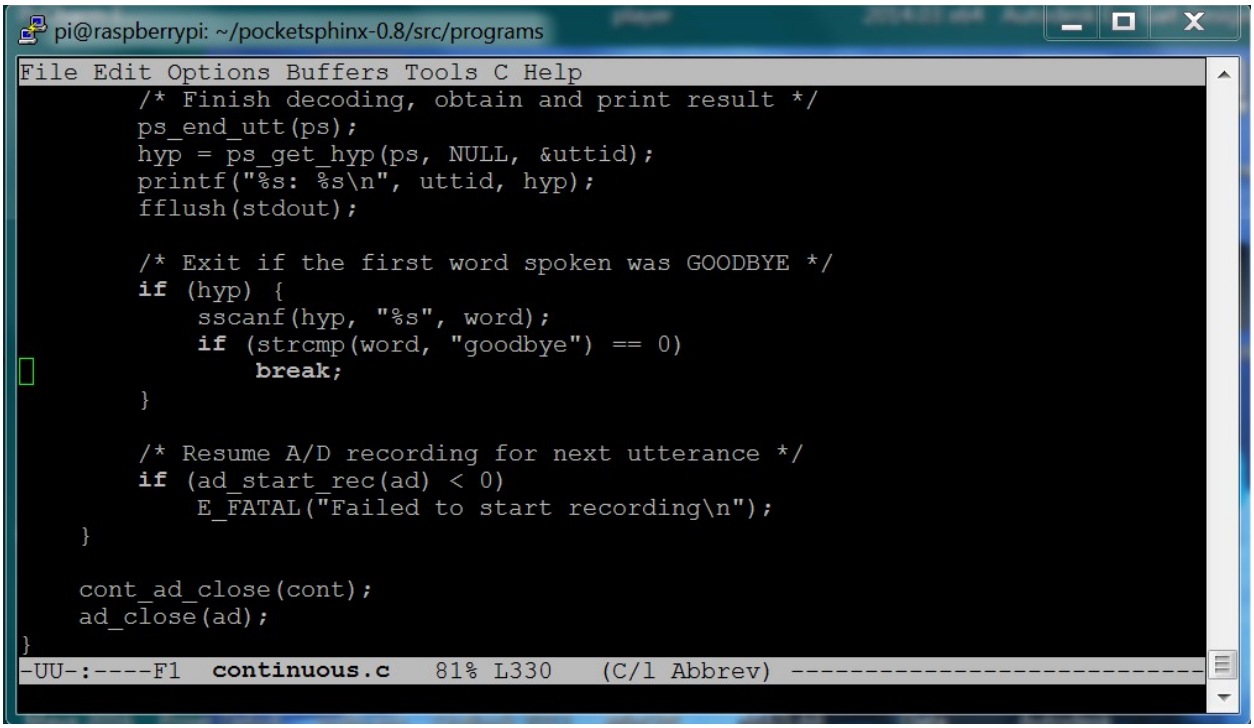

pi@raspberrypi: ~
pi@raspberrypi:~ $ arecord test.wav
Recording WAVE 'test.wav' : Unsigned 8 bit, Rate 8000 Hz, Mono

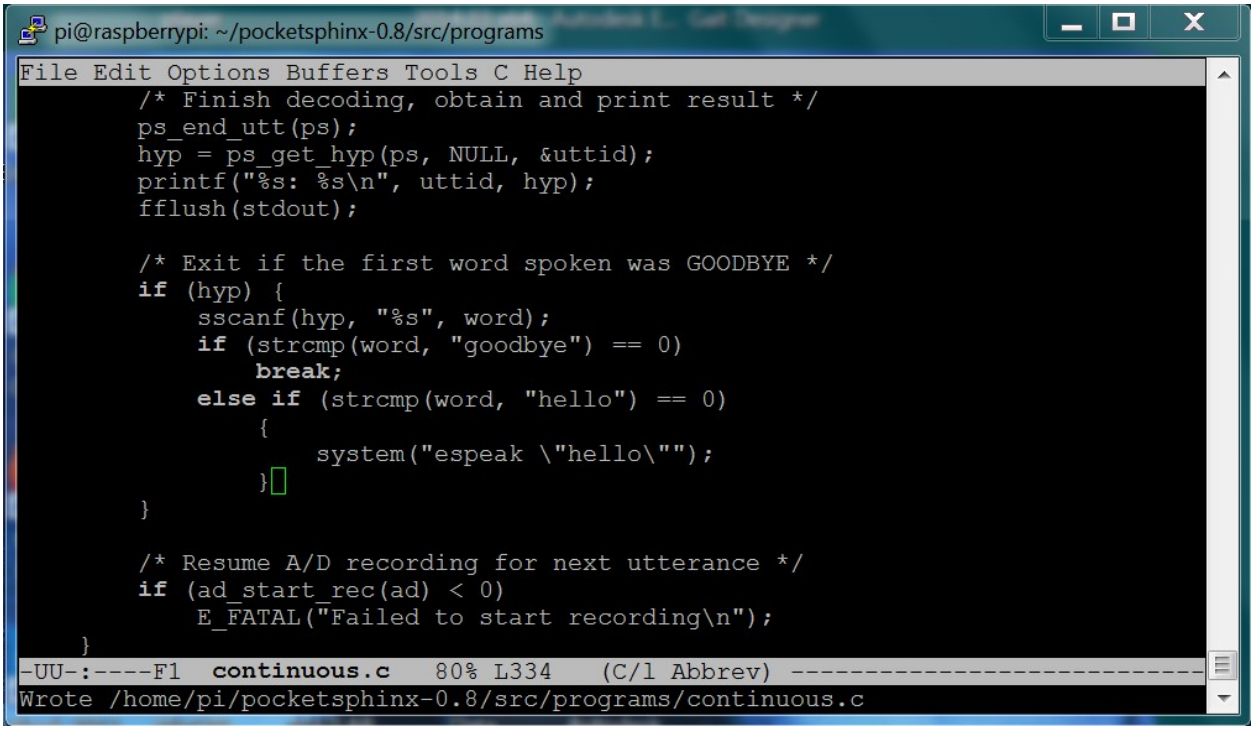

pi@raspberrypi: ~/sphinxbase-0.8
sphinxbase-0.8/win32/sphinxbase/
sphinxbase-0.8/win32/sphinxbase/sphinxbase.vcxproj
sphinxbase-0.8/win32/sphinxbase/sphinxbase.vcxproj.filters
sphinxbase-0.8/win32/sphinx_jsgf2fsg/
sphinxbase-0.8/win32/sphinx_jsgf2fsg/sphinx_jsgf2fsg.vcxproj.filters
sphinxbase-0.8/win32/sphinx_jsgf2fsg/sphinx_jsgf2fsg.vcxproj
sphinxbase-0.8/win32/sphinx_pitch/
sphinxbase-0.8/win32/sphinx_pitch/sphinx_pitch.vcxproj
sphinxbase-0.8/win32/sphinx_pitch/sphinx_pitch.vcxproj.filters
sphinxbase-0.8/win32/sphinx_cepview/
sphinxbase-0.8/win32/sphinx_cepview/sphinx_cepview.vcxproj
sphinxbase-0.8/win32/sphinx_cepview/sphinx_cepview.vcxproj.filters
sphinxbase-0.8/win32/sphinx_lm_convert/
sphinxbase-0.8/win32/sphinx_lm_convert/sphinx_lm_convert.vcxproj.filters
sphinxbase-0.8/win32/sphinx_lm_convert/sphinx_lm_convert.vcxproj
pi@raspberrypi:~ $ cd sphinxbase-0.8/
pi@raspberrypi:~/sphinxbase-0.8 $ ls
aclocal.m4 config.sub group Makefile.am sphinxbase.pc.in
AUTHORS configure include Makefile.in sphinxbase.sln
autogen.sh configure.in INSTALL missing src
ChangeLog COPYING install-sh NEWS test
config.guess depcomp ltmain.sh python win32
config.rpath doc m4 README ylwrap
pi@raspberrypi:~/sphinxbase-0.8 $

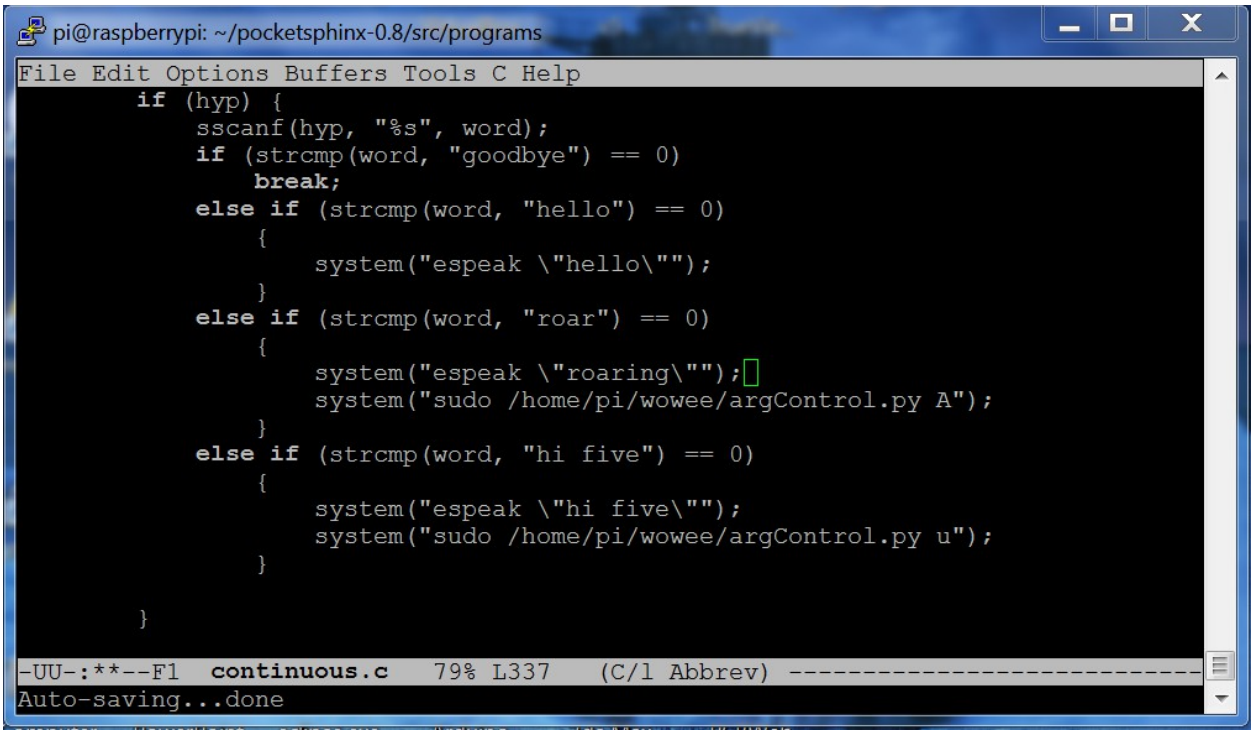

pi@raspberrypi: ~
File Edit Options Buffers Tools Conf Help
include /etc/ld.so.conf.d/*.conf
/usr/local/lib


pi@raspberrypi: ~/pocketsphinx-0.8/src/programs
INFO: ngram_model_dmp.c(288): 436879 = LM.bigrams(+trailer) read
INFO: ngram_model_dmp.c(314): 418286 = LM.trigrams read
INFO: ngram_model_dmp.c(339): 37293 = LM.prob2 entries read
INFO: ngram_model_dmp.c(359): 14370 = LM.bo_wt2 entries read
INFO: ngram_model_dmp.c(379): 36094 = LM.prob3 entries read
INFO: ngram_model_dmp.c(407): 854 = LM.tseg_base entries read
INFO: ngram_model_dmp.c(463): 5001 = ascii word strings read
INFO: ngram_search_fwdtree.c(99): 788 unique initial diphones
INFO: ngram_search_fwdtree.c(147): 0 root, 0 non-root channels, 60 single-phone words
INFO: ngram_search_fwdtree.c(186): Creating search tree
INFO: ngram_search_fwdtree.c(191): before: 0 root, 0 non-root channels, 60 single-phone words
INFO: ngram_search_fwdtree.c(326): after: max nonroot chan increased to 13428
INFO: ngram_search_fwdtree.c(338): after: 457 root, 13300 non-root channels, 26 single-phone words
INFO: ngram_search_fwdflat.c(156): fwdflat: min_ef_width = 4, max_sf_win = 25
INFO: continuous.c(371): /home/pi/pocketsphinx-0.8/src/programs/.libs/lt-pocketsphinx_continuous COMPILED ON: Dec 6 2015, AT: 12:27:01
Warning: Could not find Mic element
Warning: Could not find Capture element
READY....


pi@raspberrypi: ~/pocketsphinx-0.8/src/programs
INFO: ngram_search_fwdtree.c(1557):   5275 words for which last channels evalu
ated (79/fr)
INFO: ngram_search_fwdtree.c(1560):   29399 candidate words for entering last p
hone (445/fr)
INFO: ngram_search_fwdtree.c(1562): fwdtree 1.92 CPU 2.909 xRT
INFO: ngram_search_fwdtree.c(1565): fwdtree 3.37 wall 5.100 xRT
INFO: ngram_search_fwdflat.c(302): Utterance vocabulary contains 134 words
INFO: ngram_search_fwdflat.c(937):   1773 words recognized (27/fr)
INFO: ngram_search_fwdflat.c(939):   91470 senones evaluated (1386/fr)
INFO: ngram_search_fwdflat.c(941):   154528 channels searched (2341/fr)
INFO: ngram_search_fwdflat.c(943):   8014 words searched (121/fr)
INFO: ngram_search_fwdflat.c(945):   6337 word transitions (96/fr)
INFO: ngram_search_fwdflat.c(948): fwdflat 0.78 CPU 1.182 xRT
INFO: ngram_search_fwdflat.c(951): fwdflat 0.81 wall 1.228 xRT
INFO: ngram_search.c(1266): lattice start node <s>.0 end node </s>.55
INFO: ngram_search.c(1294): Eliminated 0 nodes before end node
INFO: ngram_search.c(1399): Lattice has 196 nodes, 1498 links
INFO: ps_lattice.c(1365): Normalizer P(O) = alpha(</s>:55:64) = -467488
INFO: ps_lattice.c(1403): Joint P(O,S) = -479230 P(S|O) = -11742
INFO: ngram_search.c(888): bestpath 0.11 CPU 0.169 xRT
INFO: ngram_search.c(891): bestpath 0.13 wall 0.196 xRT
000000000: hello
READY....

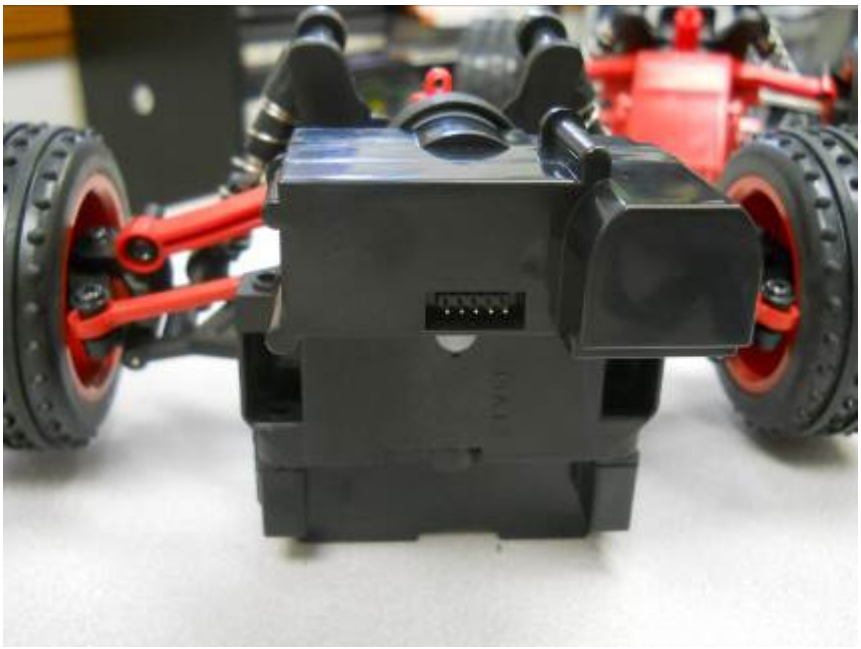

pi@raspberrypi: ~/pocketsphinx-0.8/src/programs
File Edit Options Buffers Tools C Help
/* Finish decoding, obtain and print result */
ps_end_utt(ps);
hyp = ps_get_hyp(ps, NULL, &uttid);
printf("%s: %s\n", uttid, hyp);
fflush(stdout);
/* Exit if the first word spoken was GOODBYE */
if (hyp) {
sscanf(hyp, "%s", word);
if (strcmp(word, "goodbye") == 0)
break;
}
/* Resume A/D recording for next utterance */
if (ad_start_rec(ad) < 0)
E_FATAL("Failed to start recording\n");
}
cont_ad_close(cont);
ad_close(ad);
}
-UU-:----F1 continuous.c 81% L330 (C/l Abbrev)


pi@raspberrypi: ~/pocketsphinx-0.8/src/programs
File Edit Options Buffers Tools C Help
/* Finish decoding, obtain and print result */
ps_end_utt(ps);
hyp = ps_get_hyp(ps, NULL, &uttid);
printf("%s: %s\n", uttid, hyp);
fflush(stdout);
/* Exit if the first word spoken was GOODBYE */
if (hyp) {
sscanf(hyp, "%s", word);
if (strcmp(word, "goodbye") == 0)
break;
else if (strcmp(word, "hello") == 0)
{
system("espeak \"hello\"");
}
}
/* Resume A/D recording for next utterance */
if (ad_start_rec(ad) < 0)
E_FATAL("Failed to start recording\n");
}
-UU-:----F1 continuous.c 80% L334 (C/l Abbrev)
Wrote /home/pi/pocketsphinx-0.8/src/programs/continuous.c


pi@raspberrypi: ~/pocketsphinx-0.8/src/programs
File Edit Options Buffers Tools C Help
if (hyp) {
sscanf(hyp, "%s", word);
if (strcmp(word, "goodbye") == 0)
break;
else if (strcmp(word, "hello") == 0)
{
system("espeak \"hello\"");
}
else if (strcmp(word, "roar") == 0)
{
system("espeak \"roaring\"");
system("sudo /home/pi/wowee/argControl.py A");
}
else if (strcmp(word, "hi five") == 0)
{
system("espeak \"hi five\"");
system("sudo /home/pi/wowee/argControl.py u");
}
}
-UU-:**--F1 continuous.c 79% L337 (C/l Abbrev)
Auto-saving...done

Chapter 7: Adding Raspberry Pi Zero to an RC Vehicle


OFF
ON

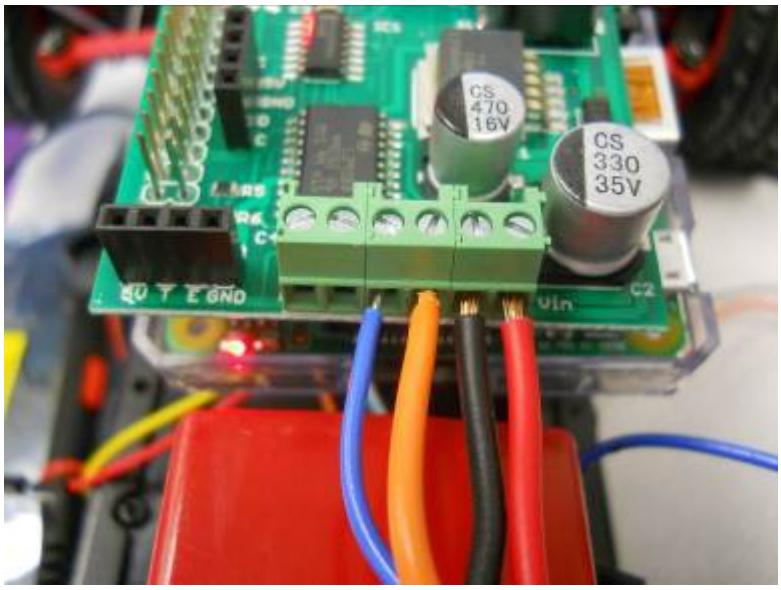


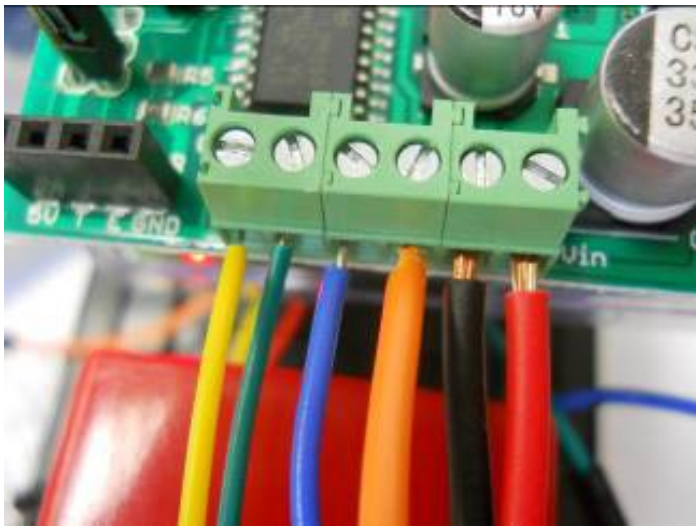

Pairing

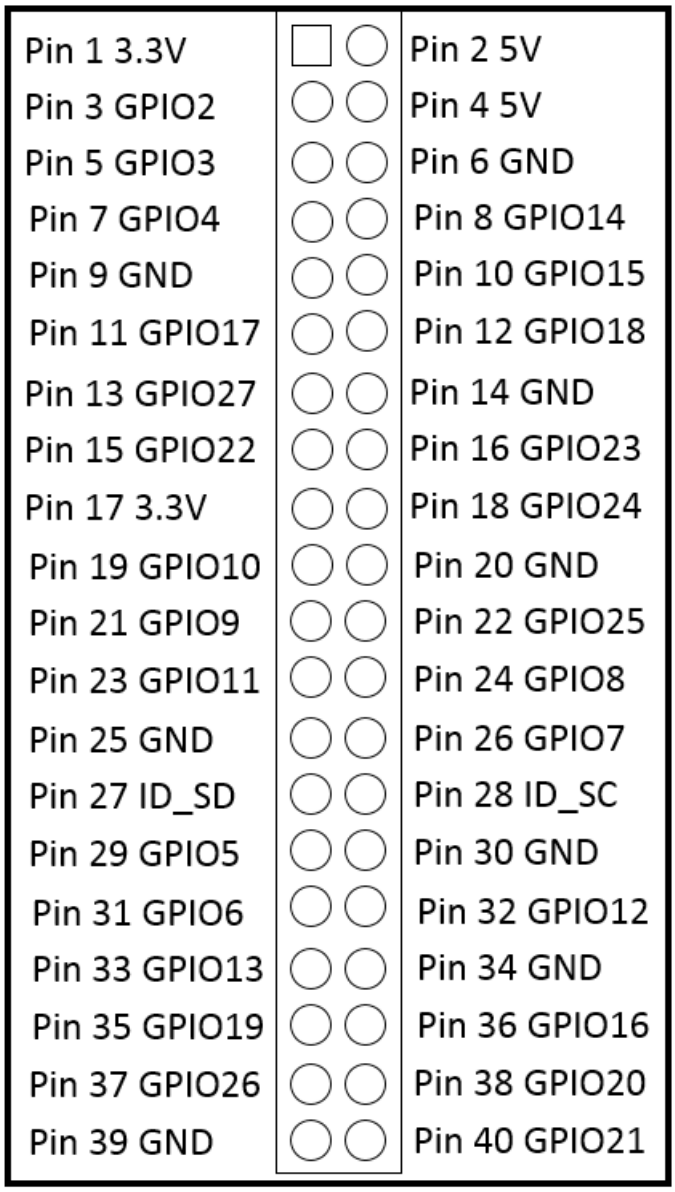

E329E

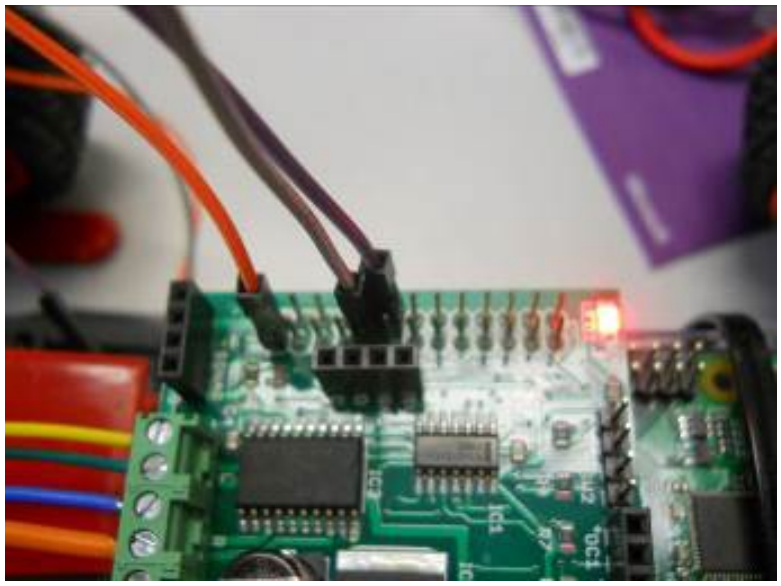

GND
CS
470
16V
CS
330
35V


CS
470
16V
CS
330
35V
5V
GND
Vin
C2


CS
470
16V
CS
330
35V
5V
GND
Vin
C2

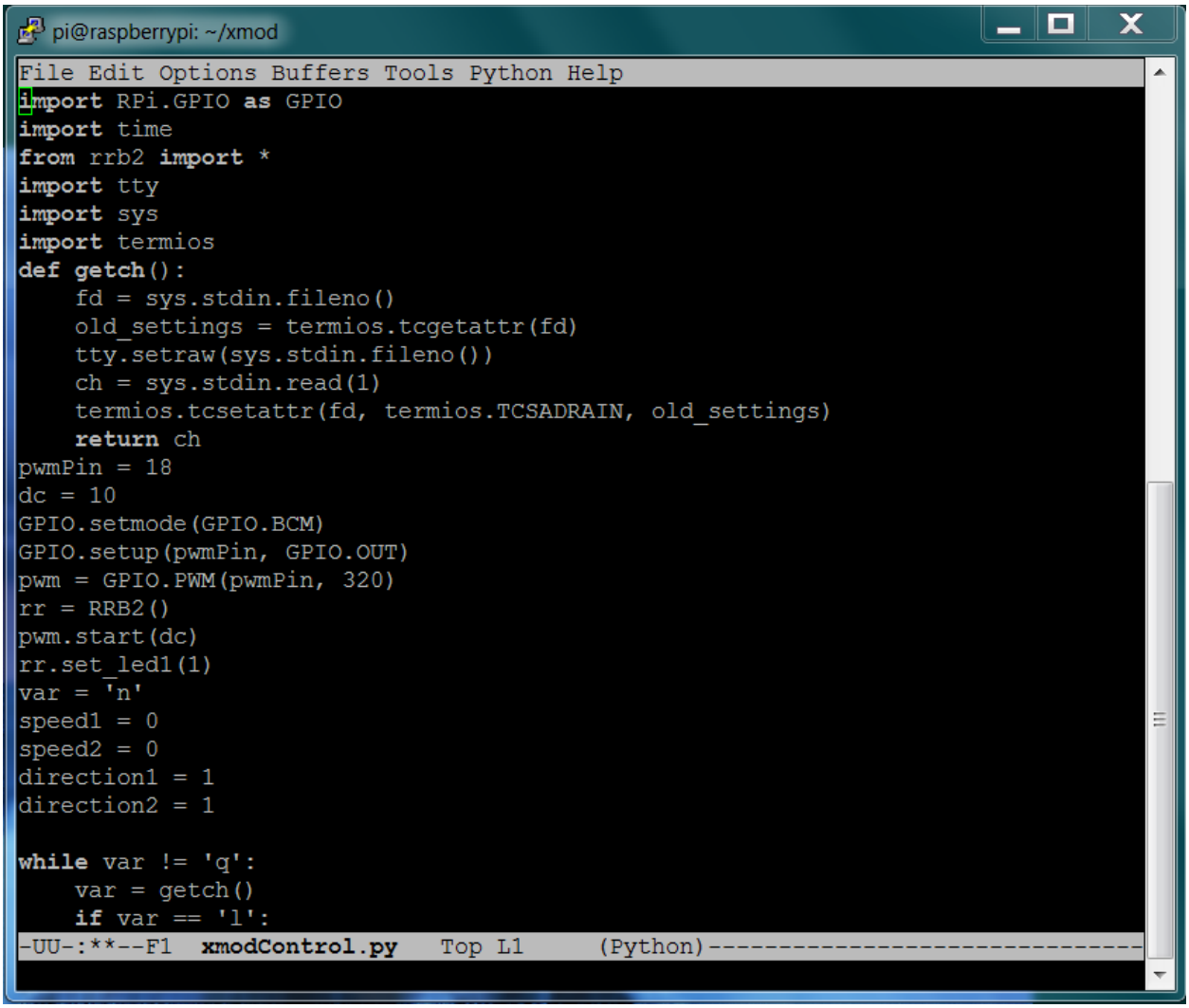

5V
GND
Vin

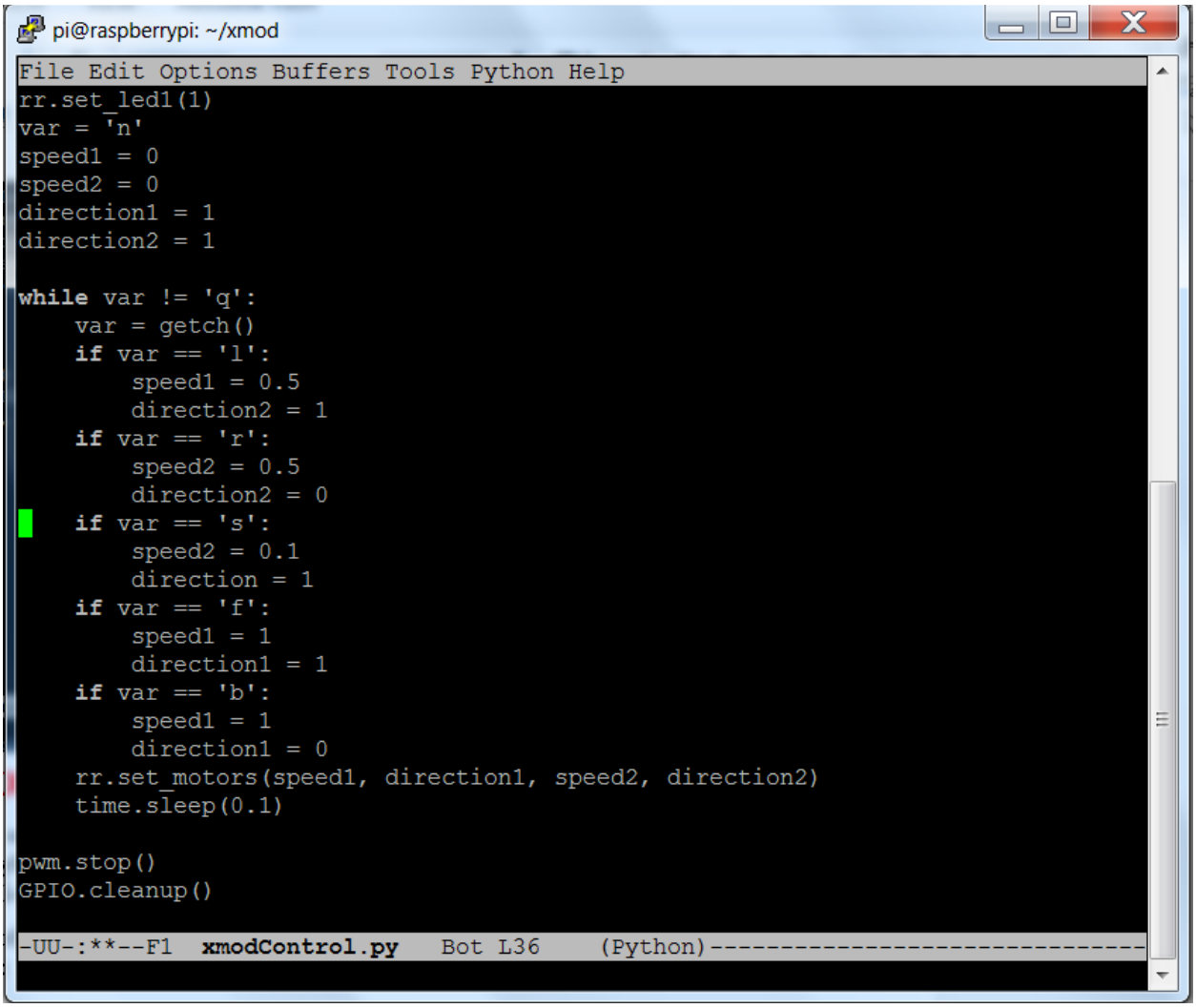

Pin 1 3.3V
Pin 2 5V
Pin 3 GPIO2
Pin 4 5V
Pin 5 GPIO3
Pin 6 GND
Pin 7 GPIO4
Pin 8 GPIO14
Pin 9 GND
Pin 10 GPIO15
Pin 11 GPIO17
Pin 12 GPIO18
Pin 13 GPIO27
Pin 14 GND
Pin 15 GPIO22
Pin 16 GPIO23
Pin 17 3.3V
Pin 18 GPIO24
Pin 19 GPIO10
Pin 20 GND
Pin 21 GPIO9
Pin 22 GPIO25
Pin 23 GPIO11
Pin 24 GPIO8
Pin 25 GND
Pin 26 GPIO7
Pin 27 ID_SD
Pin 28 ID_SC
Pin 29 GPIO5
Pin 30 GND
Pin 31 GPIO6
Pin 32 GPIO12
Pin 33 GPIO13
Pin 34 GND
Pin 35 GPIO19
Pin 36 GPIO16
Pin 37 GPIO26
Pin 38 GPIO20
Pin 39 GND
Pin 40 GPIO21



pi@raspberrypi: ~/xmod

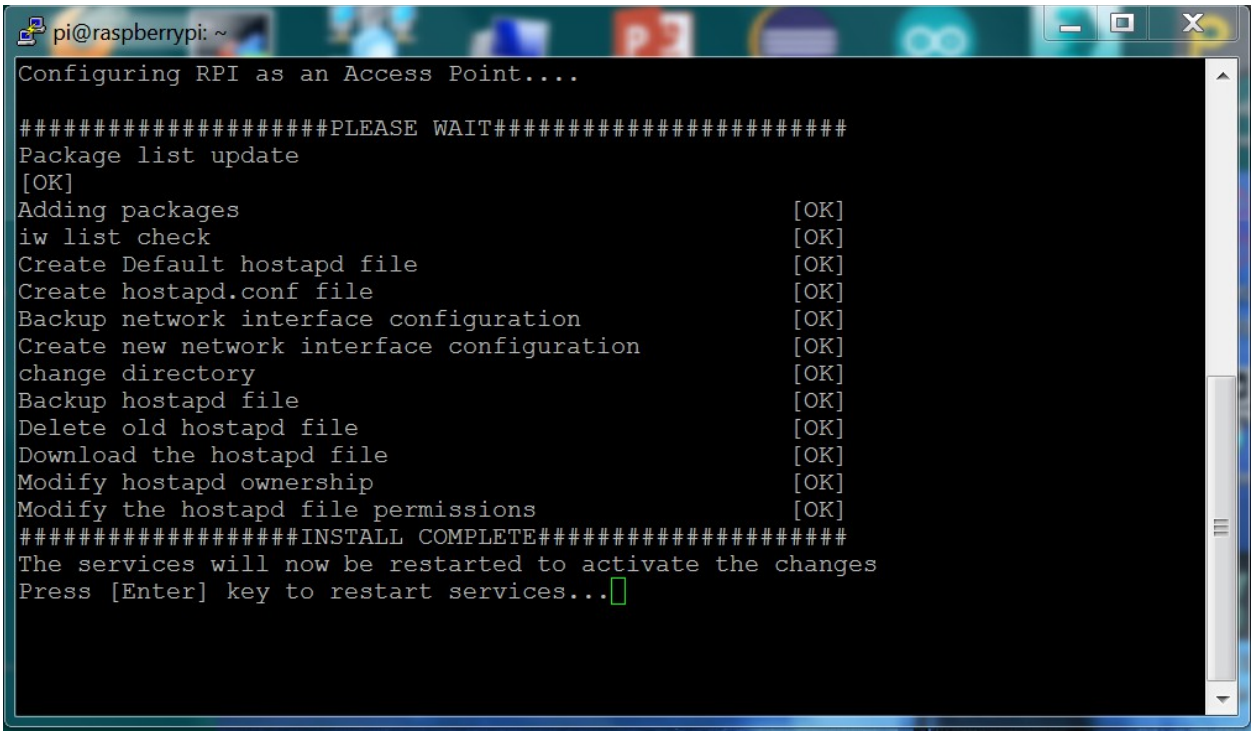
```
File Edit Options Buffers Tools Python Help
import RPi.GPIO as GPIO
import time
from rrb2 import *

pwmPin = 18
dc = 10

GPIO.setmode(GPIO.BCM)
GPIO.setup(pwmPin, GPIO.OUT)
pwm = GPIO.PWM(pwmPin, 320)
rr = RRB2()

pwm.start(dc)
rr.set_led1(1)

rr.set_motors(1, 1, 1, 1)

print("Loop, press CTRL C to exit")
while 1:
    time.sleep(0.075)

pwm.stop()
GPIO.cleanup()

-UU-:**--F1  xmod.py        All L23    (Python)----------------------------------
Auto-saving...done
```

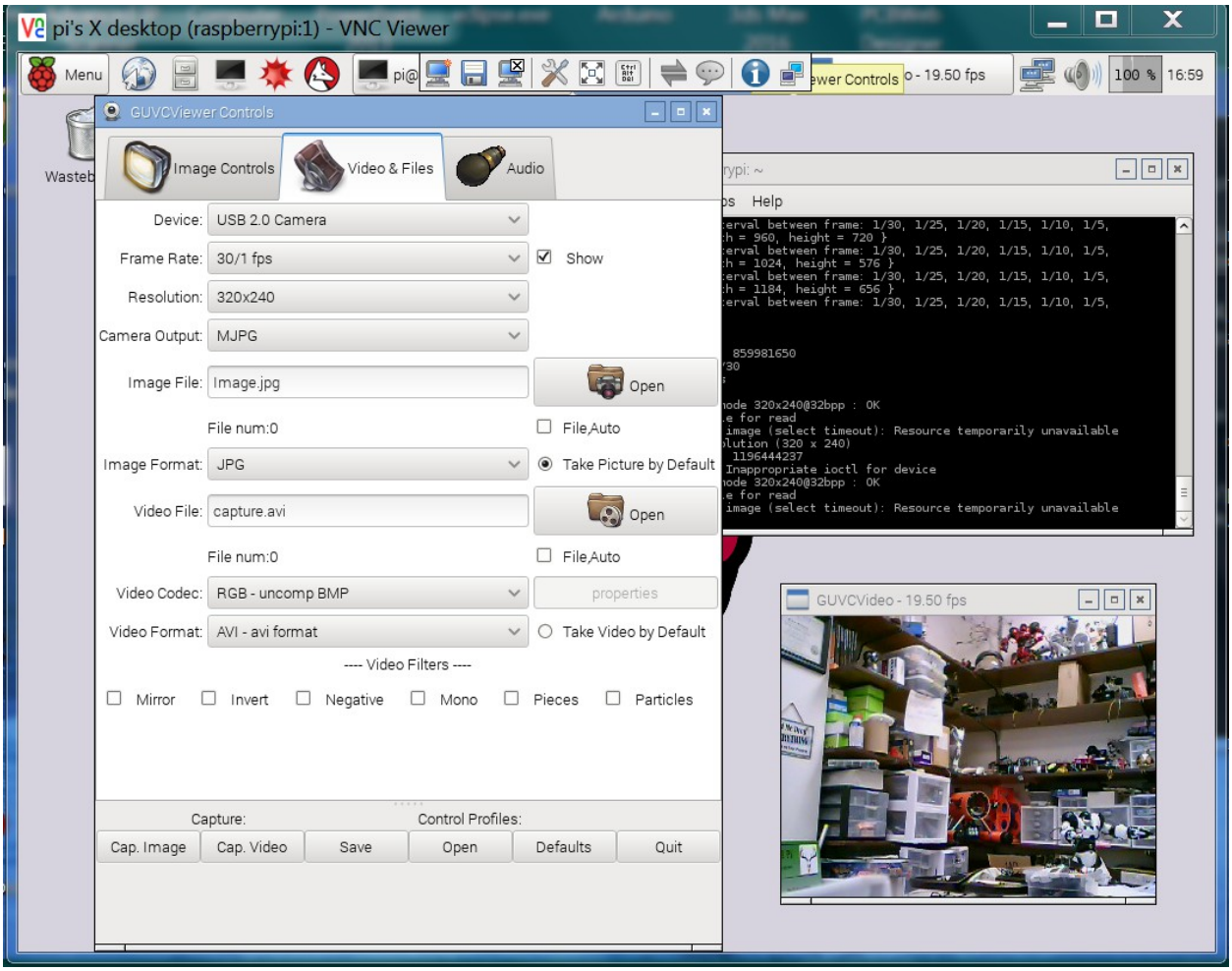

pi@raspberrypi: ~/xmod
File Edit Options Buffers Tools Python Help
import RPi.GPIO as GPIO
import time
from rrb2 import *
import tty
import sys
import termios
def getch():
fd = sys.stdin.fileno()
old_settings = termios.tcgetattr(fd)
tty.setraw(sys.stdin.fileno())
ch = sys.stdin.read(1)
termios.tcsetattr(fd, termios.TCSADRAIN, old_settings)
return ch
pwmPin = 18
dc = 10
GPIO.setmode(GPIO.BCM)
GPIO.setup(pwmPin, GPIO.OUT)
pwm = GPIO.PWM(pwmPin, 320)
rr = RRB2()
pwm.start(dc)
rr.set_led1(1)
var = 'n'
speed1 = 0
speed2 = 0
direction1 = 1
direction2 = 1
while var != 'q':
var = getch()
if var == '1':
-UU-:**--F1 xmodControl.py Top L1 (Python)


pi@raspberrypi: ~/xmod
File Edit Options Buffers Tools Python Help
rr.set_led1(1)
var = 'n'
speed1 = 0
speed2 = 0
direction1 = 1
direction2 = 1
while var != 'q':
var = getch()
if var == 'l':
speed1 = 0.5
direction2 = 1
if var == 'r':
speed2 = 0.5
direction2 = 0
if var == 's':
speed2 = 0.1
direction = 1
if var == 'f':
speed1 = 1
direction1 = 1
if var == 'b':
speed1 = 1
direction1 = 0
rr.set_motors(speed1, direction1, speed2, direction2)
time.sleep(0.1)
pwm.stop()
GPIO.cleanup()
-UU-:**--F1 xmodControl.py Bot L36 (Python)

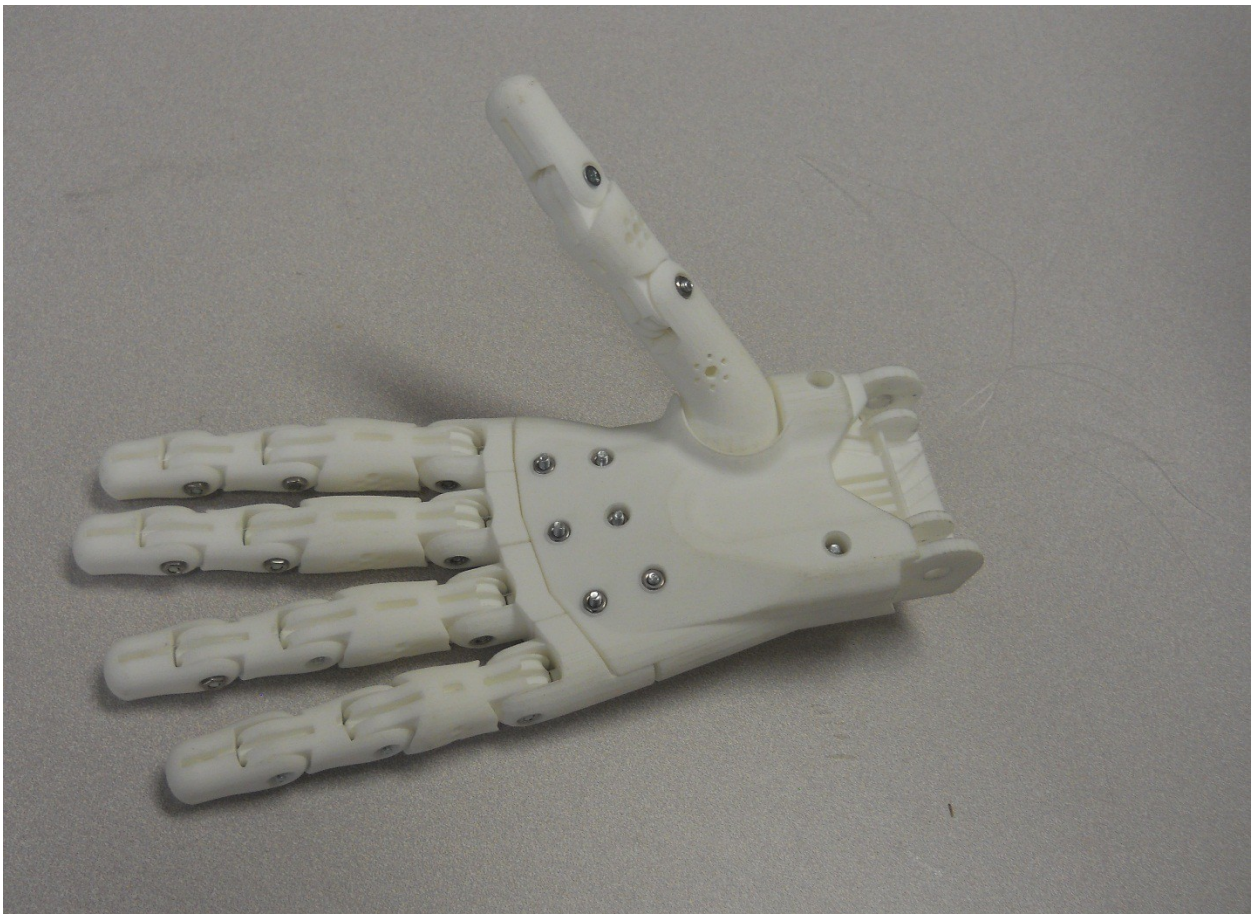
pi@raspberrypi: ~

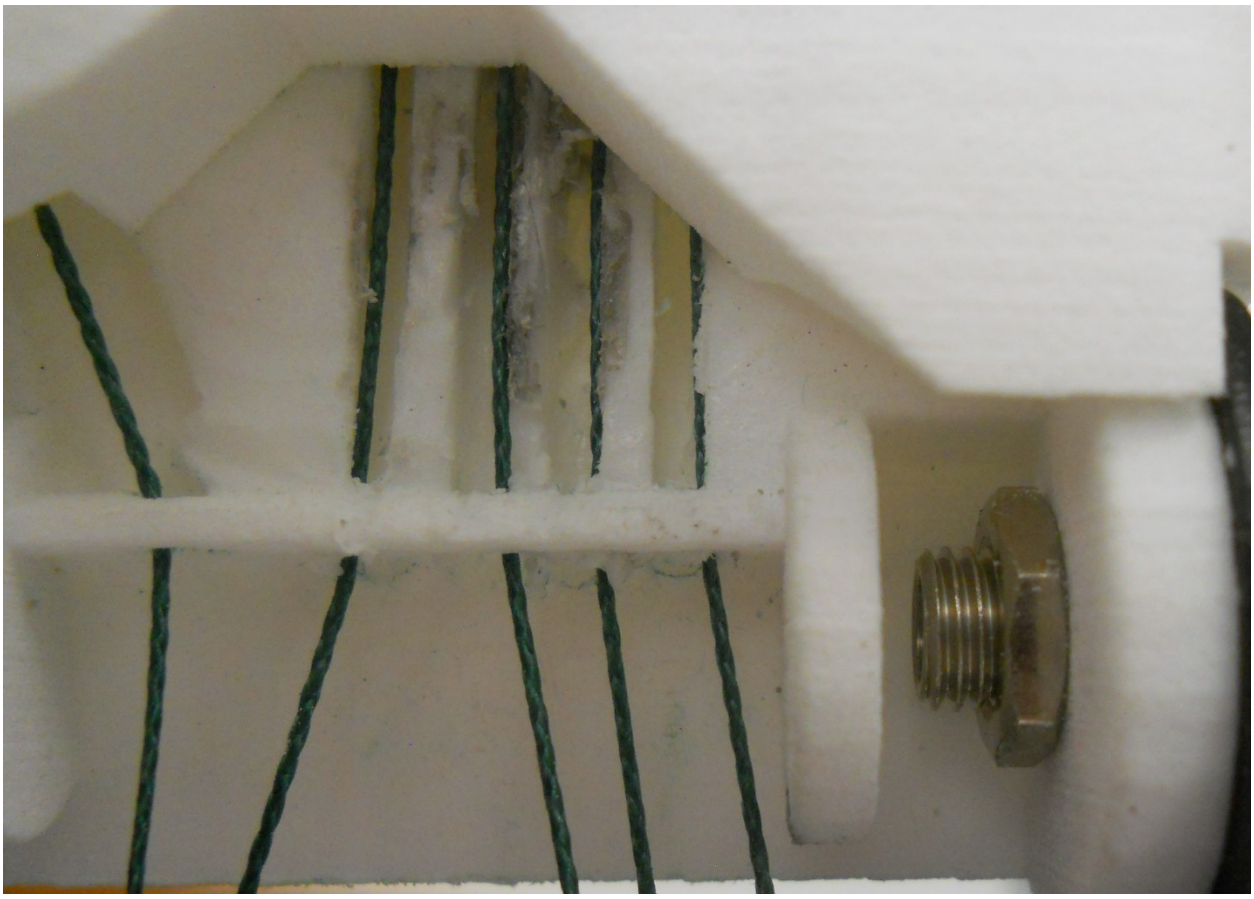
```
Capture User Settings:
======================
Please answer the following questions.
Hitting return will continue with the default option


IPv4 DHCP or STATIC? [DHCP]: STATIC
IPv4 Address [192.168.1.150]: 10.10.0.1
IPv4 Netmask [255.255.255.0]:
IPv4 Gateway Address [192.168.1.1]:
IPv4 Primary DNS server [8.8.8.8]:
IPv4 Secondary DNS server [4.4.4.4]:
Wifi Country [NZ]: US
Wifi Channel Name [1]:
Wifi SSID [RPiAP]: CarPi
Wifi PassPhrase (min 8 max 63 characters) [PASSWORD]: 12345678
Access Point
======================
Please answer the following question.
Hitting return will continue with the default 'No' option

Do you wish to continue and Setup RPi as an Access Point? (y/n) y
```


pi@raspberrypi: ~
Configuring RPI as an Access Point....
####################PLEASE WAIT#########################
Package list update
[OK]
Adding packages [OK]
iw list check [OK]
Create Default hostapd file [OK]
Create hostapd.conf file [OK]
Backup network interface configuration [OK]
Create new network interface configuration [OK]
change directory [OK]
Backup hostapd file [OK]
Delete old hostapd file [OK]
Download the hostapd file [OK]
Modify hostapd ownership [OK]
Modify the hostapd file permissions [OK]
####################INSTALL COMPLETE####################
The services will now be restarted to activate the changes
Press [Enter] key to restart services...

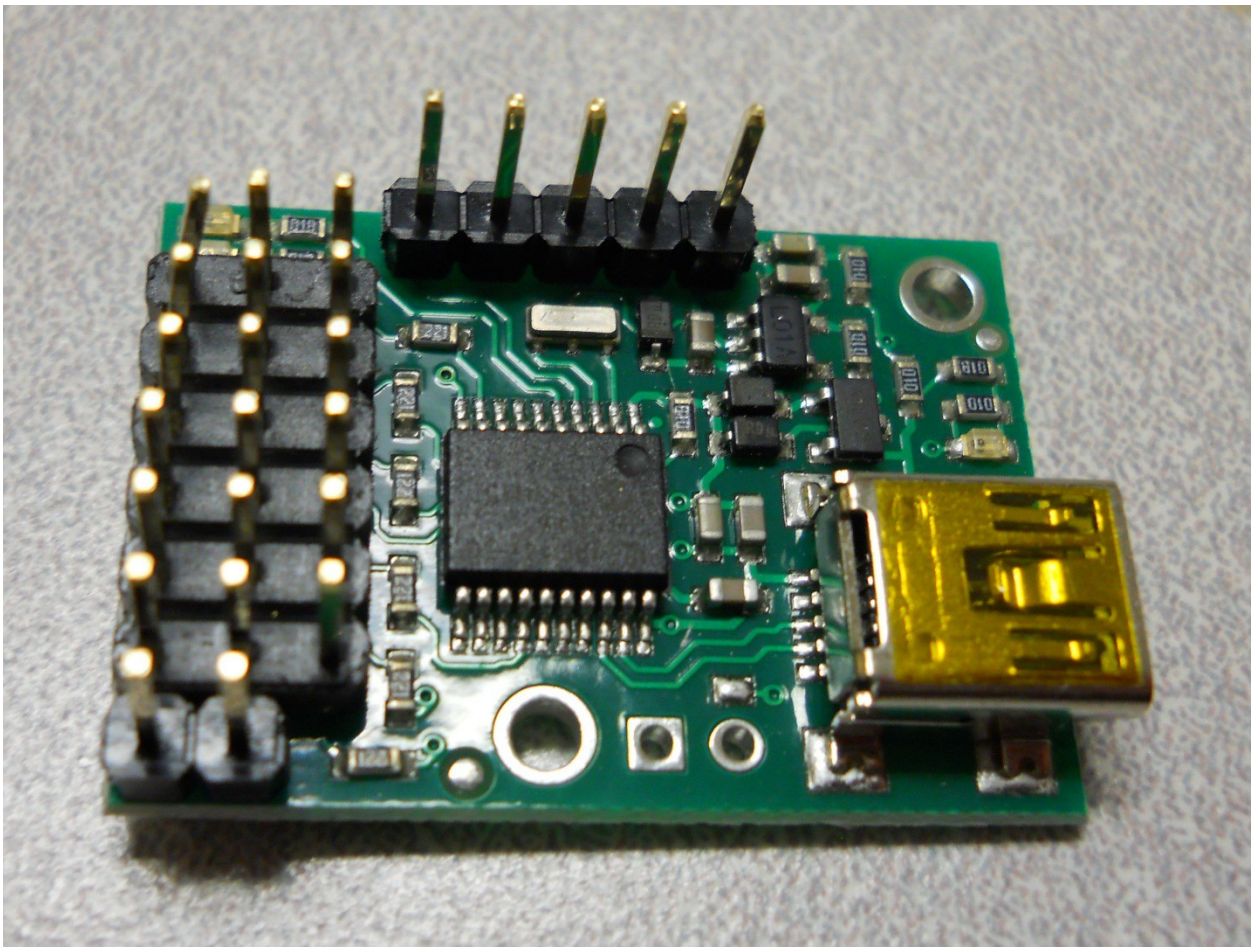

pi's X desktop (raspberrypi:1) - VNC Viewer
Menu
100 %
16:59
GUVCViewer Controls
Image Controls
Video & Files
Audio
Device:
USB 2.0 Camera
Frame Rate:
30/1 fps
Show
Resolution:
320x240
Camera Output:
MJPG
Image File:
Image.jpg
Open
File num:0
File,Auto
Image Format:
JPG
Take Picture by Default
Video File:
capture.avi
Open
File num:0
File,Auto
Video Codec:
RGB - uncomp BMP
properties
Video Format:
AVI - avi format
Take Video by Default
---- Video Filters ----
Mirror
Invert
Negative
Mono
Pieces
Particles
Capture:
Control Profiles:
Cap. Image
Cap. Video
Save
Open
Defaults
Quit
Help
GUVCVideo - 19.50 fps

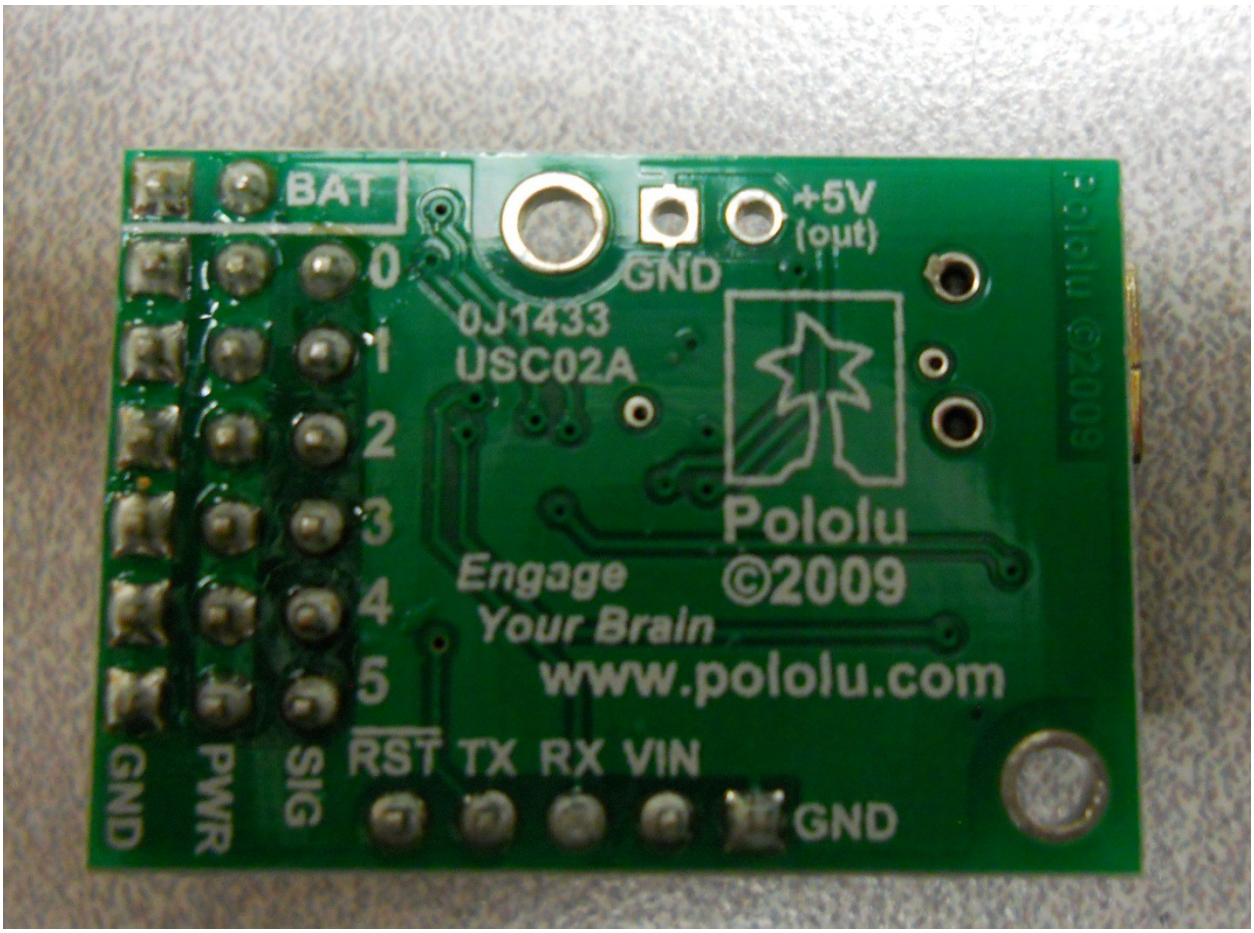
Chapter 8: Playing Rock, Paper, or Scissors with Raspberry Pi Zero

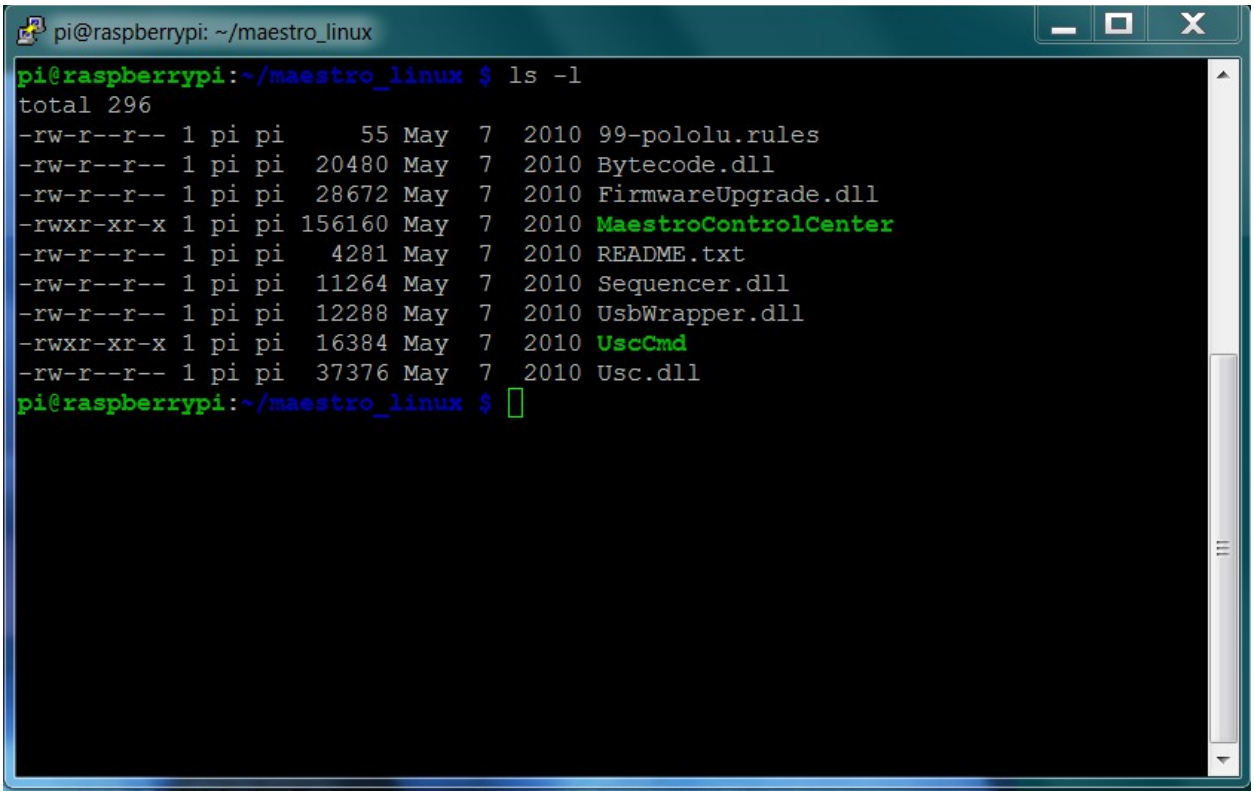


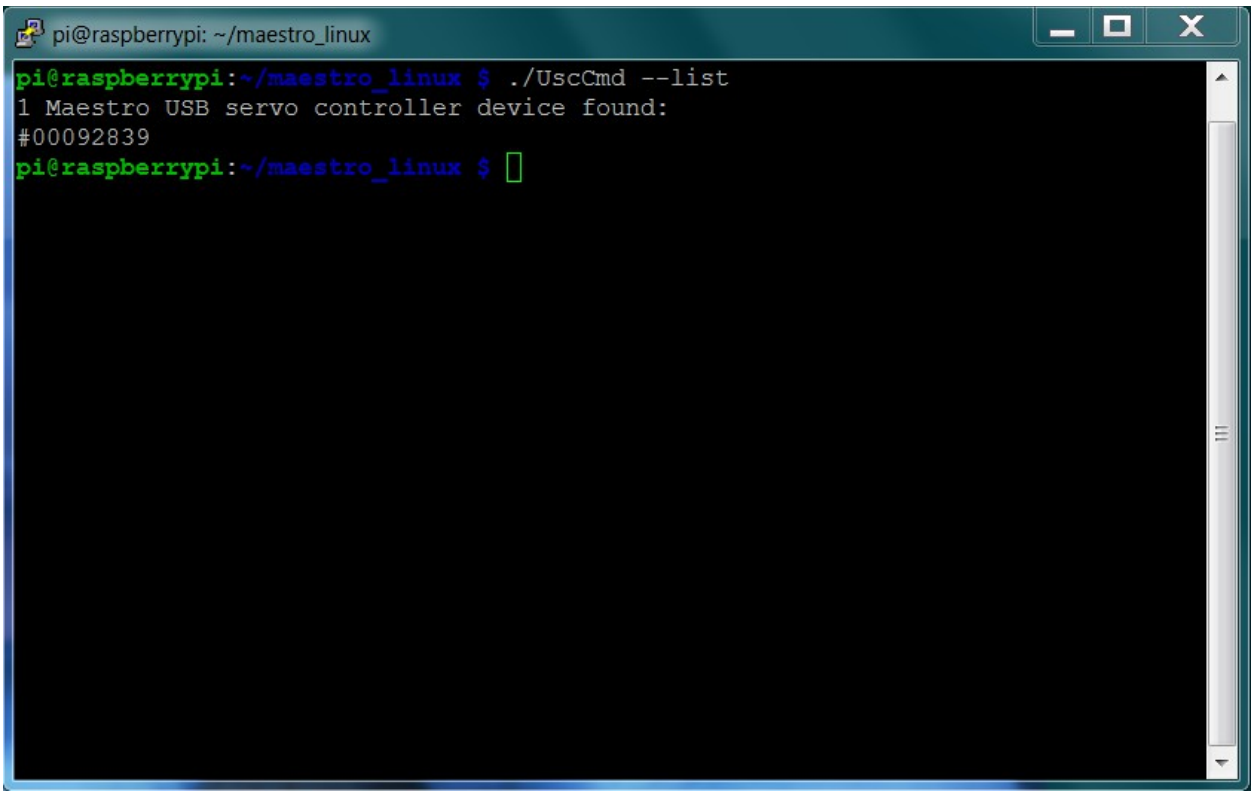


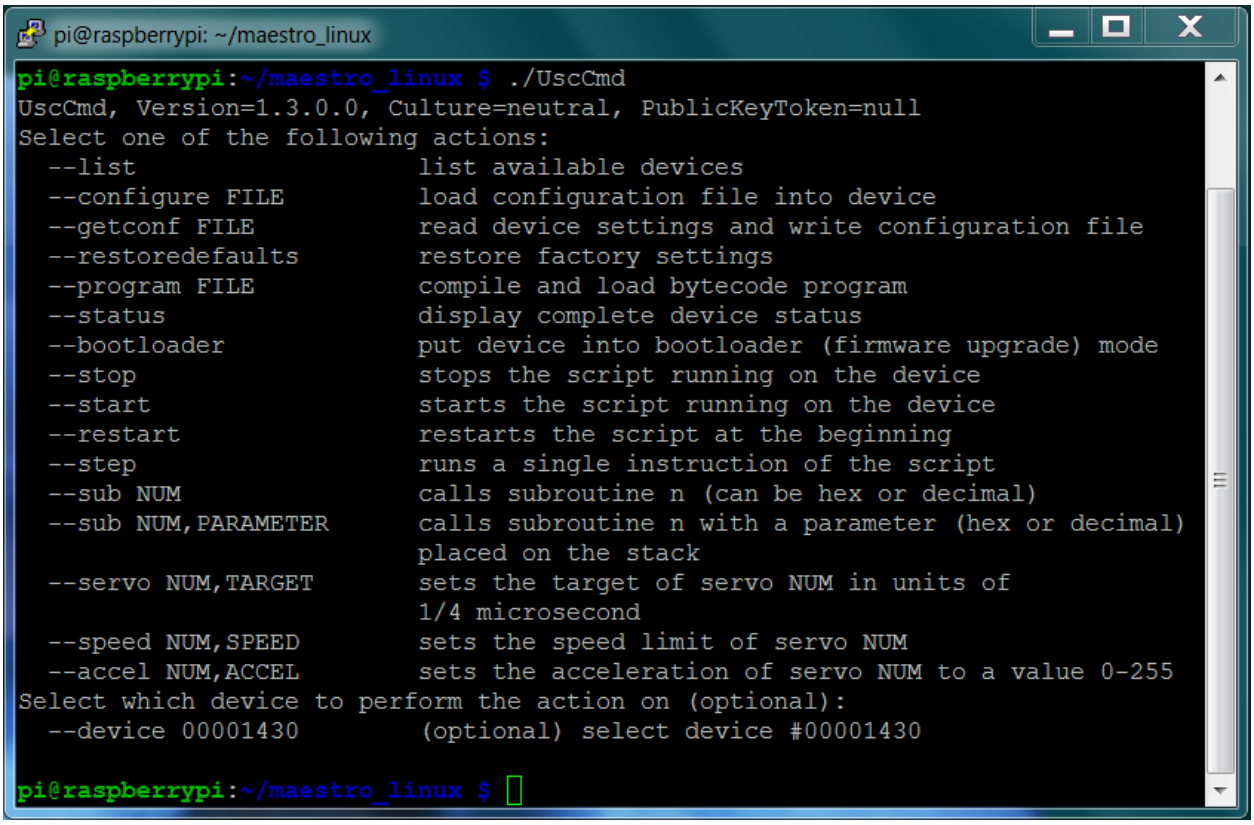

HS-422
HS-422
HS-422
HS-322HD

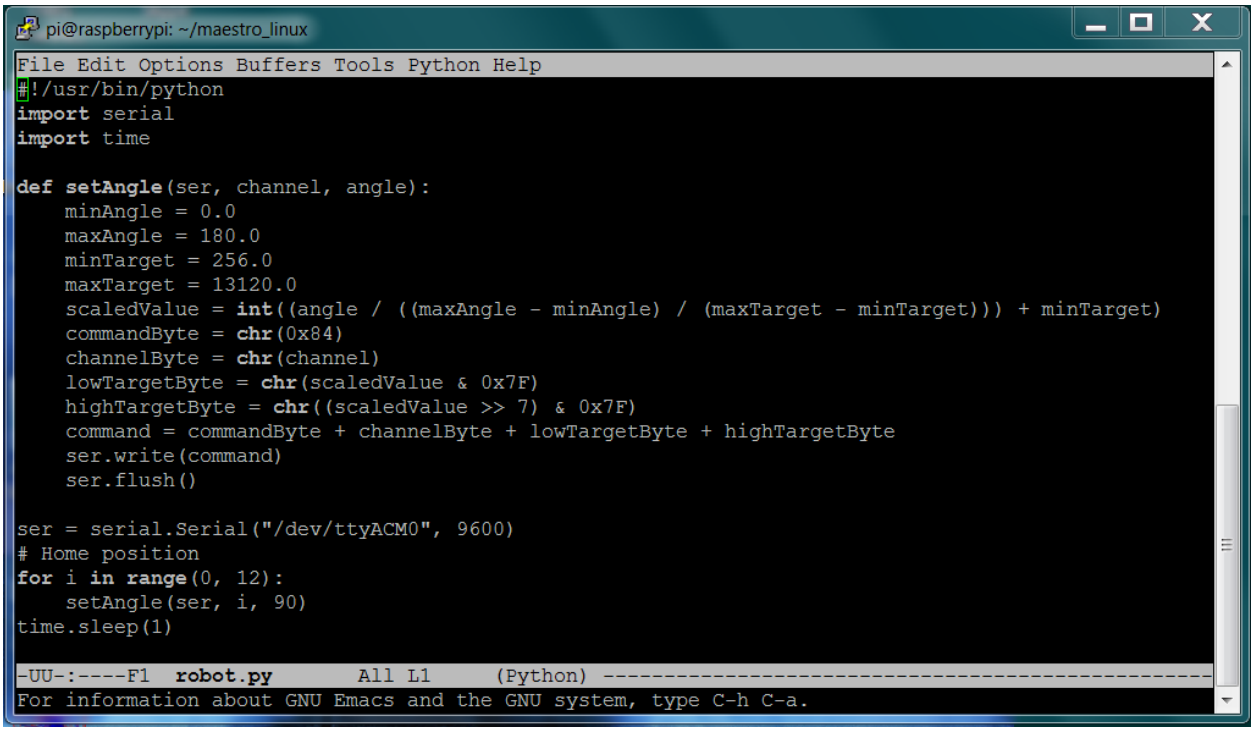


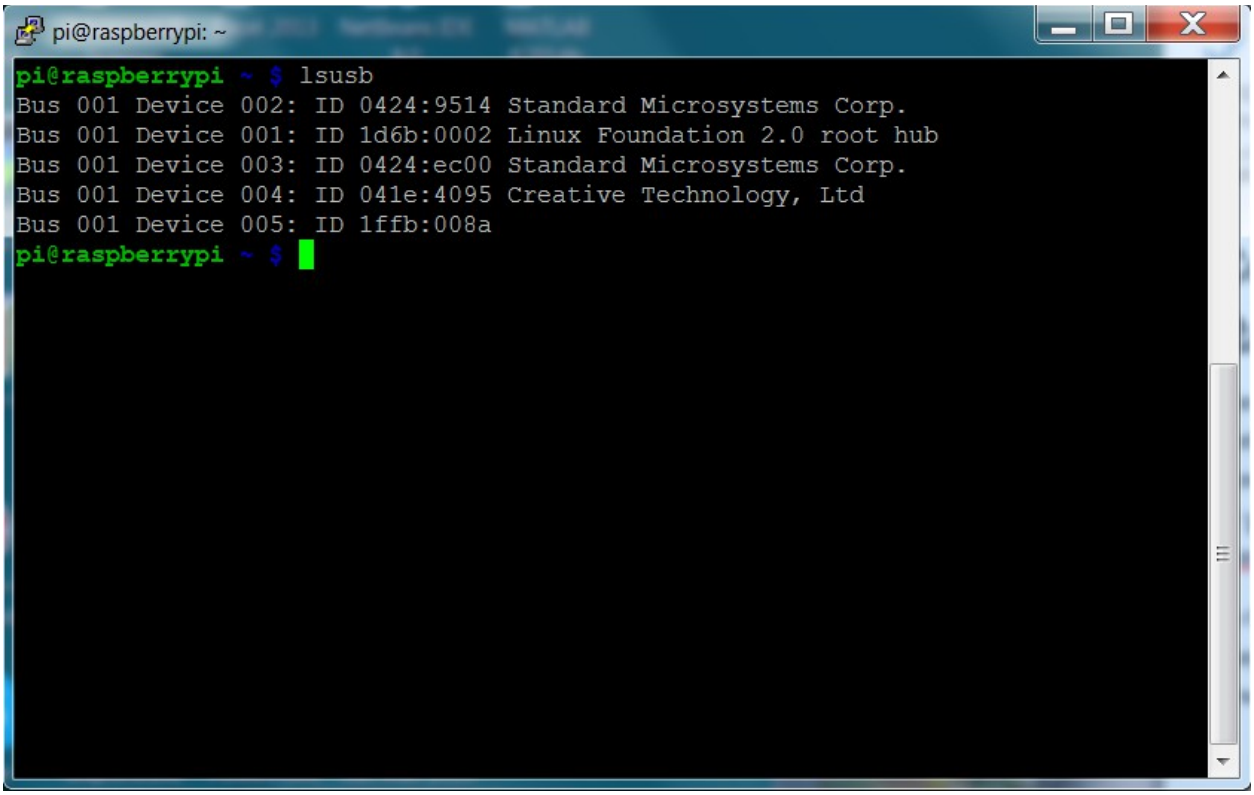

BAT
+5V
(out)
GND
0
1
2
3
4
5
0J1433
USC02A
Pololu
©2009
Engage
Your Brain
www.pololu.com
GND
PWR
SIG
RST
TX
RX
VIN
GND

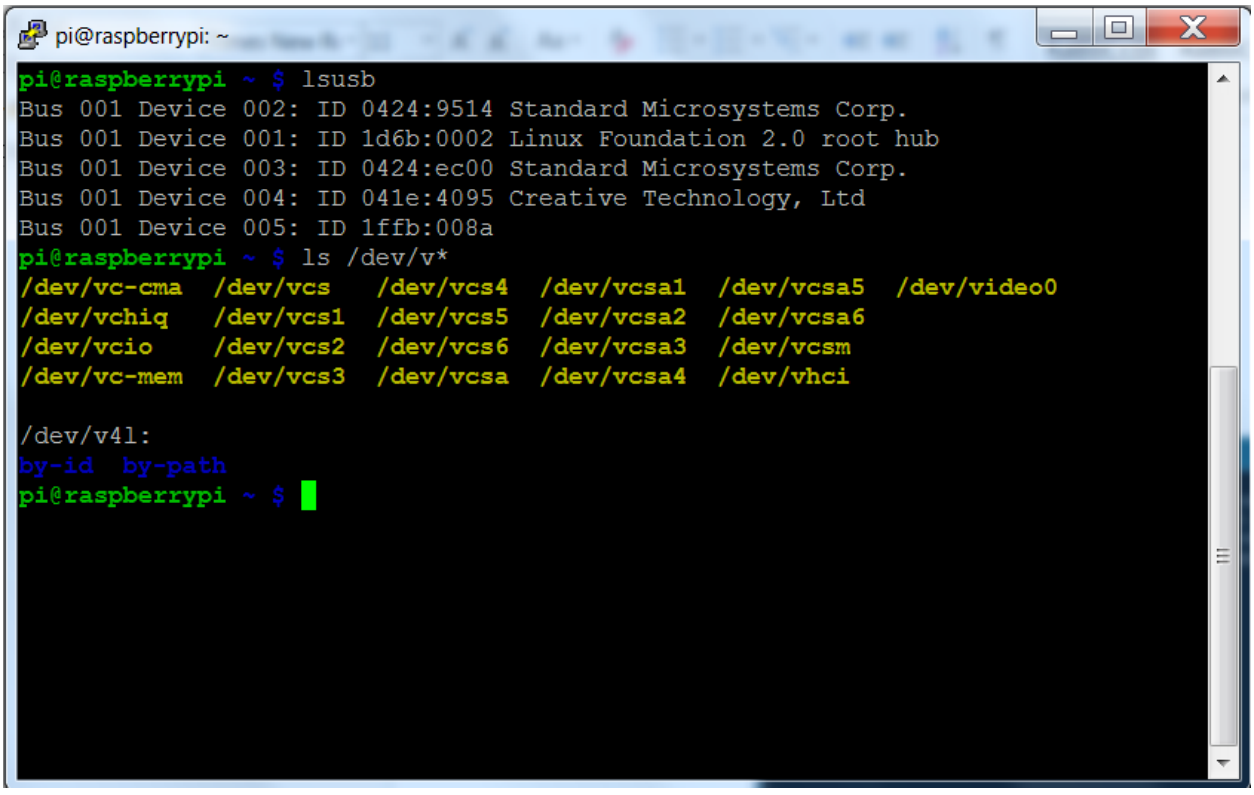

pi@raspberrypi: ~/maestro_linux
pi@raspberrypi:~/maestro_linux $ ls -l
total 296
-rw-r--r-- 1 pi pi   55 May 7 2010 99-pololu.rules
-rw-r--r-- 1 pi pi 20480 May 7 2010 Bytecode.dll
-rw-r--r-- 1 pi pi 28672 May 7 2010 FirmwareUpgrade.dll
-rwxr-xr-x 1 pi pi 156160 May 7 2010 MaestroControlCenter
-rw-r--r-- 1 pi pi   4281 May 7 2010 README.txt
-rw-r--r-- 1 pi pi 11264 May 7 2010 Sequencer.dll
-rw-r--r-- 1 pi pi 12288 May 7 2010 UsbWrapper.dll
-rwxr-xr-x 1 pi pi 16384 May 7 2010 UscCmd
-rw-r--r-- 1 pi pi 37376 May 7 2010 Usc.dll
pi@raspberrypi:~/maestro_linux $

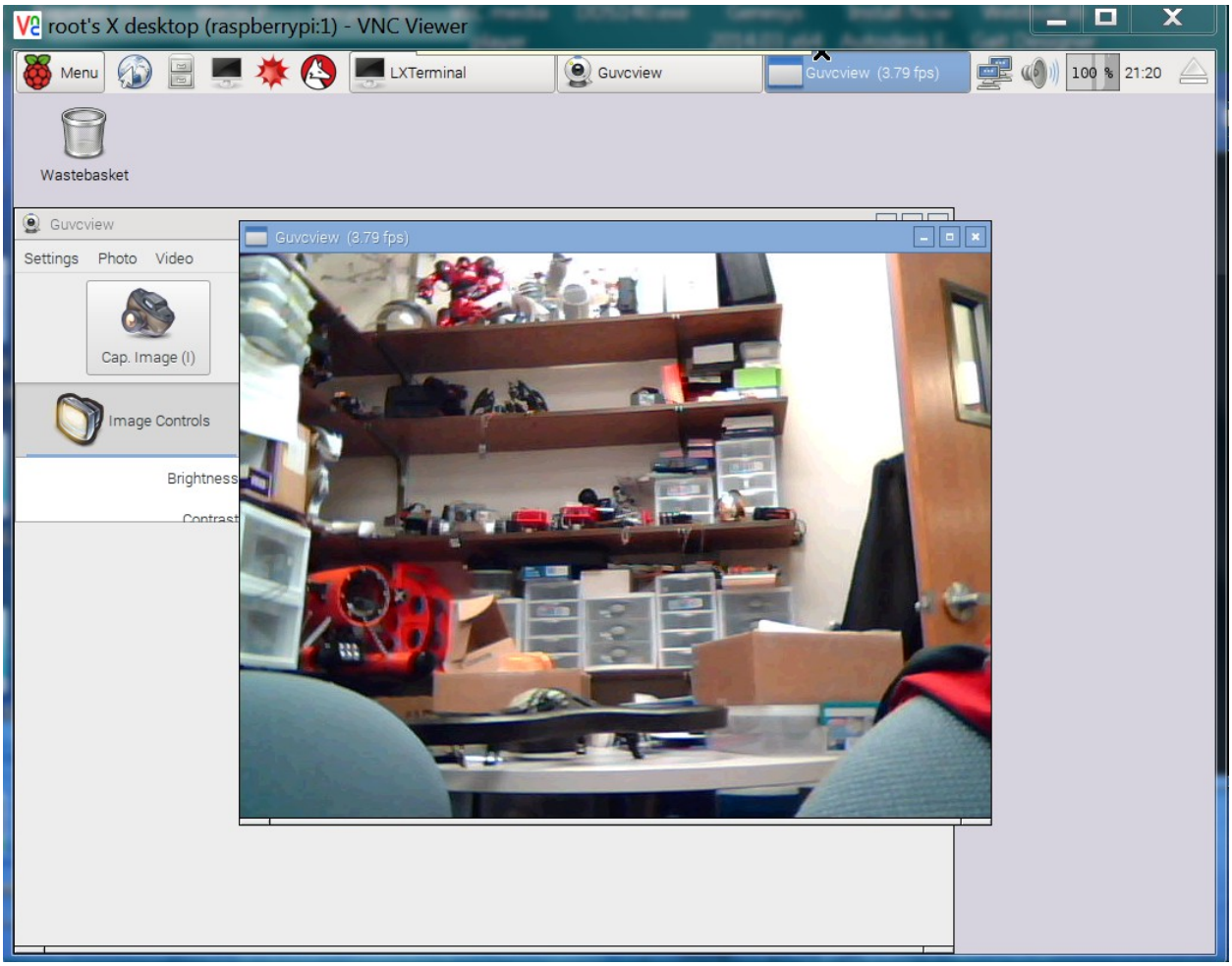

pi@raspberrypi: ~/maestro_linux
pi@raspberrypi:~/maestro_linux $ ./UscCmd --list
1 Maestro USB servo controller device found:
#00092839
pi@raspberrypi:~/maestro_linux $


pi@raspberrypi: ~/maestro_linux
pi@raspberrypi:~/maestro_linux $ ./UscCmd
UscCmd, Version=1.3.0.0, Culture=neutral, PublicKeyToken=null
Select one of the following actions:
--list list available devices
--configure FILE load configuration file into device
--getconf FILE read device settings and write configuration file
--restoredefaults restore factory settings
--program FILE compile and load bytecode program
--status display complete device status
--bootloader put device into bootloader (firmware upgrade) mode
--stop stops the script running on the device
--start starts the script running on the device
--restart restarts the script at the beginning
--step runs a single instruction of the script
--sub NUM calls subroutine n (can be hex or decimal)
--sub NUM,PARAMETER calls subroutine n with a parameter (hex or decimal)
placed on the stack
--servo NUM,TARGET sets the target of servo NUM in units of
1/4 microsecond
--speed NUM,SPEED sets the speed limit of servo NUM
--accel NUM,ACCEL sets the acceleration of servo NUM to a value 0-255
Select which device to perform the action on (optional):
--device 00001430 (optional) select device #00001430
pi@raspberrypi:~/maestro_linux $


pi@raspberrypi: ~/maestro_linux
File Edit Options Buffers Tools Python Help
#!/usr/bin/python
import serial
import time
def setAngle(ser, channel, angle):
minAngle = 0.0
maxAngle = 180.0
minTarget = 256.0
maxTarget = 13120.0
scaledValue = int((angle / ((maxAngle - minAngle) / (maxTarget - minTarget))) + minTarget)
commandByte = chr(0x84)
channelByte = chr(channel)
lowTargetByte = chr(scaledValue & 0x7F)
highTargetByte = chr((scaledValue >> 7) & 0x7F)
command = commandByte + channelByte + lowTargetByte + highTargetByte
ser.write(command)
ser.flush()
ser = serial.Serial("/dev/ttyACM0", 9600)
# Home position
for i in range(0, 12):
setAngle(ser, i, 90)
time.sleep(1)
-UU-:----F1 robot.py All L1 (Python)
For information about GNU Emacs and the GNU system, type C-h C-a.


pi@raspberrypi: ~
pi@raspberrypi ~ $ lsusb
Bus 001 Device 002: ID 0424:9514 Standard Microsystems Corp.
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 001 Device 003: ID 0424:ec00 Standard Microsystems Corp.
Bus 001 Device 004: ID 041e:4095 Creative Technology, Ltd
Bus 001 Device 005: ID 1ffb:008a
pi@raspberrypi ~ $

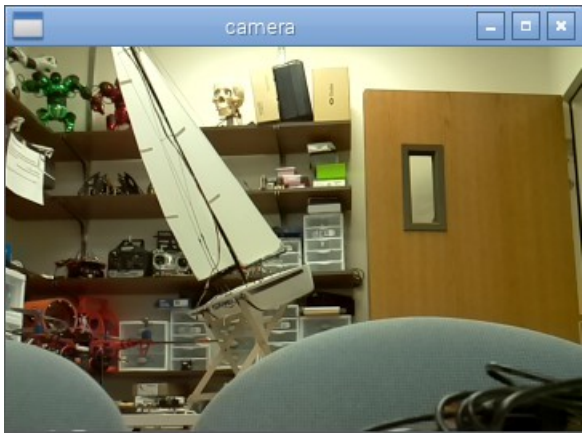

pi@raspberrypi: ~
pi@raspberrypi ~ $ lsusb
Bus 001 Device 002: ID 0424:9514 Standard Microsystems Corp.
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 001 Device 003: ID 0424:ec00 Standard Microsystems Corp.
Bus 001 Device 004: ID 041e:4095 Creative Technology, Ltd
Bus 001 Device 005: ID 1ffb:008a
pi@raspberrypi ~ $ ls /dev/v*
/dev/vc-cma /dev/vcs /dev/vcs4 /dev/vcsa1 /dev/vcsa5 /dev/video0
/dev/vchiq /dev/vcs1 /dev/vcs5 /dev/vcsa2 /dev/vcsa6
/dev/vcio /dev/vcs2 /dev/vcs6 /dev/vcsa3 /dev/vcsm
/dev/vc-mem /dev/vcs3 /dev/vcsa /dev/vcsa4 /dev/vhci
/dev/v4l:
by-id by-path
pi@raspberrypi ~ $


root's X desktop (raspberrypi:1) - VNC Viewer
Menu
LXTerminal
Guvcview
Guvcview (3.79 fps)
100 %
21:20
Wastebasket
Guvcview
Settings
Photo
Video
Cap. Image (I)
Image Controls
Brightness
Guvcview (3.79 fps)

pi@raspberrypi: ~/examples/python

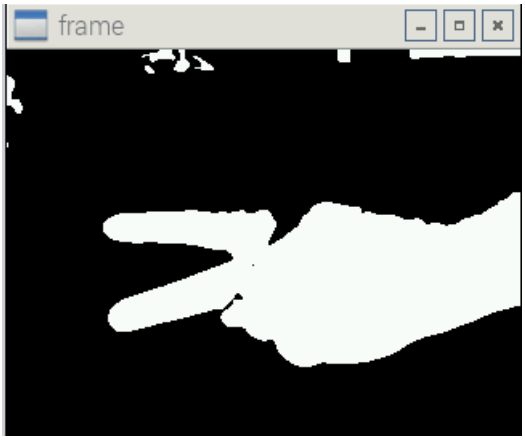
```
File Edit Options Buffers Tools Python Help
import cv2.cv as cv
import time

cv.NamedWindow("camera", 1)

capture = cv.CaptureFromCAM(0)
cv.SetCaptureProperty(capture, 3, 360)
cv.SetCaptureProperty(capture, 4, 240)

while True:
    img = cv.QueryFrame(capture)
    cv.ShowImage("camera", img)
    if cv.WaitKey(10) == 27:
        break
cv.DestroyAllWindows()
```

```
-UU-:----F1  myCamera.py     All L6      (Python)----------------------------------
Wrote /home/pi/examples/python/myCamera.py
```



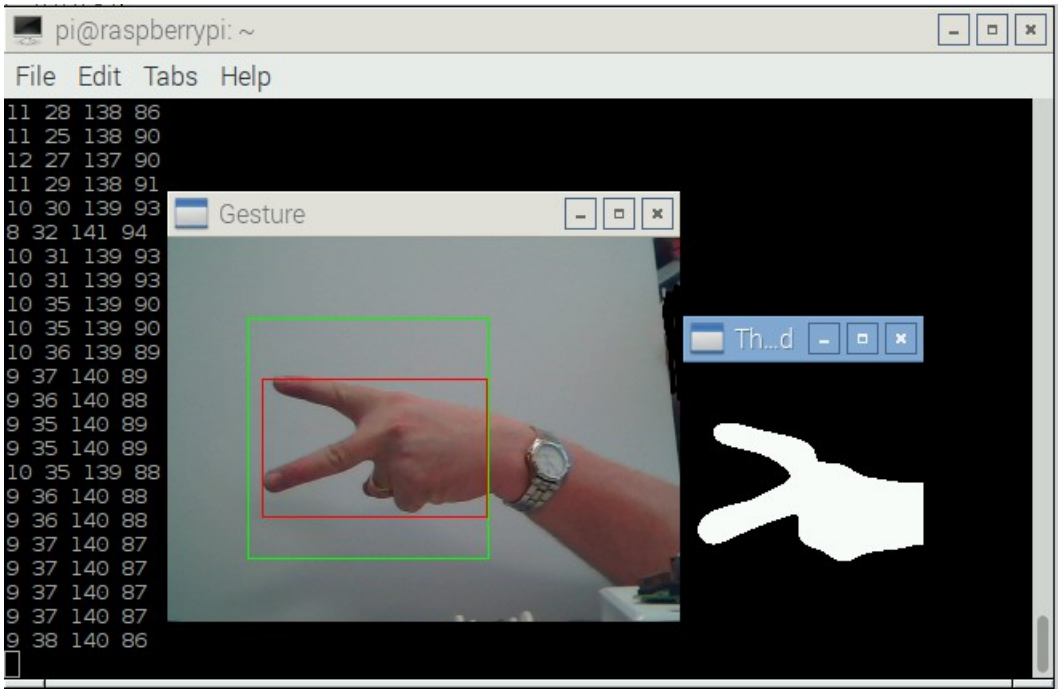
pi@raspberrypi: ~/examples/python

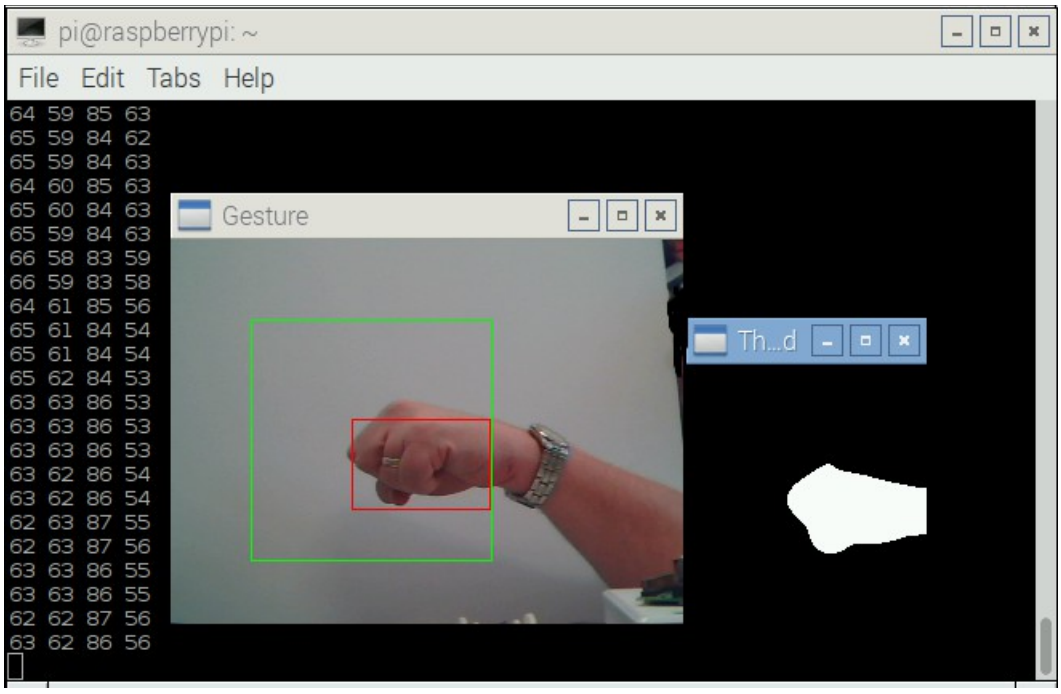
```
File Edit Options Buffers Tools Python Help
#!/usr/bin/python

import numpy as np
import cv2

cap = cv2.VideoCapture(0)
cap.set(3, 320)
cap.set(4, 240)
low_range = np.array([10, 120, 120])
high_range = np.array([70, 255, 255])

while (cap.isOpened()):
    ret, frame = cap.read()
    gray_image = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)
    blur = cv2.GaussianBlur(gray_image,(5,5),0)
    ret, threshold_img= cv2.threshold(blur,80,255,cv2.THRESH_BINARY_INV+cv2.THRESH_OTSU)
    cv2.imshow('frame', threshold_img)
    if cv2.waitKey(10) == 27:
        break
cap.release()
cv2.destroyAllWindows()



-UU-:----F1  hand_gesture.py   All L1      (Python) ----------------------------------------------
For information about GNU Emacs and the GNU system, type C-h C-a.
```

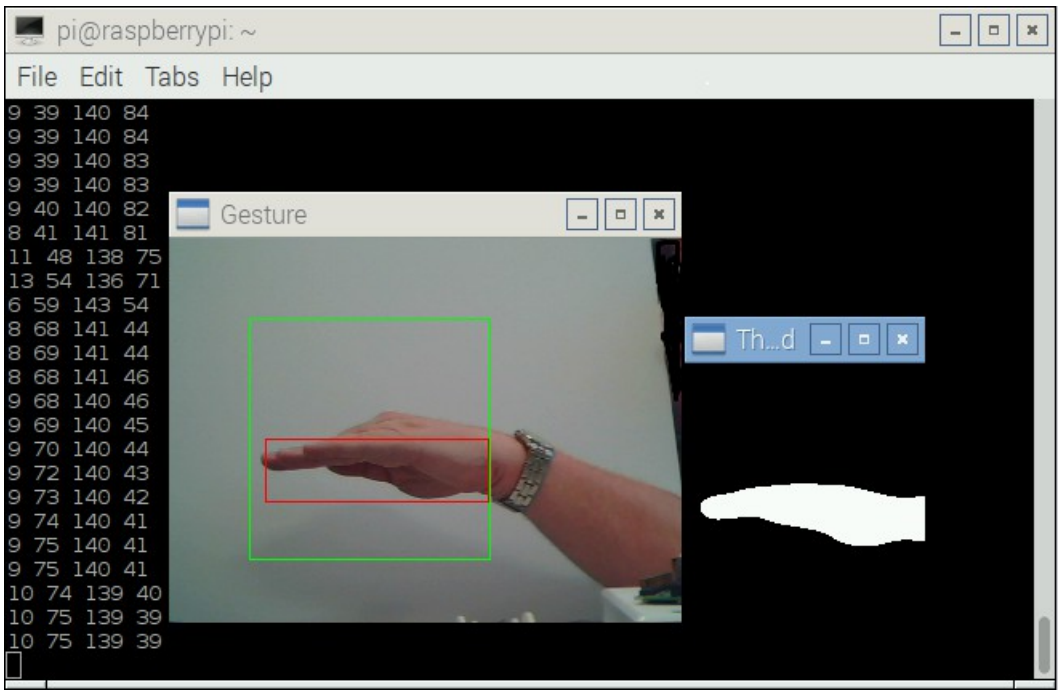


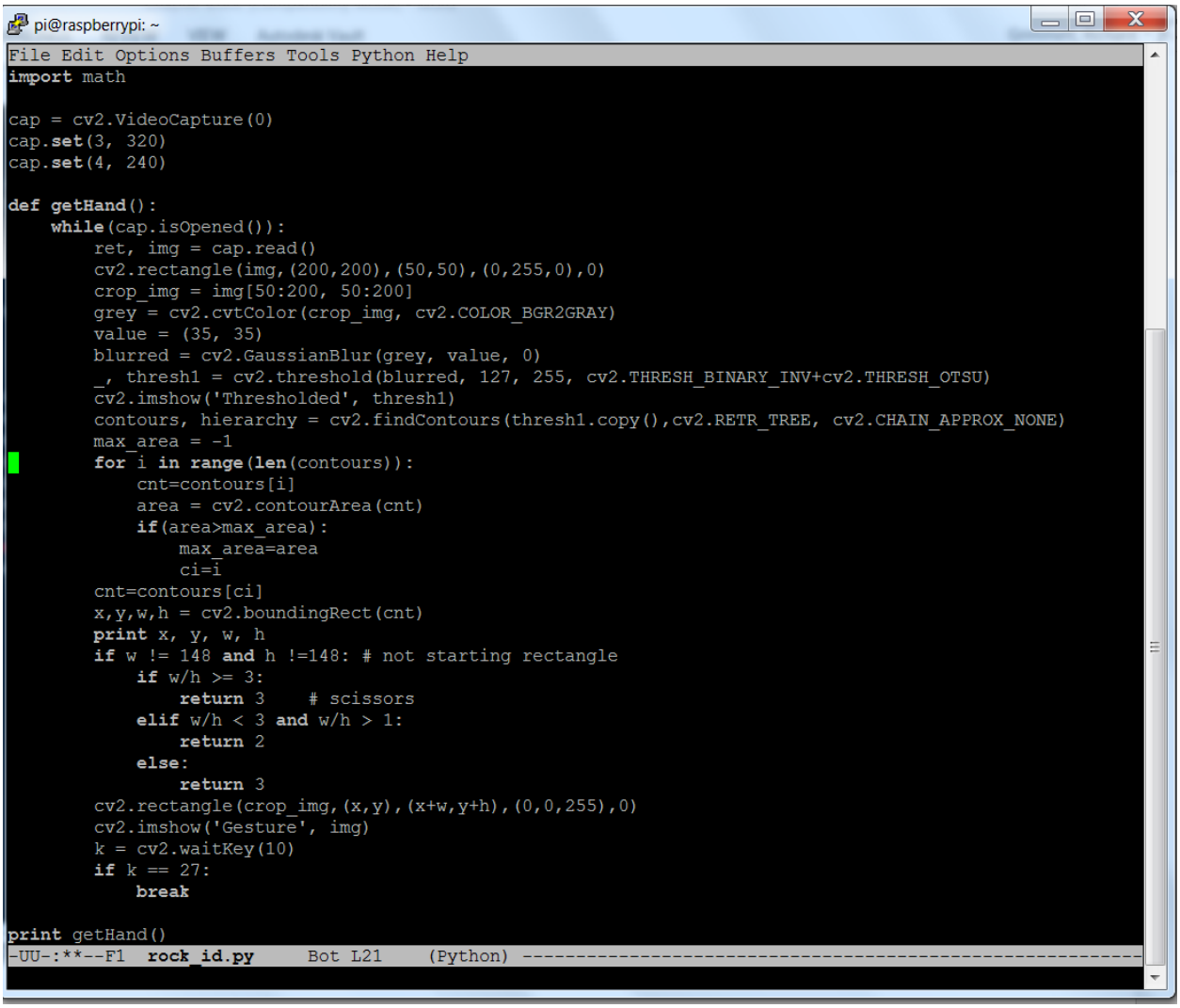
pi@raspberrypi: ~

```
File Edit Options Buffers Tools Python Help
import cv2
import numpy as np
import math

cap = cv2.VideoCapture(0)
cap.set(3, 320)
cap.set(4, 240)

def getHand():
    while(cap.isOpened()):
        ret, img = cap.read()
        cv2.rectangle(img,(200,200),(50,50),(0,255,0),0)
        crop_img = img[50:200, 50:200]
        grey = cv2.cvtColor(crop_img, cv2.COLOR_BGR2GRAY)
        value = (35, 35)
        blurred = cv2.GaussianBlur(grey, value, 0)
        _, thresh1 = cv2.threshold(blurred, 127, 255, cv2.THRESH_BINARY_INV+cv2.THRESH_OTSU)
        cv2.imshow('Thresholded', thresh1)
        contours, hierarchy = cv2.findContours(thresh1.copy(),cv2.RETR_TREE, cv2.CHAIN_APPROX_NONE)
        max_area = -1
        for i in range(len(contours)):
            cnt=contours[i]
            area = cv2.contourArea(cnt)
            if(area>max_area):
                max_area=area
                ci=i
        cnt=contours[ci]
        x,y,w,h = cv2.boundingRect(cnt)
        print x, y, w, h
        cv2.rectangle(crop_img,(x,y),(x+w,y+h),(0,0,255),0)
        cv2.imshow('Gesture', img)
        k = cv2.waitKey(10)
        if k == 27:
            break

getHand()

-UU-:----F1  rock_id.py      All L1      (Python) ----------------------------------------------------------------
For information about GNU Emacs and the GNU system, type C-h C-a.
```

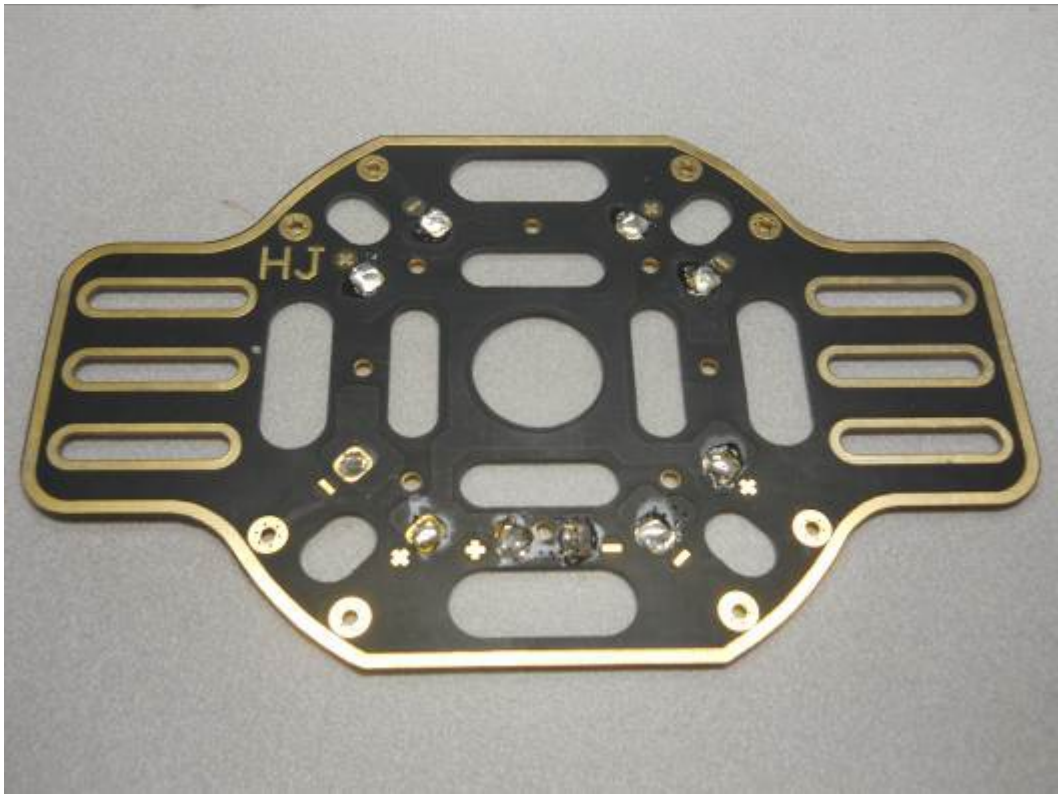



pi@raspberrypi: ~
File Edit Tabs Help
64 59 85 63
65 59 84 62
65 59 84 63
64 60 85 63
65 60 84 63
65 59 84 63
66 58 83 59
66 59 83 58
64 61 85 56
65 61 84 54
65 61 84 54
65 62 84 53
63 63 86 53
63 63 86 53
63 63 86 53
63 62 86 54
63 62 86 54
62 63 87 55
62 63 87 56
63 63 86 55
63 63 86 55
62 62 87 56
63 62 86 56
Gesture
Th...d


pi@raspberrypi: ~
File Edit Tabs Help
9 39 140 84
9 39 140 84
9 39 140 83
9 39 140 83
9 40 140 82
8 41 141 81
11 48 138 75
13 54 136 71
6 59 143 54
8 68 141 44
8 69 141 44
8 68 141 46
9 68 140 46
9 69 140 45
9 70 140 44
9 72 140 43
9 73 140 42
9 74 140 41
9 75 140 41
9 75 140 41
10 74 139 40
10 75 139 39
10 75 139 39
Gesture
Th...d

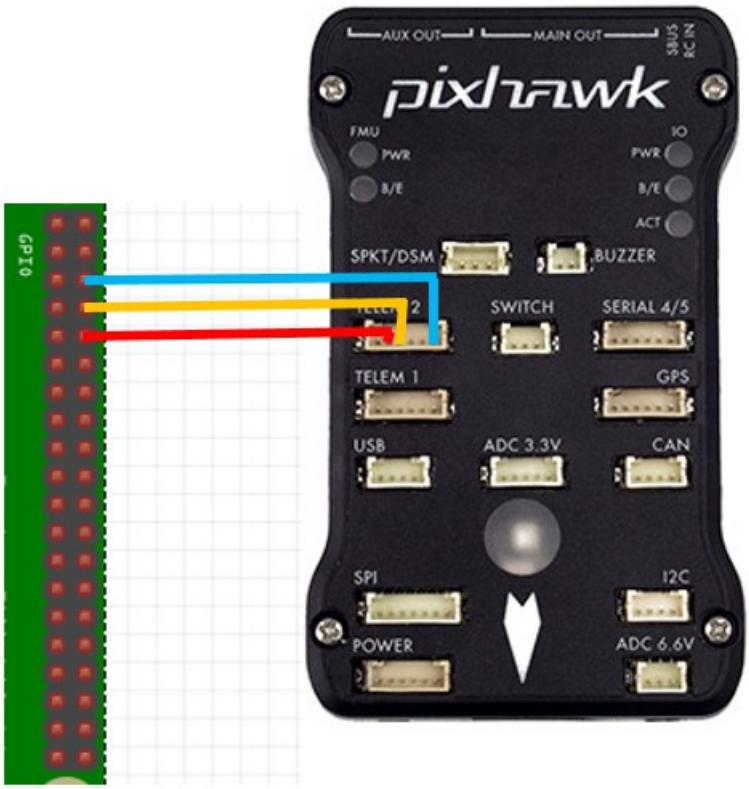

pi@raspberrypi: ~
File Edit Options Buffers Tools Python Help
import math
cap = cv2.VideoCapture(0)
cap.set(3, 320)
cap.set(4, 240)
def getHand():
while(cap.isOpened()):
ret, img = cap.read()
cv2.rectangle(img,(200,200),(50,50),(0,255,0),0)
crop_img = img[50:200, 50:200]
grey = cv2.cvtColor(crop_img, cv2.COLOR_BGR2GRAY)
value = (35, 35)
blurred = cv2.GaussianBlur(grey, value, 0)
_, thresh1 = cv2.threshold(blurred, 127, 255, cv2.THRESH_BINARY_INV+cv2.THRESH_OTSU)
cv2.imshow('Thresholded', thresh1)
contours, hierarchy = cv2.findContours(thresh1.copy(),cv2.RETR_TREE, cv2.CHAIN_APPROX_NONE)
max_area = -1
for i in range(len(contours)):
cnt=contours[i]
area = cv2.contourArea(cnt)
if(area>max_area):
max_area=area
ci=i
cnt=contours[ci]
x,y,w,h = cv2.boundingRect(cnt)
print x, y, w, h
if w != 148 and h !=148: # not starting rectangle
if w/h >= 3:
return 3 # scissors
elif w/h < 3 and w/h > 1:
return 2
else:
return 3
cv2.rectangle(crop_img,(x,y),(x+w,y+h),(0,0,255),0)
cv2.imshow('Gesture', img)
k = cv2.waitKey(10)
if k == 27:
break
print getHand()
-UU-:**--F1 rock_id.py Bot L21 (Python)

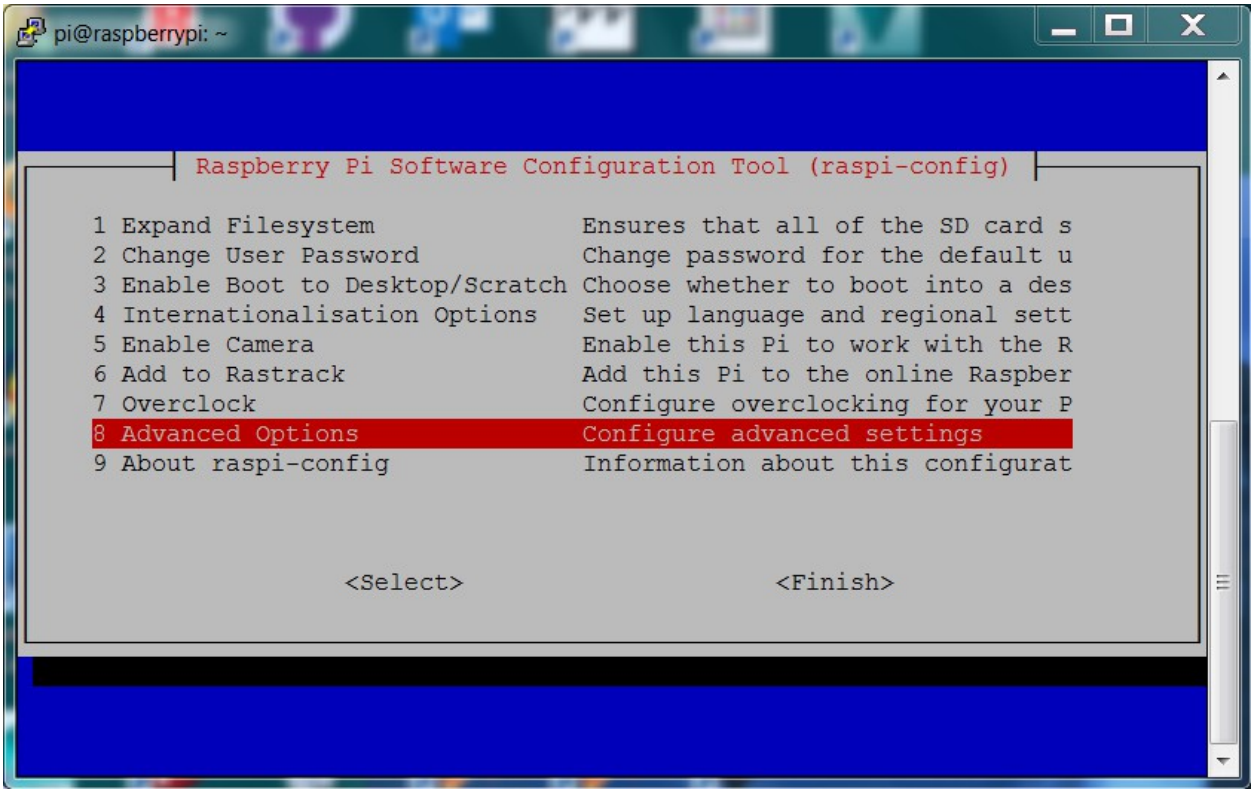
Chapter 9: Adding Raspberry Pi Zero to a Quadcopter

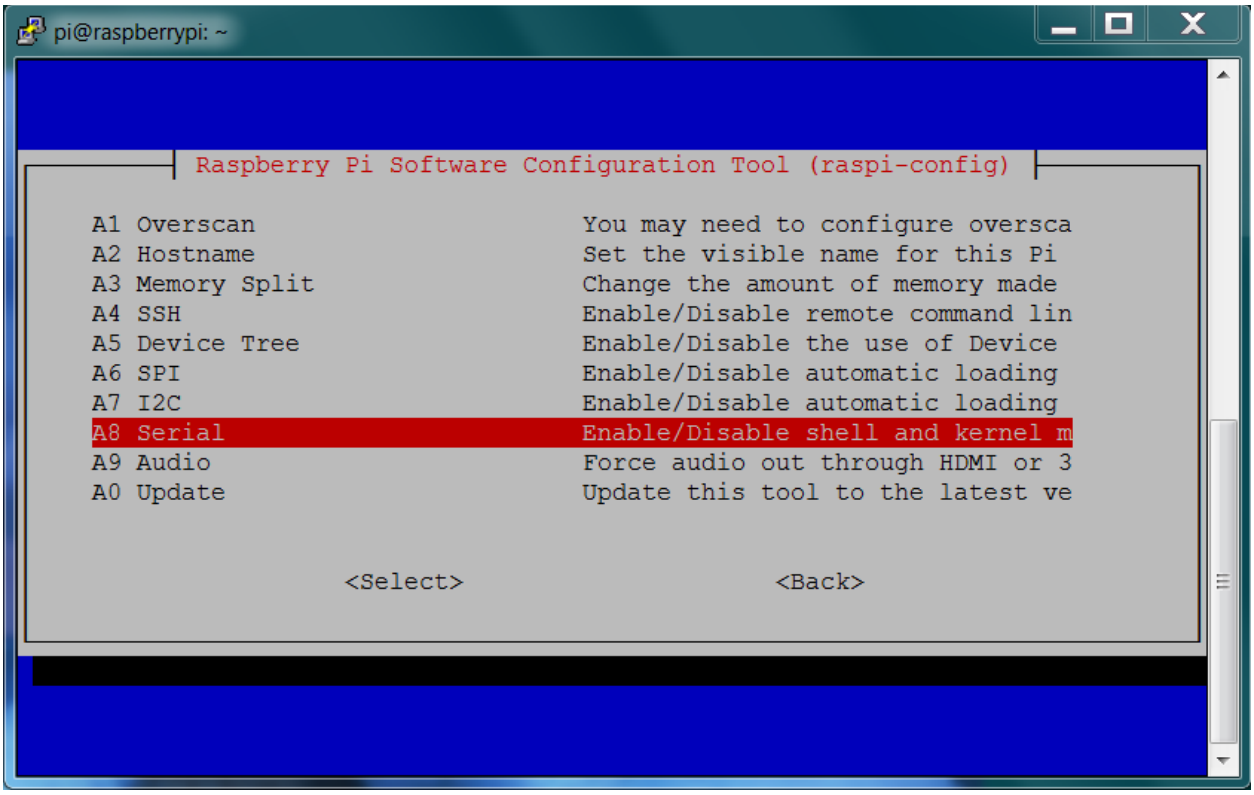



Multicopter
ESC 40A

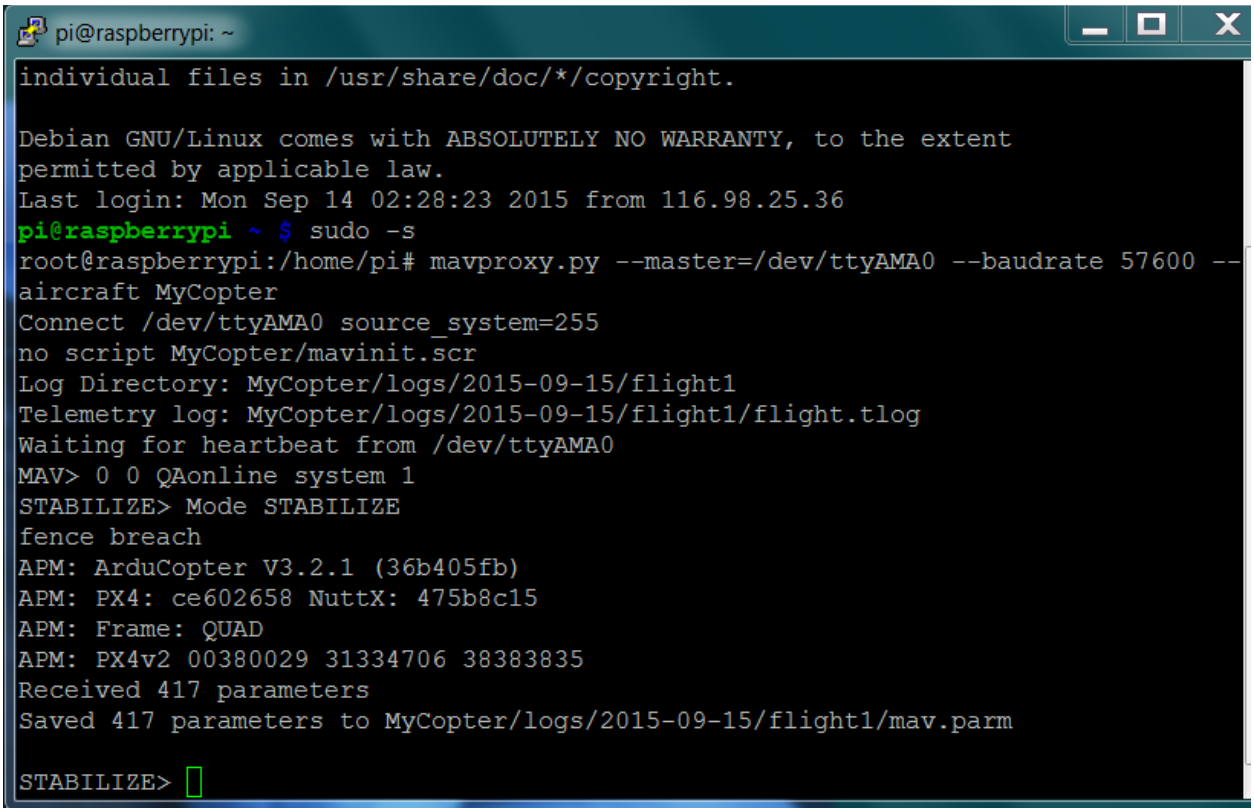

FLIGHT DATA
FLIGHT PLAN
INITIAL SETUP
CONFIG/TUNING
SIMULATION
TERMINAL
HELP
DONATE
CONNECT
DISARMED
GPS: No GPS
Altitude (m)
GroundSpeed (m
0.00
0.00
Dist to WP (m
Yaw (deg)
0.00
0.00
Vertical Speed (r
DistToMAV
0.00
0.00

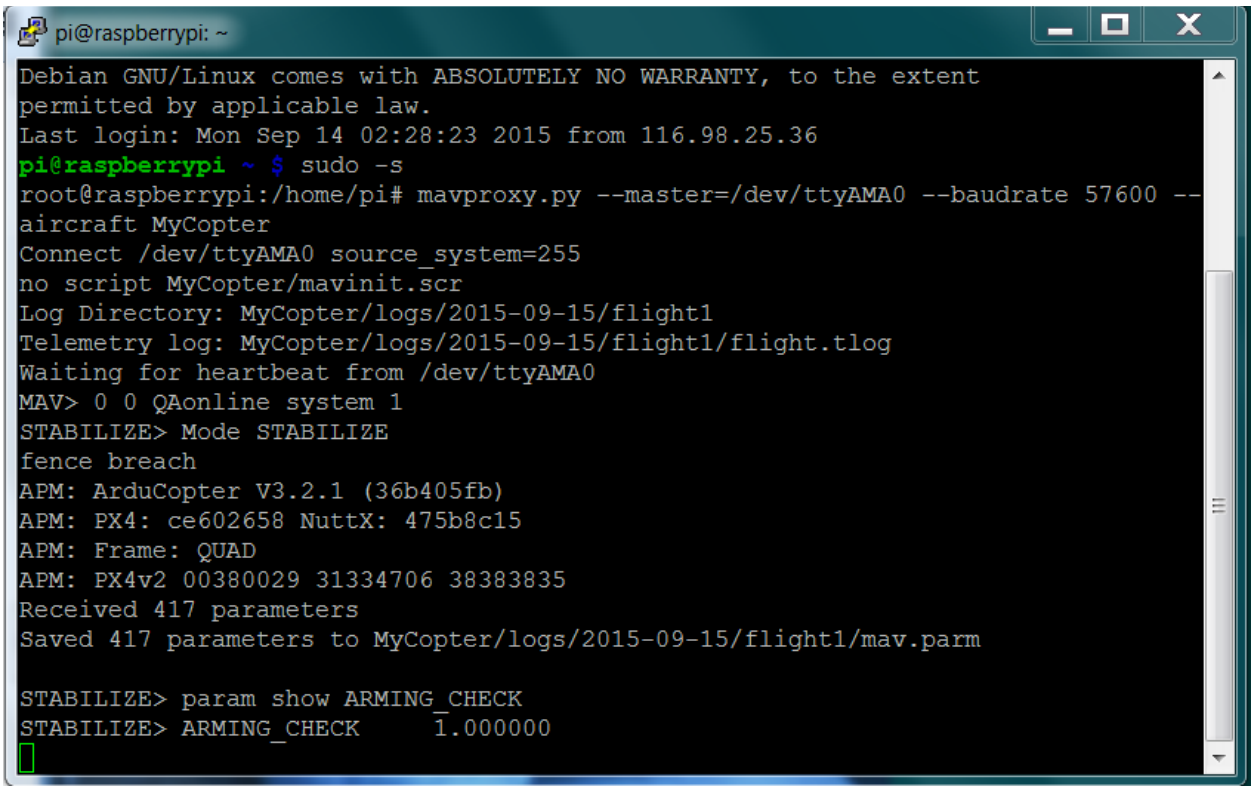

AUX OUT
MAIN OUT
SBUS RC IN
pixhawk
FMU
PWR
B/E
IO
PWR
B/E
ACT
SPKT/DSM
BUZZER
SWITCH
SERIAL 4/5
TELEM 1
GPS
USB
ADC 3.3V
CAN
SPI
I2C
POWER
ADC 6.6V
GPIO


pi@raspberrypi: ~
Raspberry Pi Software Configuration Tool (raspi-config)
1 Expand Filesystem Ensures that all of the SD card s
2 Change User Password Change password for the default u
3 Enable Boot to Desktop/Scratch Choose whether to boot into a des
4 Internationalisation Options Set up language and regional sett
5 Enable Camera Enable this Pi to work with the R
6 Add to Rastrack Add this Pi to the online Raspber
7 Overclock Configure overclocking for your P
8 Advanced Options Configure advanced settings
9 About raspi-config Information about this configurat
<Select>
<Finish>


pi@raspberrypi: ~
Raspberry Pi Software Configuration Tool (raspi-config)
A1 Overscan
You may need to configure oversca
A2 Hostname
Set the visible name for this Pi
A3 Memory Split
Change the amount of memory made
A4 SSH
Enable/Disable remote command lin
A5 Device Tree
Enable/Disable the use of Device
A6 SPI
Enable/Disable automatic loading
A7 I2C
Enable/Disable automatic loading
A8 Serial
Enable/Disable shell and kernel m
A9 Audio
Force audio out through HDMI or 3
A0 Update
Update this tool to the latest ve
<Select>
<Back>


pi@raspberrypi: ~
Would you like a login shell to be accessible over serial?
<Yes>
<No>


pi@raspberrypi: ~
individual files in /usr/share/doc/*/copyright.
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Mon Sep 14 02:28:23 2015 from 116.98.25.36
pi@raspberrypi ~ $ sudo -s
root@raspberrypi:/home/pi# mavproxy.py --master=/dev/ttyAMA0 --baudrate 57600 --
aircraft MyCopter
Connect /dev/ttyAMA0 source_system=255
no script MyCopter/mavinit.scr
Log Directory: MyCopter/logs/2015-09-15/flight1
Telemetry log: MyCopter/logs/2015-09-15/flight1/flight.tlog
Waiting for heartbeat from /dev/ttyAMA0
MAV> 0 0 QAonline system 1
STABILIZE> Mode STABILIZE
fence breach
APM: ArduCopter V3.2.1 (36b405fb)
APM: PX4: ce602658 NuttX: 475b8c15
APM: Frame: QUAD
APM: PX4v2 00380029 31334706 38383835
Received 417 parameters
Saved 417 parameters to MyCopter/logs/2015-09-15/flight1/mav.parm
STABILIZE>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Last login: Mon Sep 14 02:28:23 2015 from 116.98.25.36
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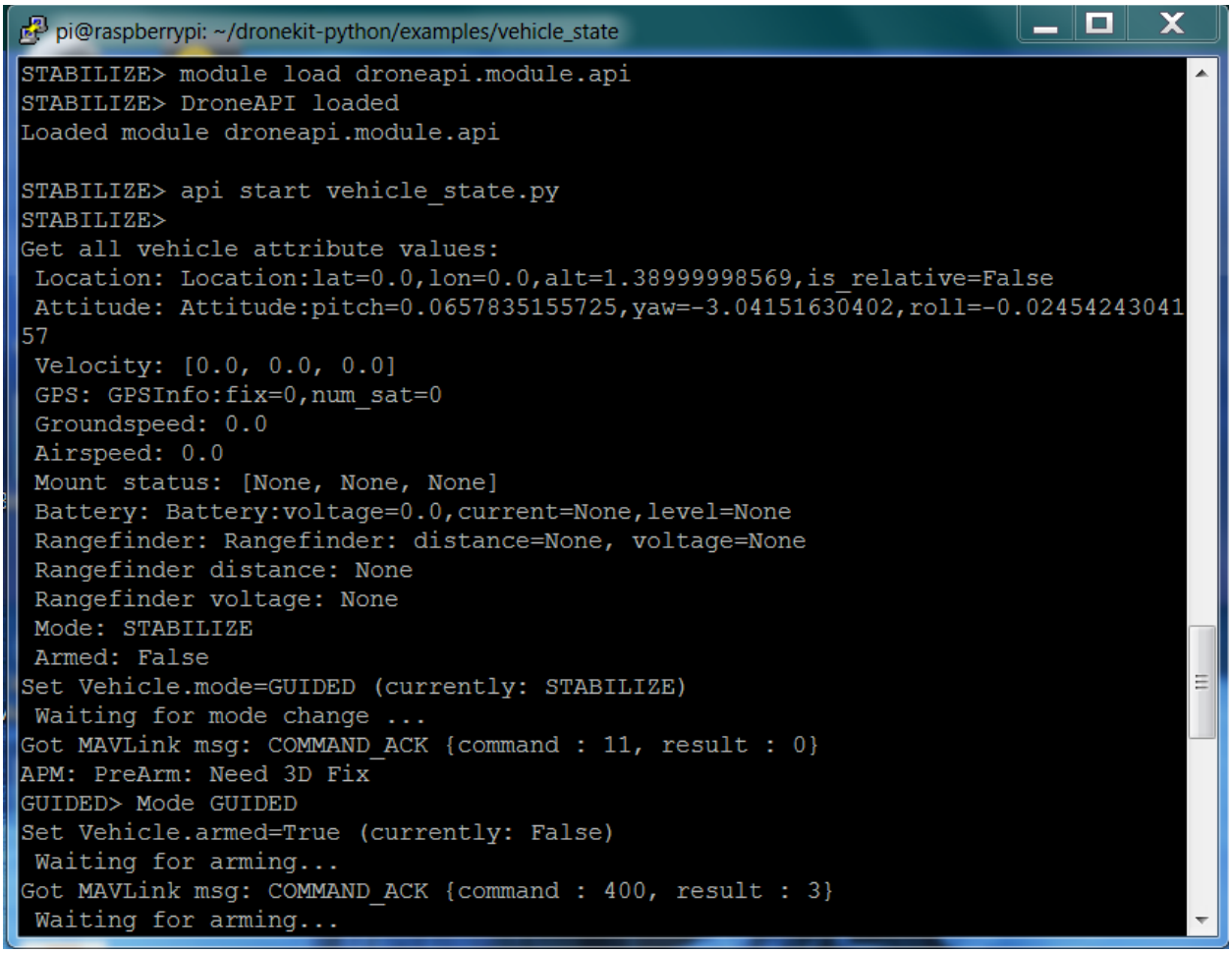
aircraft MyCopter
Connect /dev/ttyAMA0 source_system=255
no script MyCopter/mavinit.scr
Log Directory: MyCopter/logs/2015-09-15/flight1
Telemetry log: MyCopter/logs/2015-09-15/flight1/flight.tlog
Waiting for heartbeat from /dev/ttyAMA0
MAV> 0 0 QAonline system 1
STABILIZE> Mode STABILIZE
fence breach
APM: ArduCopter V3.2.1 (36b405fb)
APM: PX4: ce602658 NuttX: 475b8c15
APM: Frame: QUAD
APM: PX4v2 00380029 31334706 38383835
Received 417 parameters
Saved 417 parameters to MyCopter/logs/2015-09-15/flight1/mav.parm
STABILIZE> param show ARMING_CHECK
STABILIZE> ARMING_CHECK 1.000000


pi@raspberrypi: ~/dronekit-python/examples/vehicle_state
STABILIZE> module load droneapi.module.api
STABILIZE> DroneAPI loaded
Loaded module droneapi.module.api
STABILIZE> api start vehicle_state.py
STABILIZE>
Get all vehicle attribute values:
Location: Location:lat=0.0,lon=0.0,alt=1.38999998569,is_relative=False
Attitude: Attitude:pitch=0.0657835155725,yaw=-3.04151630402,roll=-0.02454243041
57
Velocity: [0.0, 0.0, 0.0]
GPS: GPSInfo:fix=0,num_sat=0
Groundspeed: 0.0
Airspeed: 0.0
Mount status: [None, None, None]
Battery: Battery:voltage=0.0,current=None,level=None
Rangefinder: Rangefinder: distance=None, voltage=None
Rangefinder distance: None
Rangefinder voltage: None
Mode: STABILIZE
Armed: False
Set Vehicle.mode=GUIDED (currently: STABILIZE)
Waiting for mode change ...
Got MAVLink msg: COMMAND_ACK {command : 11, result : 0}
APM: PreArm: Need 3D Fix
GUIDED> Mode GUIDED
Set Vehicle.armed=True (currently: False)
Waiting for arming...
Got MAVLink msg: COMMAND_ACK {command : 400, result : 3}
Waiting for arming...


FLIGHT DATA
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INITIAL SETUP
CONFIG/TUNING
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TERMINAL
HELP
DONATE
CONNECT
DISARMED
Altitude (m)
GroundSpeed (m
0.00
0.00
Dist to WP (m)
Yaw (deg)
0.00
0.00
Vertical Speed (m
DistToMAV
0.00
0.00
Connecting Mavlink
Mavlink Connecting...
Cancel
Listern Port
Enter Local port (ensure remote end is already sending)
14550
OK
Cancel