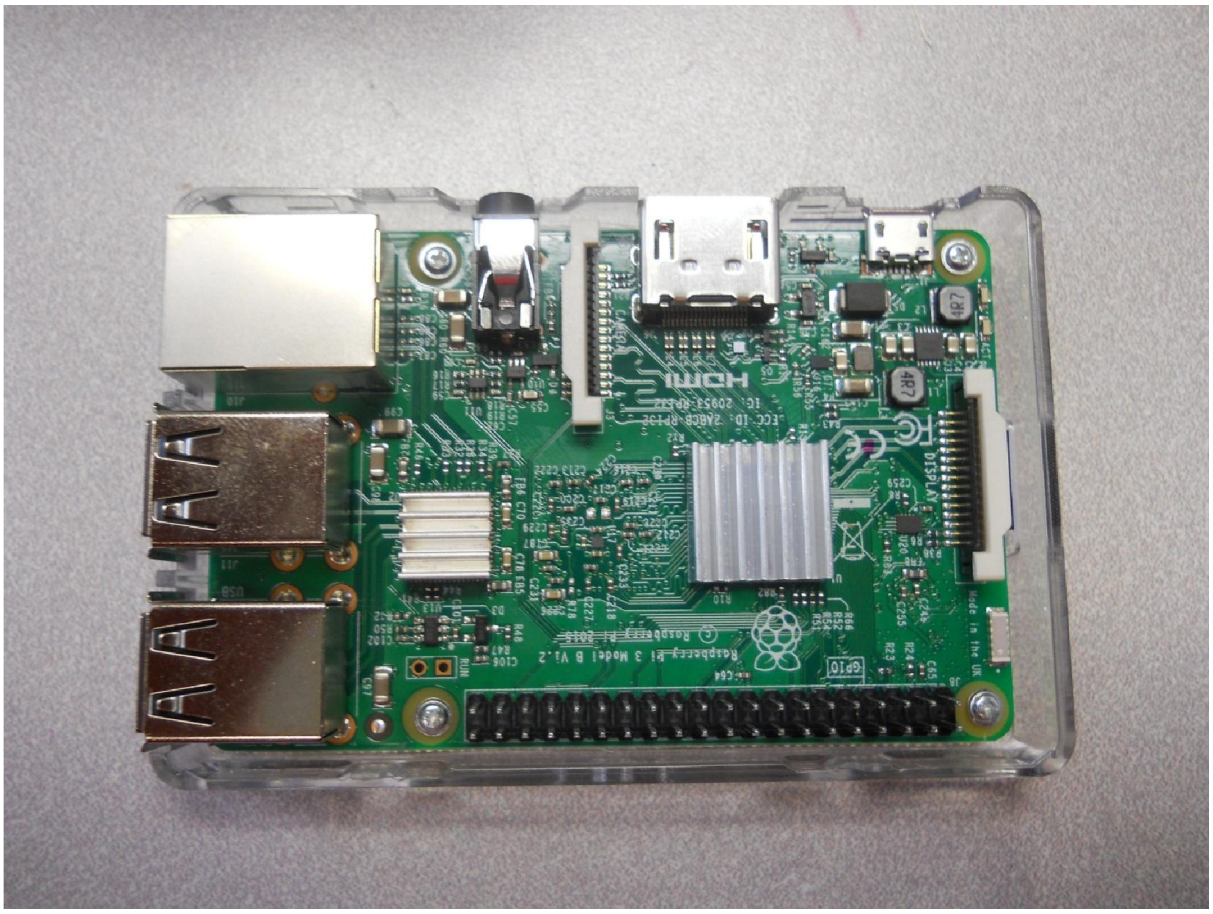
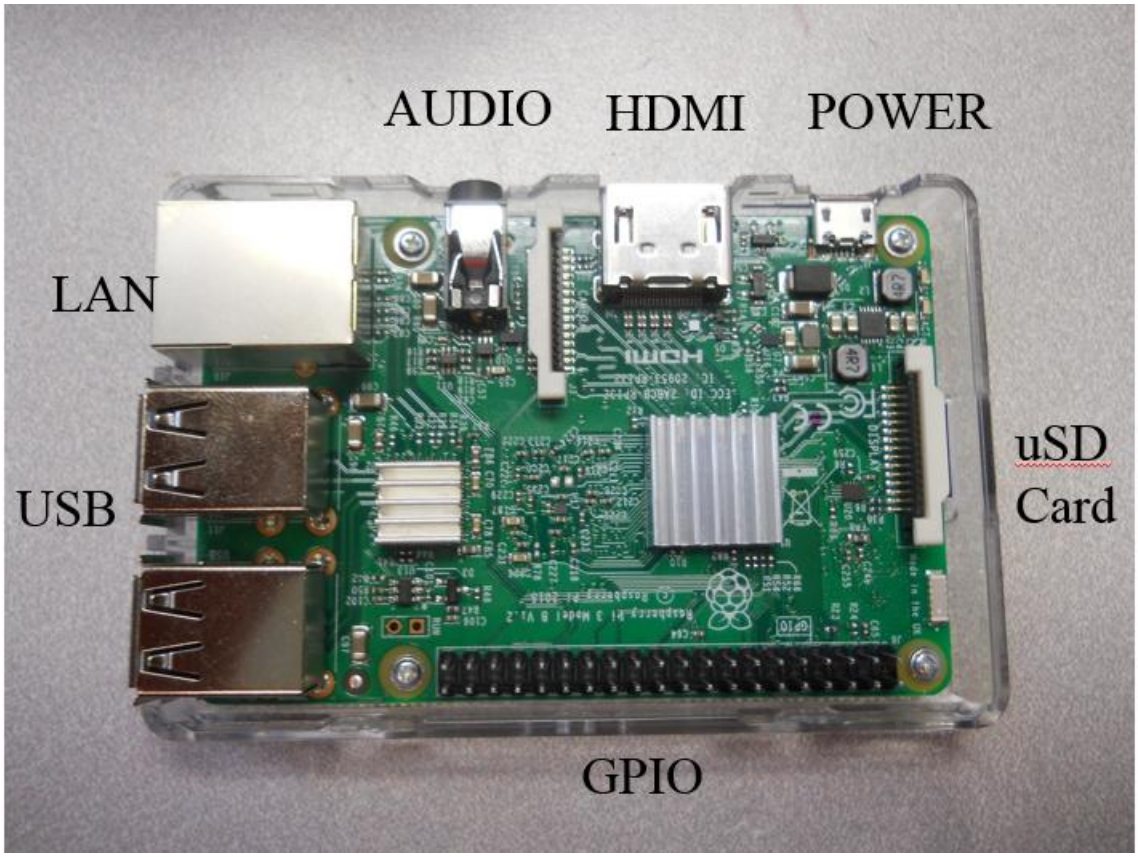
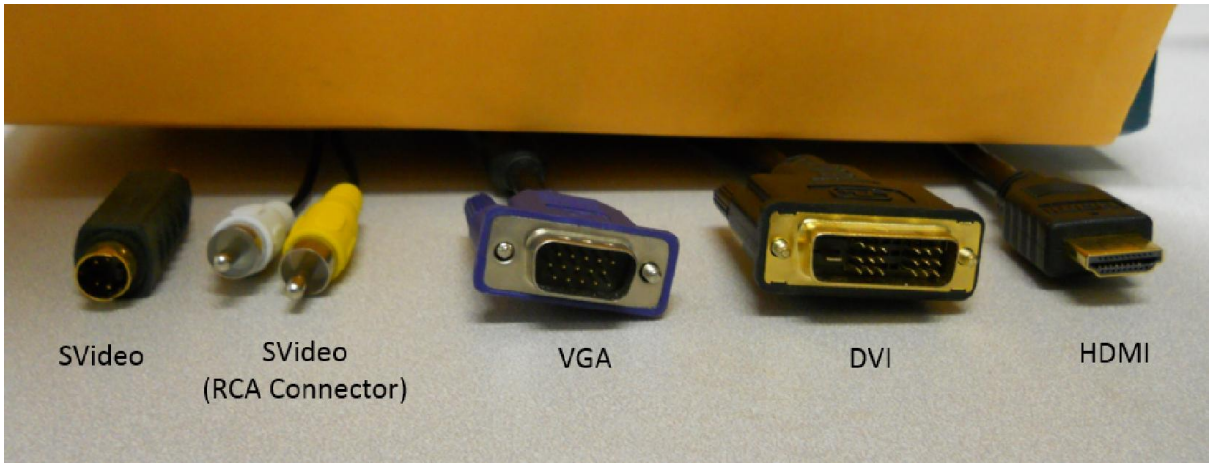
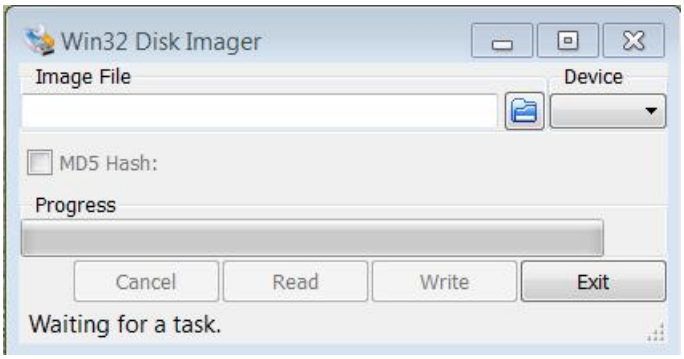
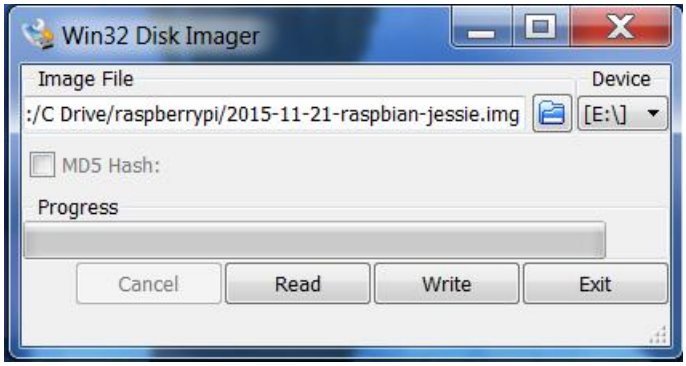
Chapter 1: Getting Started with the Raspberry Pi

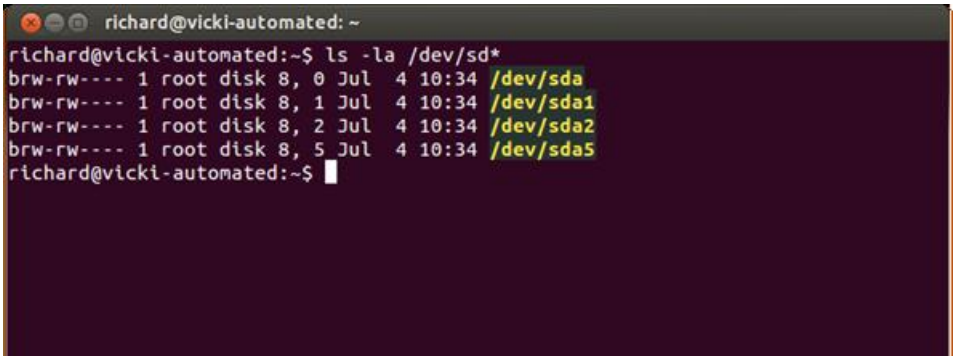


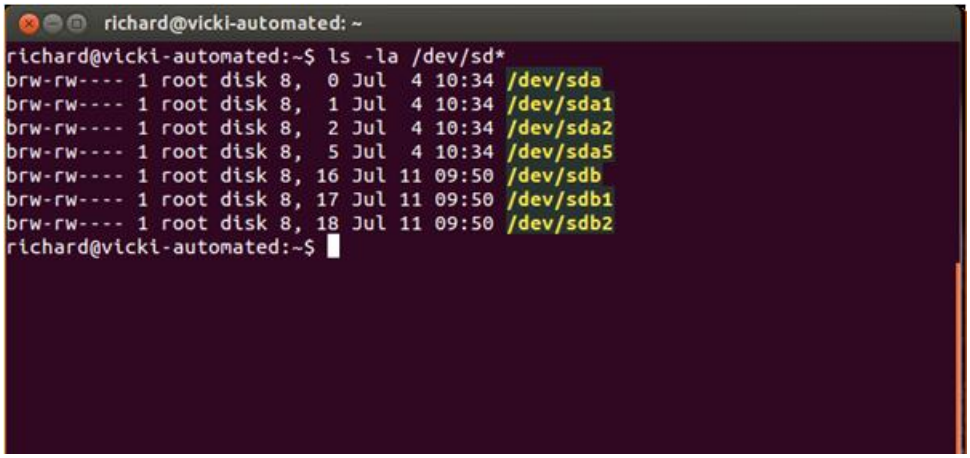

AUDIO
HDMI
POWER
LAN
USB
uSD
Card
GPIO

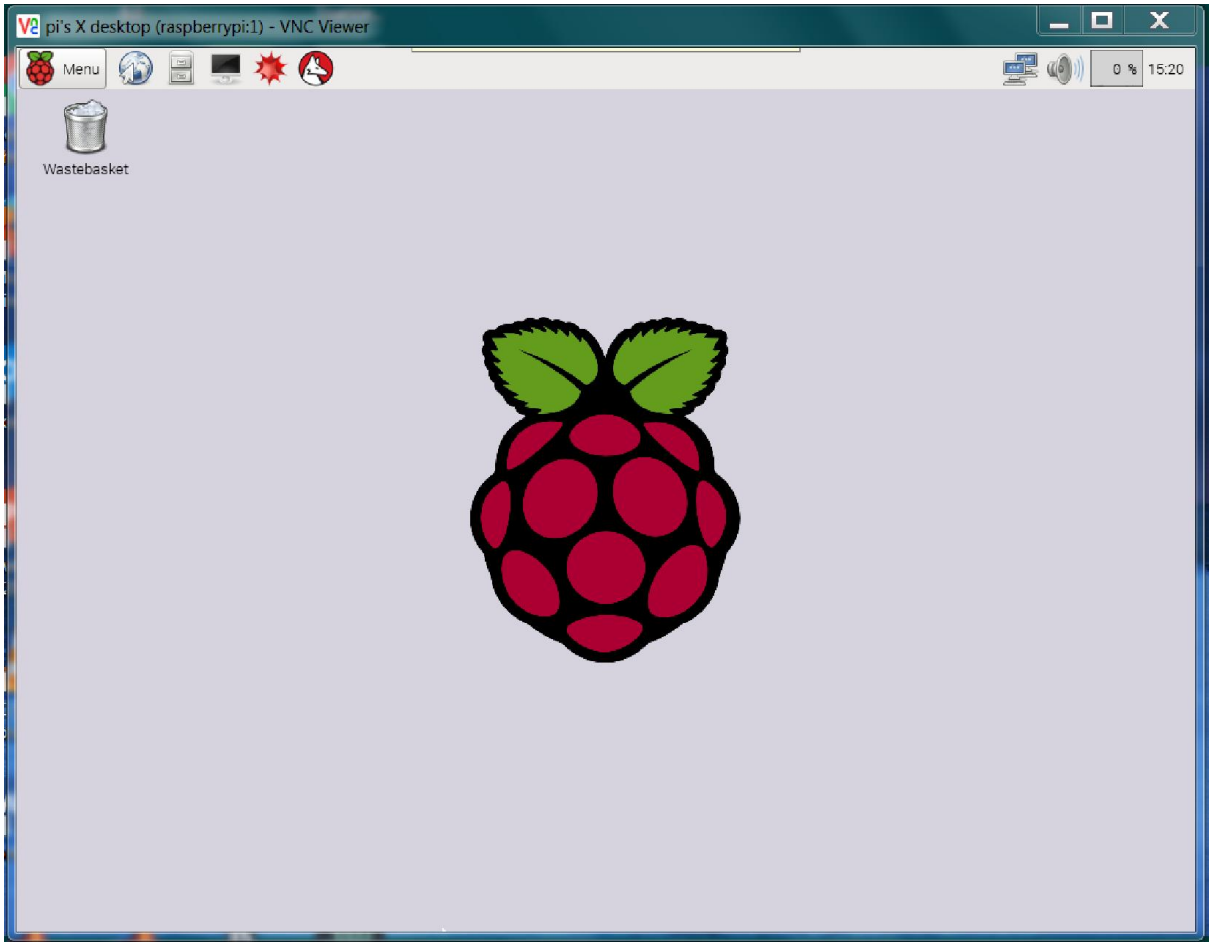

SVideo
SVideo
(RCA Connector)
VGA
DVI
HDMI

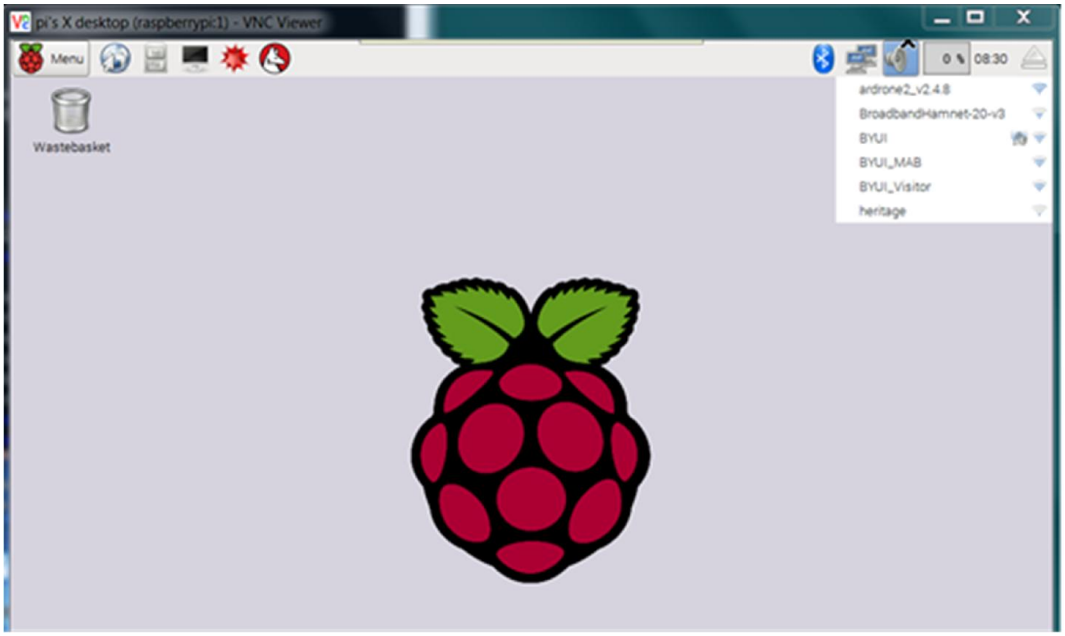

Win32 Disk Imager
Image File
Device
MD5 Hash:
Progress
Cancel
Read
Write
Exit
Waiting for a task.


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

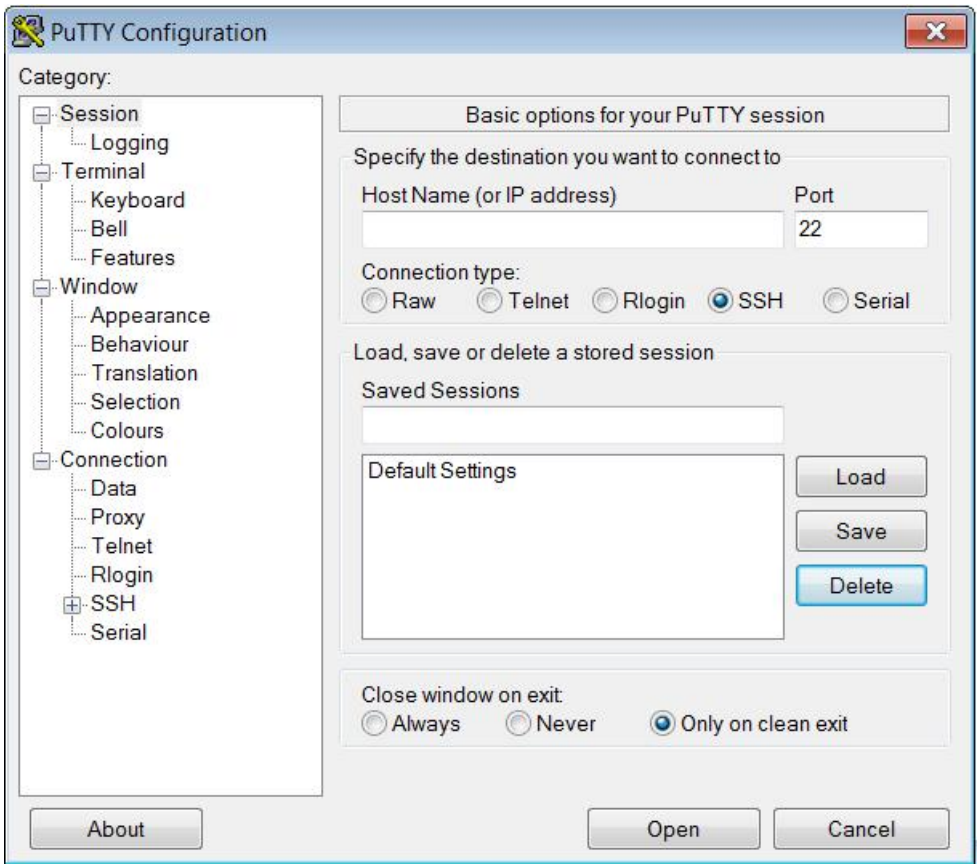

richard@vicki-automated: ~
richard@vicki-automated:~$ ls -la /dev/sd*
brw-rw---- 1 root disk 8, 0 Jul 4 10:34 /dev/sda
brw-rw---- 1 root disk 8, 1 Jul 4 10:34 /dev/sda1
brw-rw---- 1 root disk 8, 2 Jul 4 10:34 /dev/sda2
brw-rw---- 1 root disk 8, 5 Jul 4 10:34 /dev/sda5
richard@vicki-automated:~$

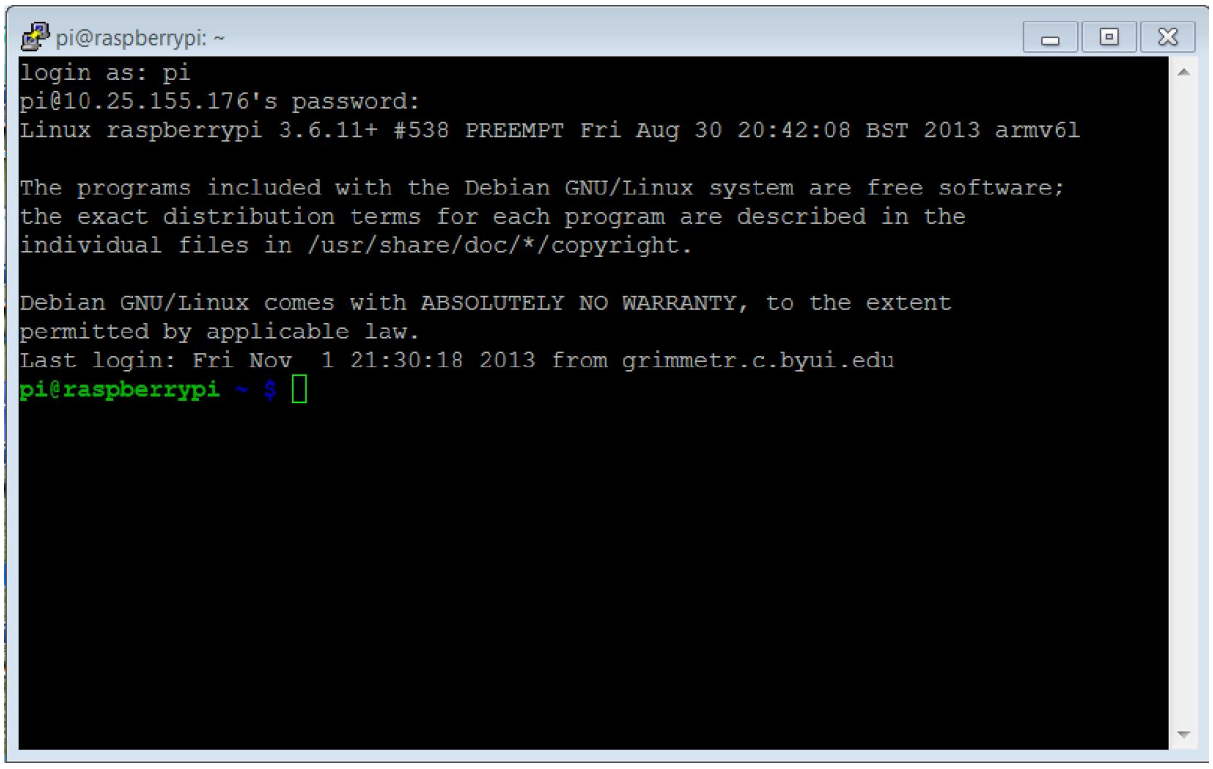

richard@vicki-automated: ~
richard@vicki-automated:~$ ls -la /dev/sd*
brw-rw---- 1 root disk 8, 0 Jul 4 10:34 /dev/sda
brw-rw---- 1 root disk 8, 1 Jul 4 10:34 /dev/sda1
brw-rw---- 1 root disk 8, 2 Jul 4 10:34 /dev/sda2
brw-rw---- 1 root disk 8, 5 Jul 4 10:34 /dev/sda5
brw-rw---- 1 root disk 8, 16 Jul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

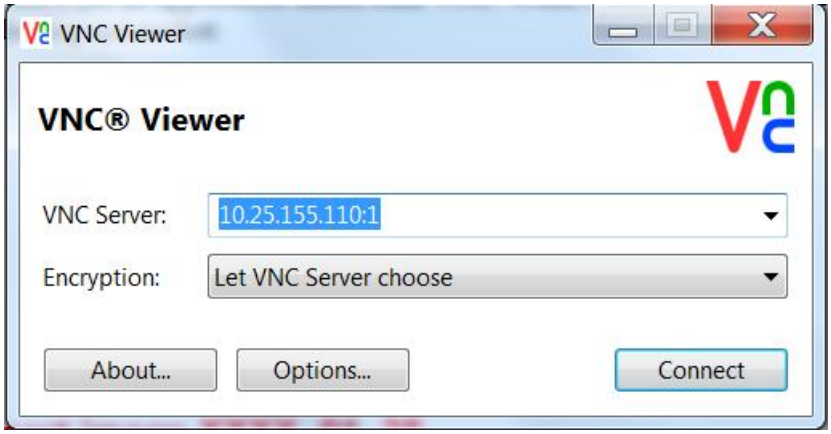

pi's X desktop (raspberrypi:1) - VNC Viewer
Menu
0 %
15:20
Wastebasket

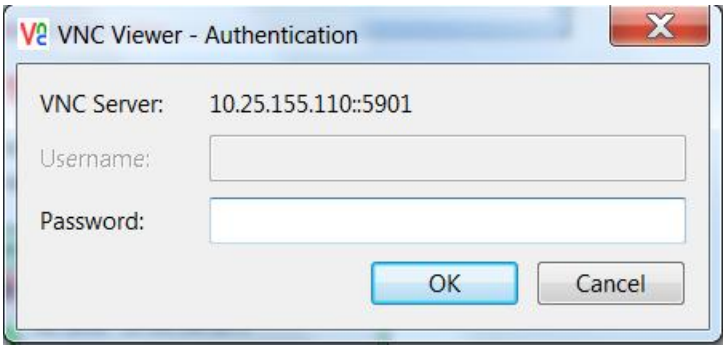


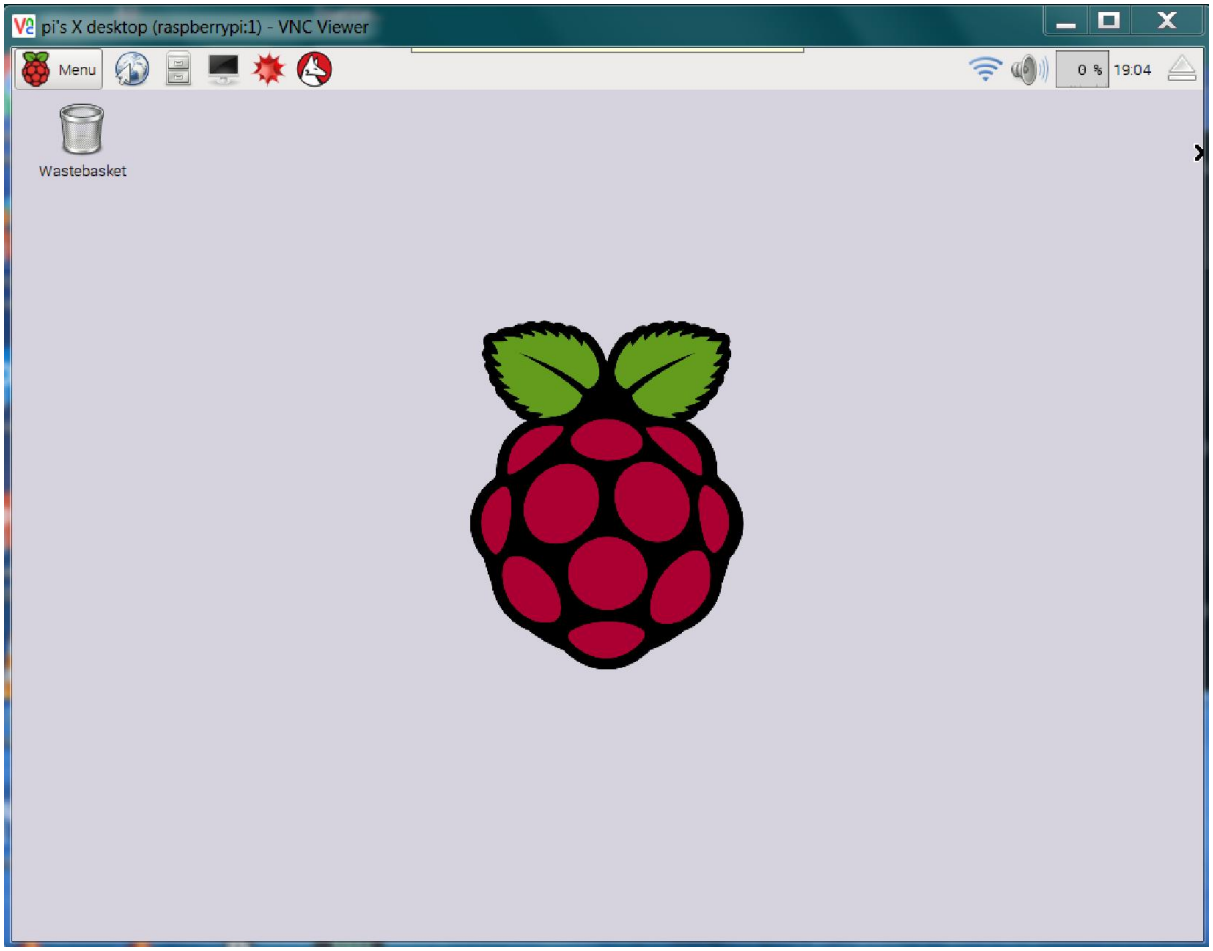

```
pi@raspberrypi: ~
pi@raspberrypi:~ $ ifconfig
eth0      Link encap:Ethernet  HWaddr b8:27:eb:ec:05:da
          inet addr:157.201.194.147  Bcast:157.201.194.255  Mask:255.255.255.128
          inet6 addr: fe80::ff0b:9233:b29a:98c3/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:264 errors:0 dropped:1 overruns:0 frame:0
          TX packets:190 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:20530 (20.0 KiB)  TX bytes:29619 (28.9 KiB)

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:1
          RX bytes:16656 (16.2 KiB)  TX bytes:16656 (16.2 KiB)

wlan0     Link encap:Ethernet  HWaddr b8:27:eb:b9:50:8f
          inet6 addr: fe80::11da:388a:ed27:cda/64 Scope:Link
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:131 errors:0 dropped:131 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:47871 (46.7 KiB)  TX bytes:0 (0.0 B)

pi@raspberrypi:~ $
```

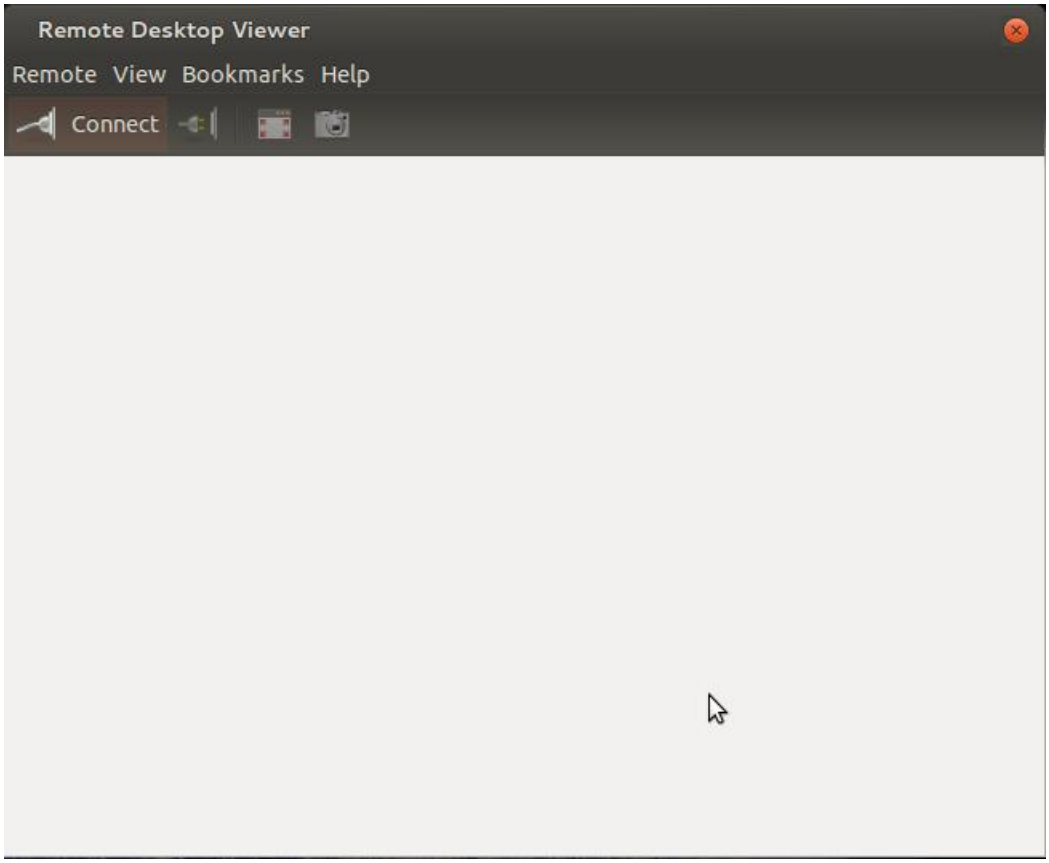

PuTTY Configuration
Category:
Session
Logging
Terminal
Keyboard
Bell
Features
Window
Appearance
Behaviour
Translation
Selection
Colours
Connection
Data
Proxy
Telnet
Rlogin
SSH
Serial
Basic options for your PuTTY session
Specify the destination you want to connect to
Host Name (or IP address)
Port
22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

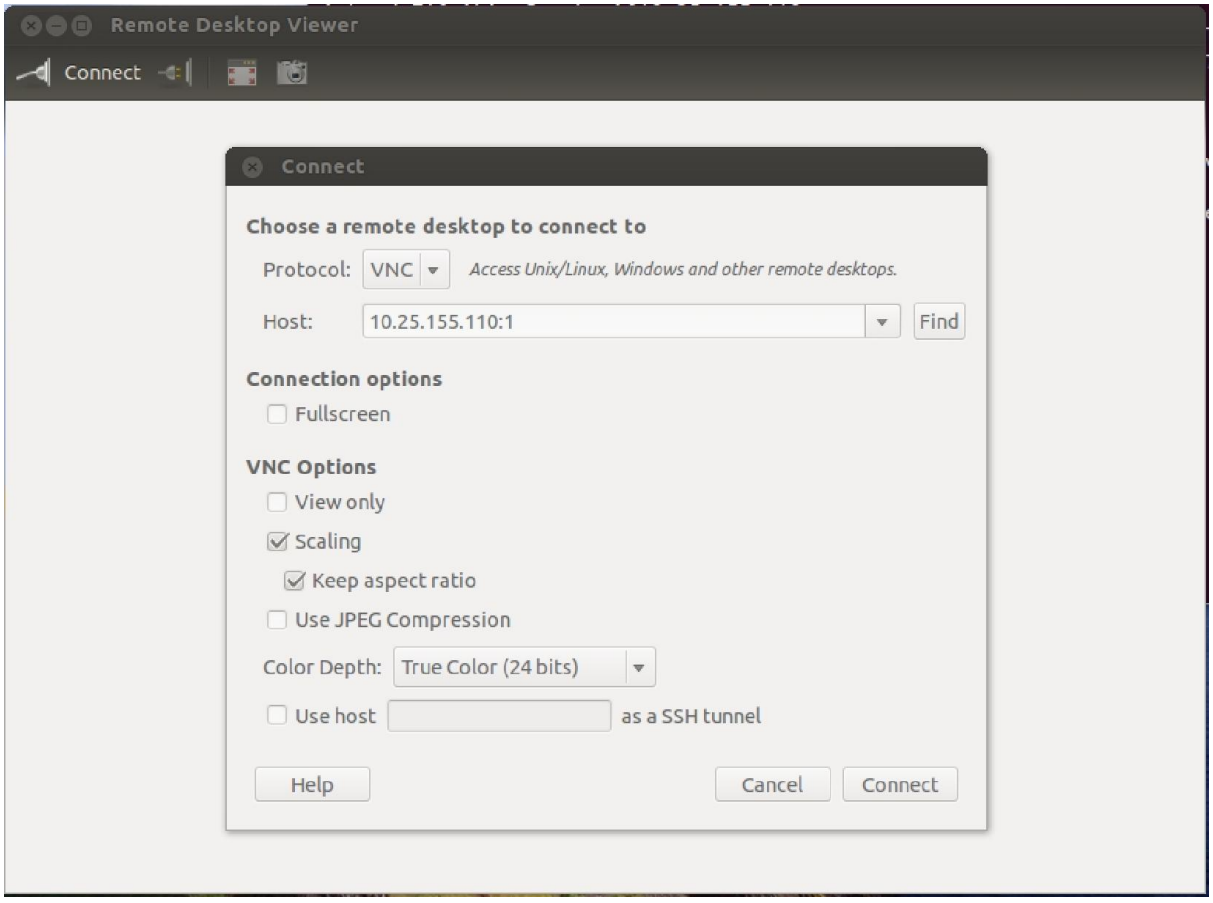

pi@raspberrypi: ~
login as: pi
pi@10.25.155.176's password:
Linux raspberrypi 3.6.11+ #538 PREEMPT Fri Aug 30 20:42:08 BST 2013 armv6l
The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.
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 ~ $

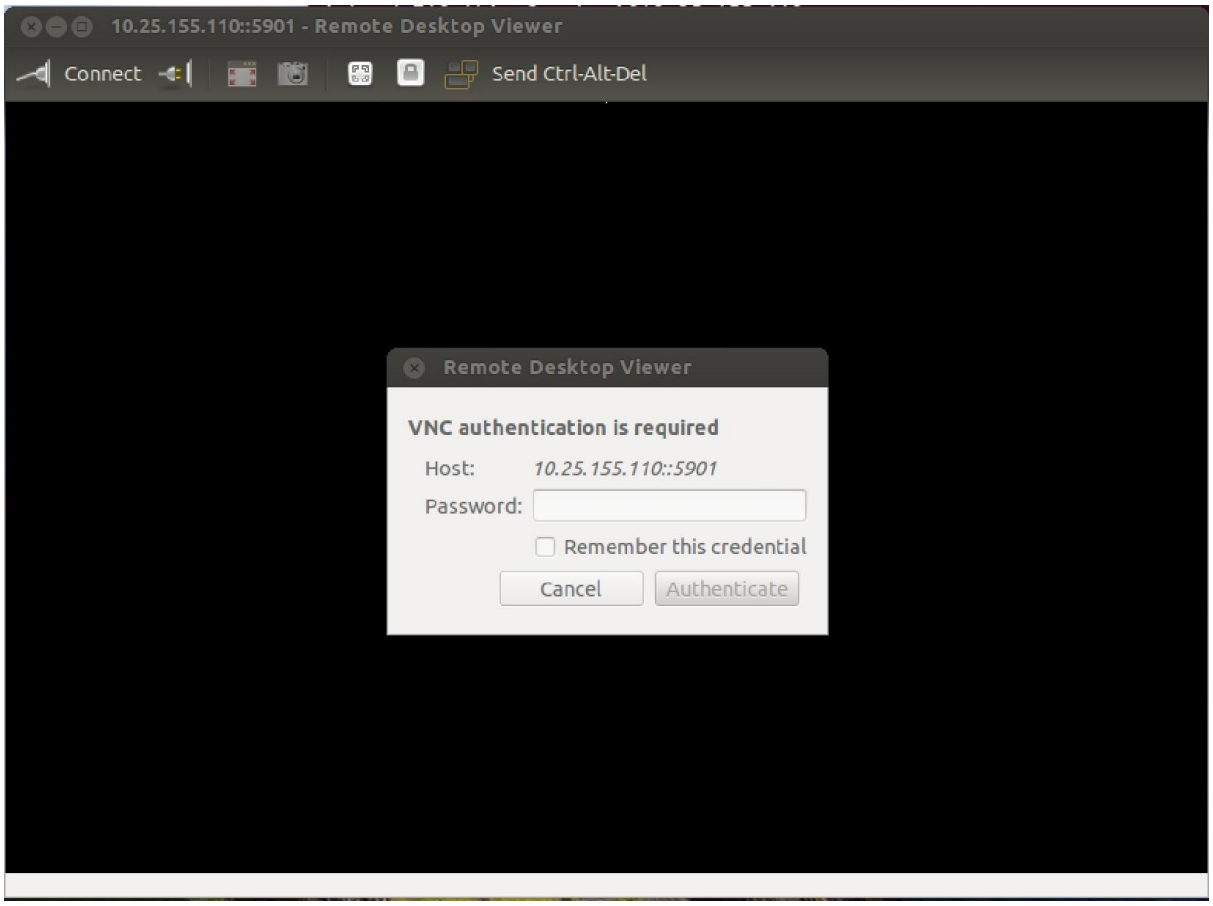

VNC Viewer
VNC® Viewer
VNC Server:
10.25.155.110:1
Encryption:
Let VNC Server choose
About...
Options...
Connect

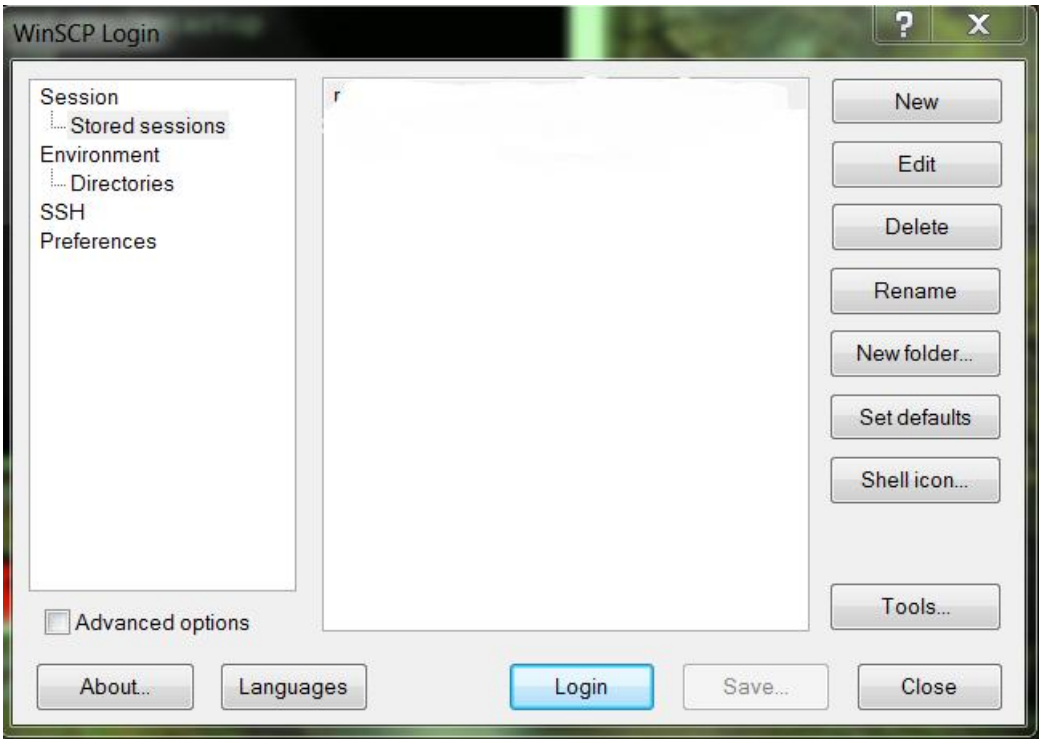

VNC Viewer - Authentication
VNC Server:
10.25.155.110::5901
Username:
Password:
OK
Cancel

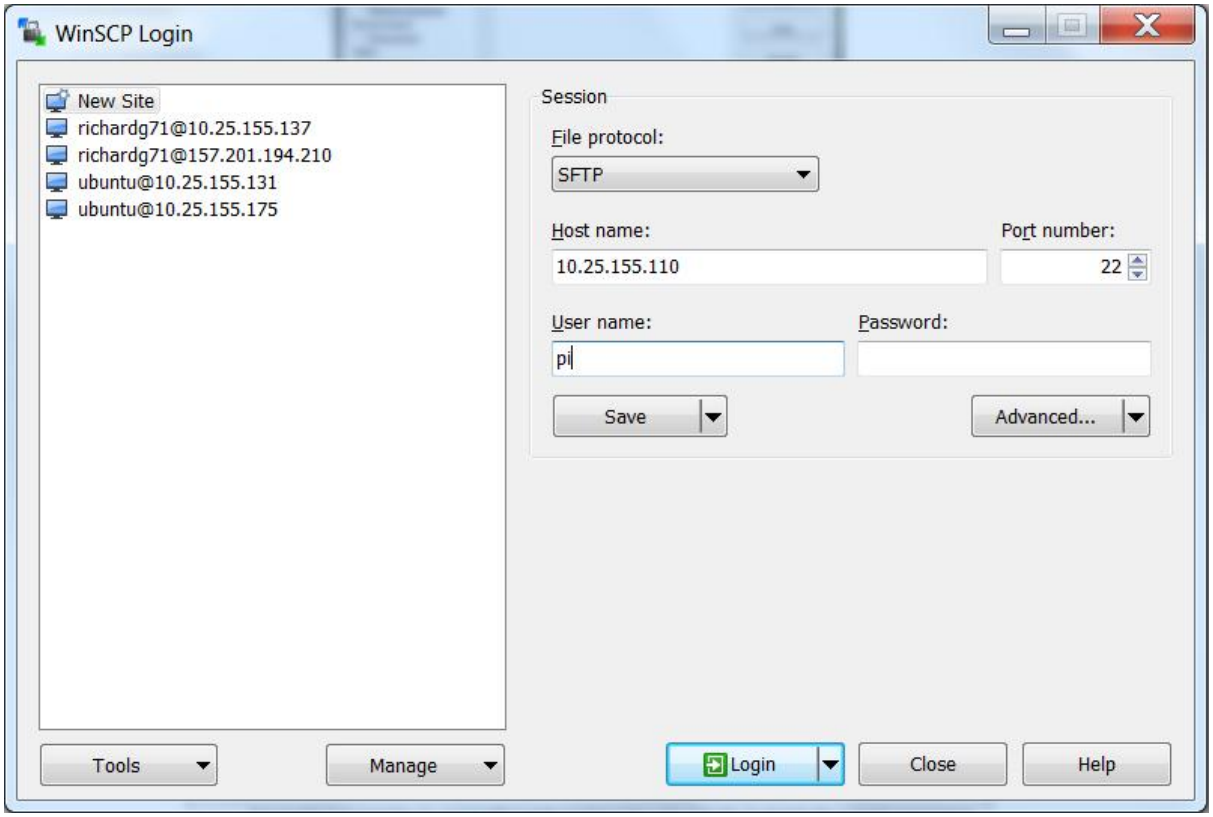

pi's X desktop (raspberrypi:1) - VNC Viewer
Menu
0 %
19:04
Wastebasket

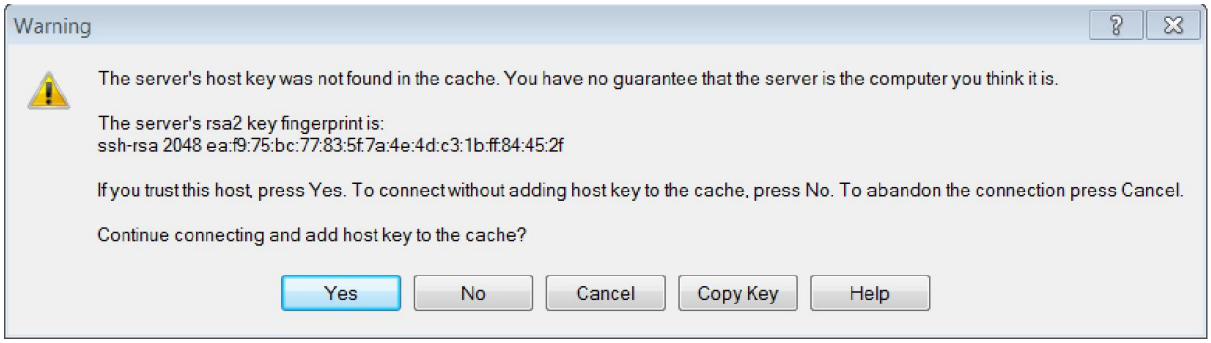

Remote Desktop Viewer
Remote View Bookmarks Help
Connect

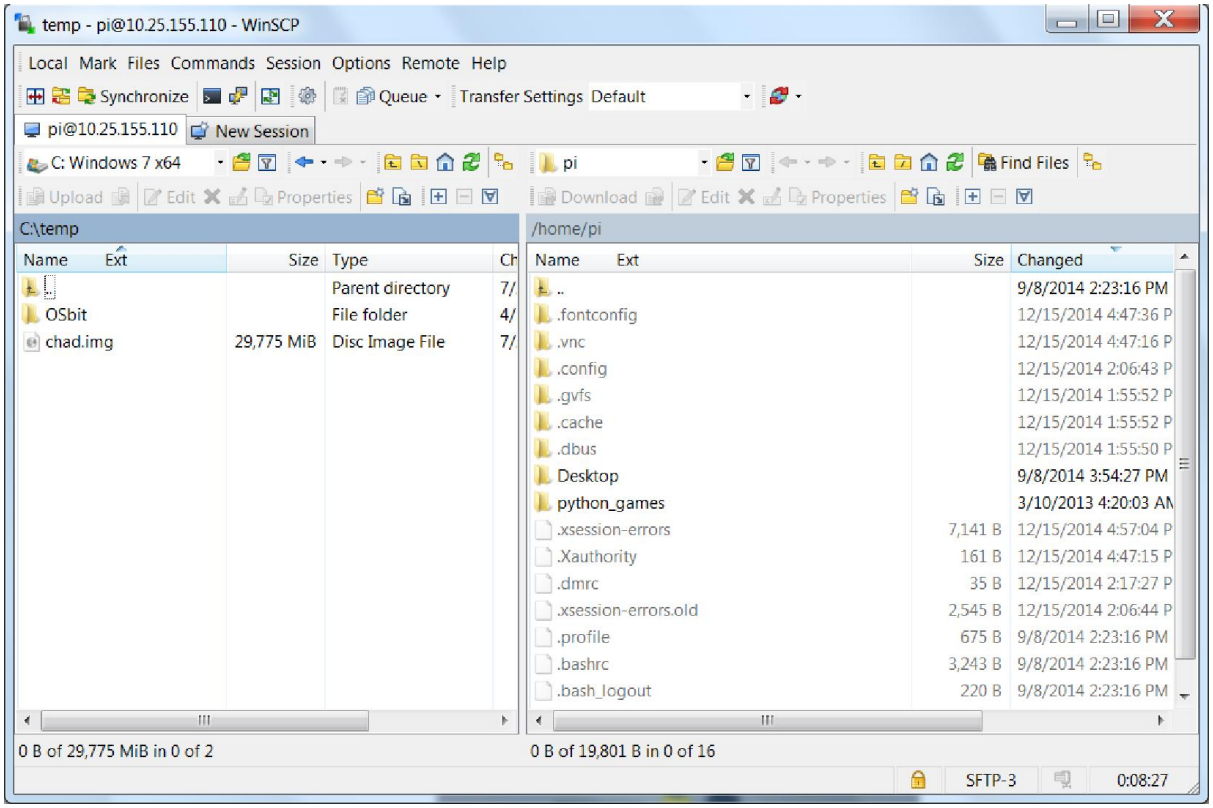

Remote Desktop Viewer
Connect
Connect
Choose a remote desktop to connect to
Protocol: VNC
Access Unix/Linux, Windows and other remote desktops.
Host: 10.25.155.110:1
Find
Connection options
Fullscreen
VNC Options
View only
Scaling
Keep aspect ratio
Use JPEG Compression
Color Depth: True Color (24 bits)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

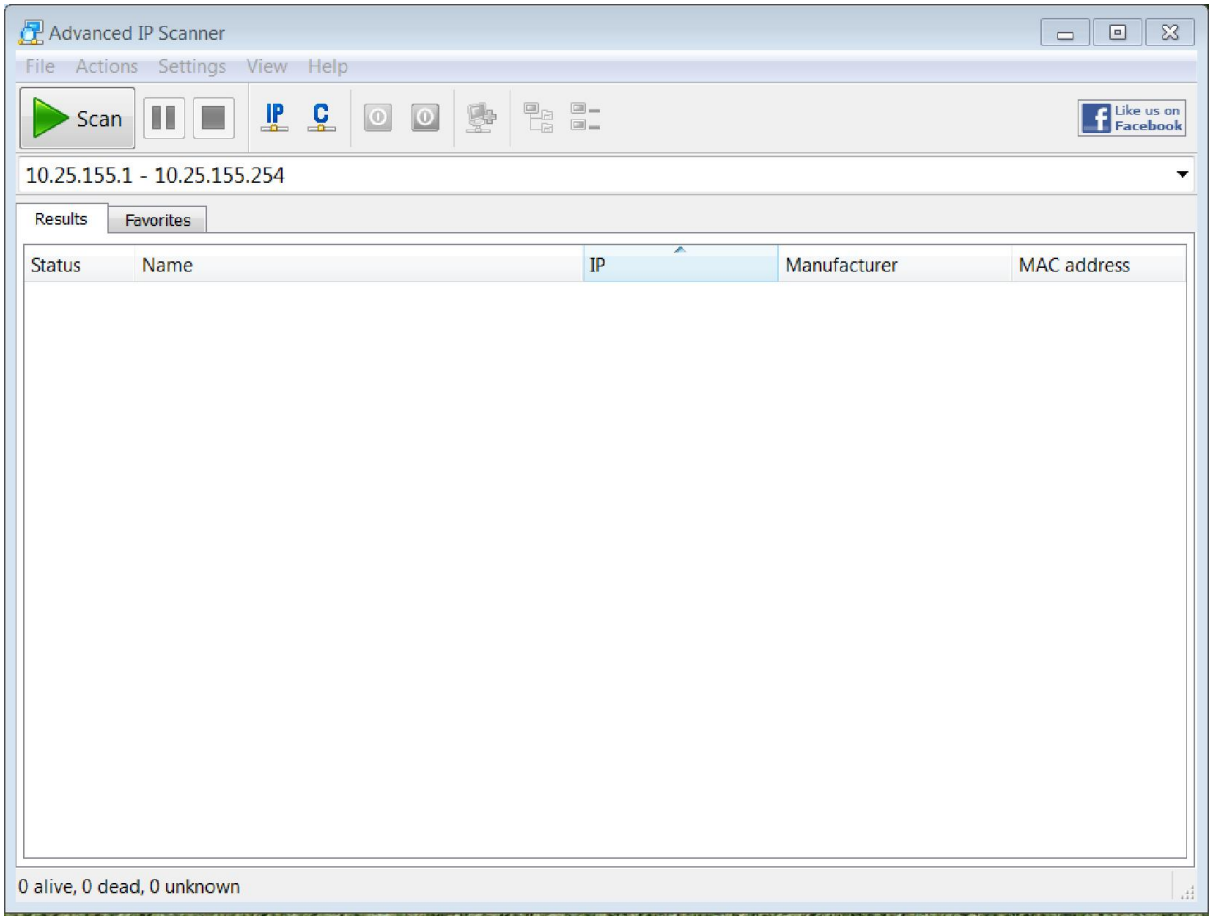

10.25.155.110::5901 - Remote Desktop Viewer
Connect
Send Ctrl-Alt-Del
Remote Desktop Viewer
VNC authentication is required
Host: 10.25.155.110::5901
Password:
Remember this credential
Cancel
Authenticate

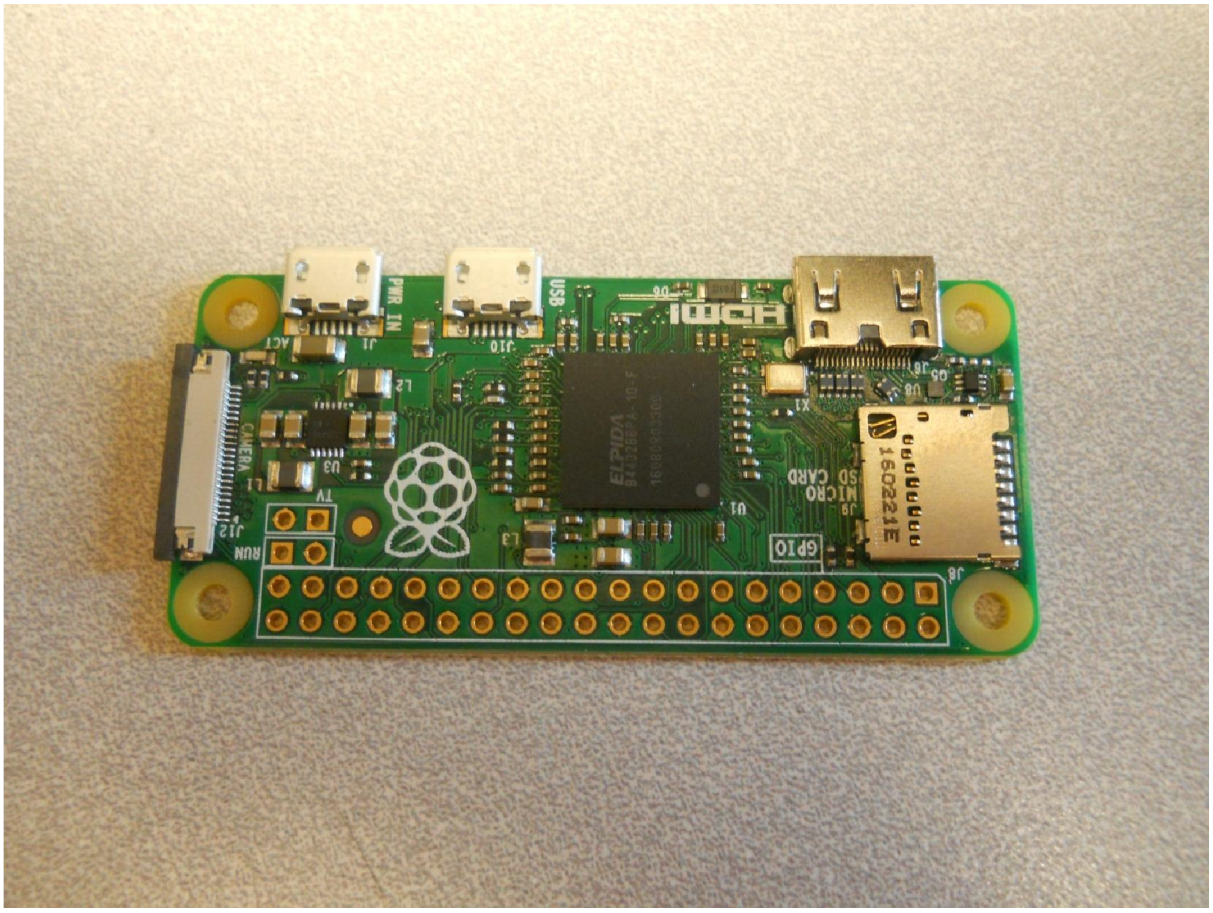

WinSCP Login
Session
Stored sessions
Environment
Directories
SSH
Preferences
New
Edit
Delete
Rename
New folder...
Set defaults
Shell icon...
Tools...
Advanced options
About...
Languages
Login
Save...
Close

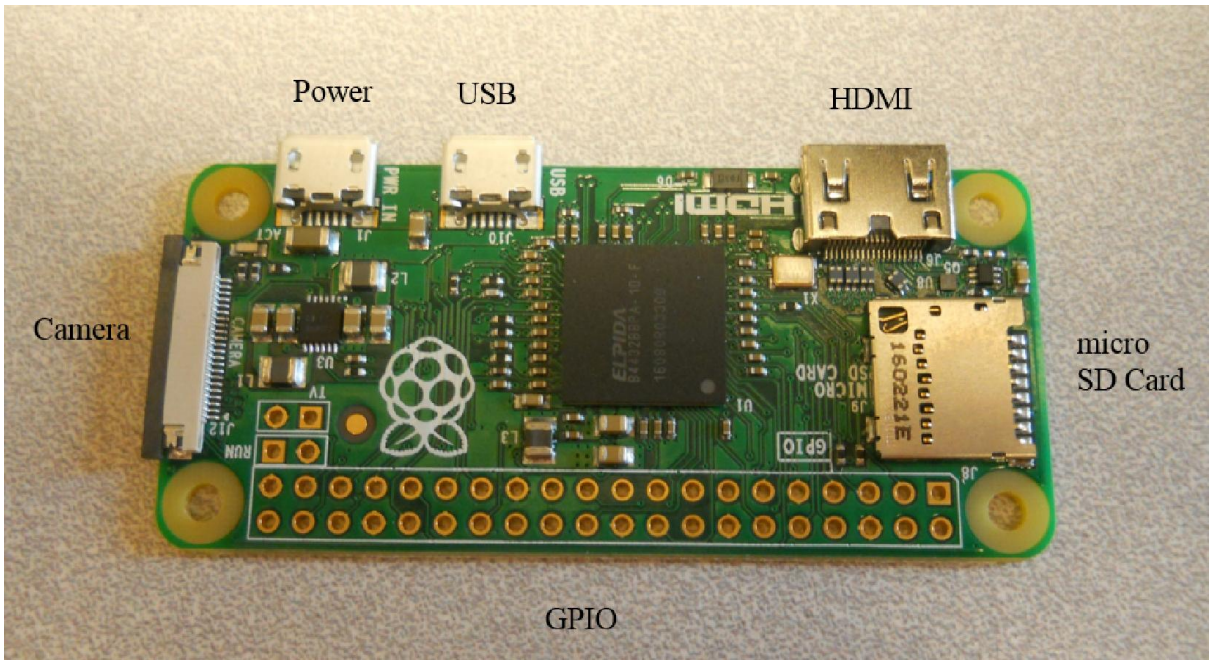

WinSCP Login
New Site
richardg71@10.25.155.137
richardg71@157.201.194.210
ubuntu@10.25.155.131
ubuntu@10.25.155.175
Session
File protocol:
SFTP
Host name:
Port number:
10.25.155.110
22
User name:
Password:
pi
Save
Advanced...
Tools
Manage
Login
Close
Help

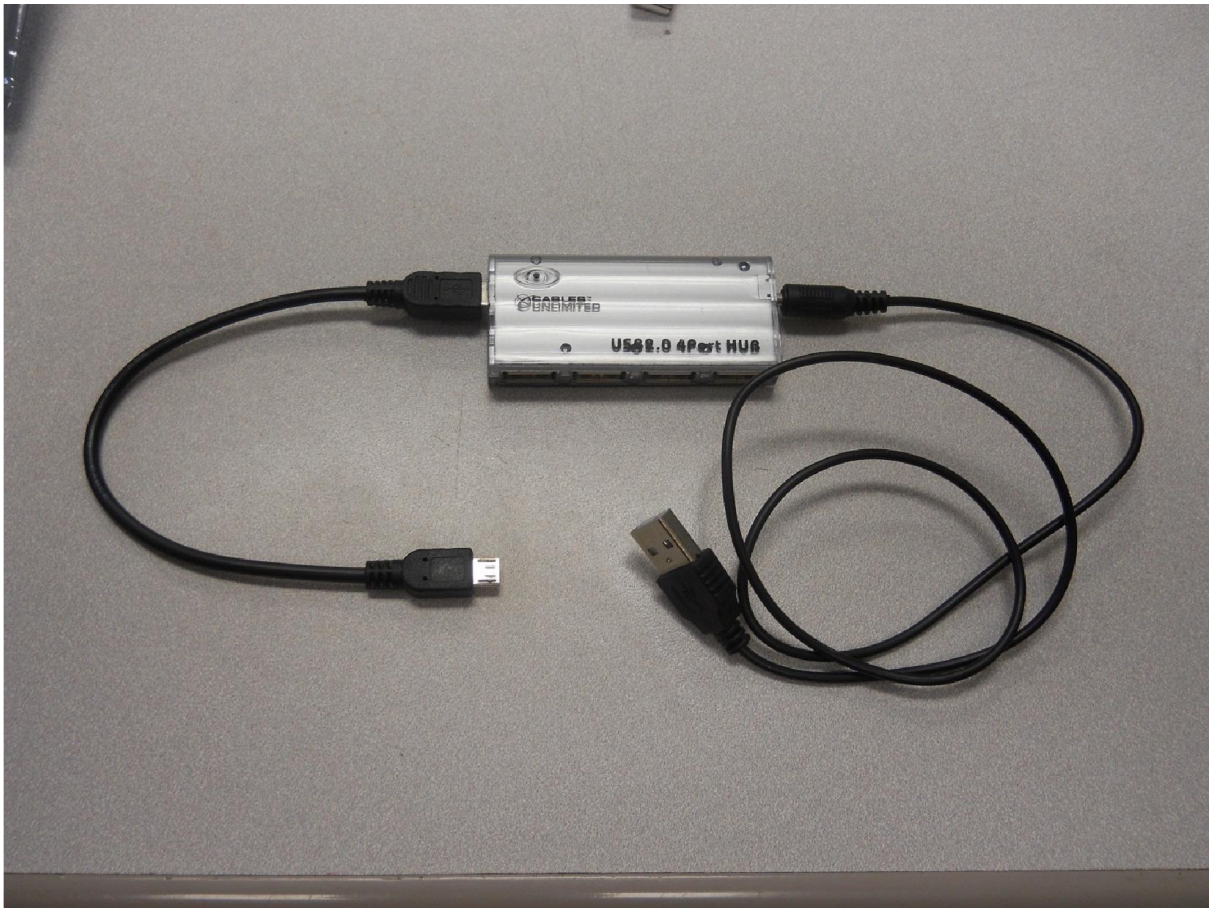

Warning
The server's host key was not found in the cache. You have no guarantee that the server is the computer you think it is.
The server's rsa2 key fingerprint is:
ssh-rsa 2048 ea:f9:75:bc:77:83:5f:7a:4e:4d:c3:1b:ff:84:45:2f
If you trust this host, press Yes. To connect without adding host key to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

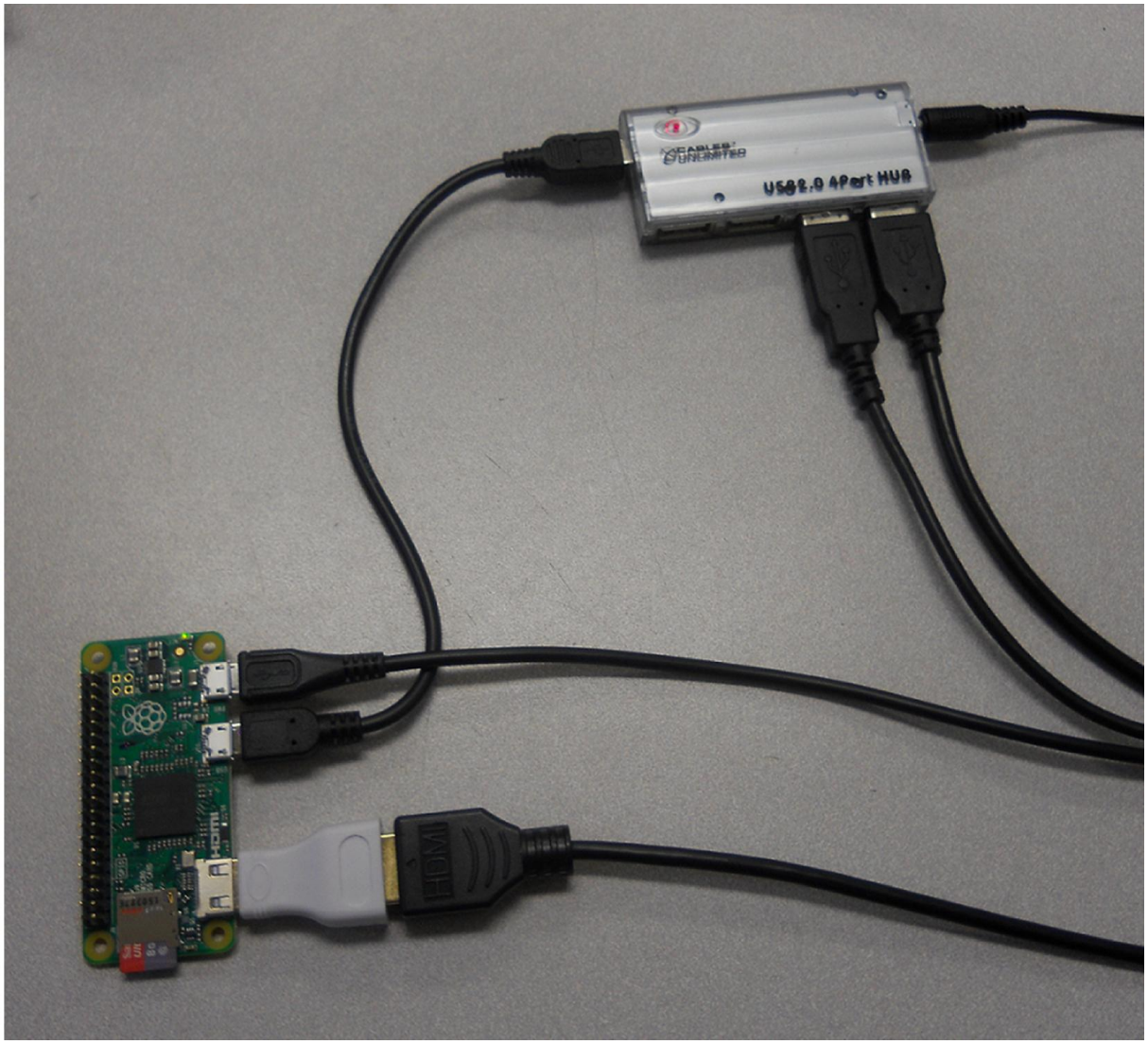

temp - pi@10.25.155.110 - WinSCP
Local Mark Files Commands Session Options Remote Help
Synchronize
Queue
Transfer Settings Default
pi@10.25.155.110
New Session
C: Windows 7 x64
pi
Find Files
Upload
Edit
Properties
Download
Edit
Properties
C:\temp
/home/pi
Name Ext Size Type Ch
Parent directory 7/
OSbit File folder 4/
chad.img 29,775 MiB Disc Image File 7/
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

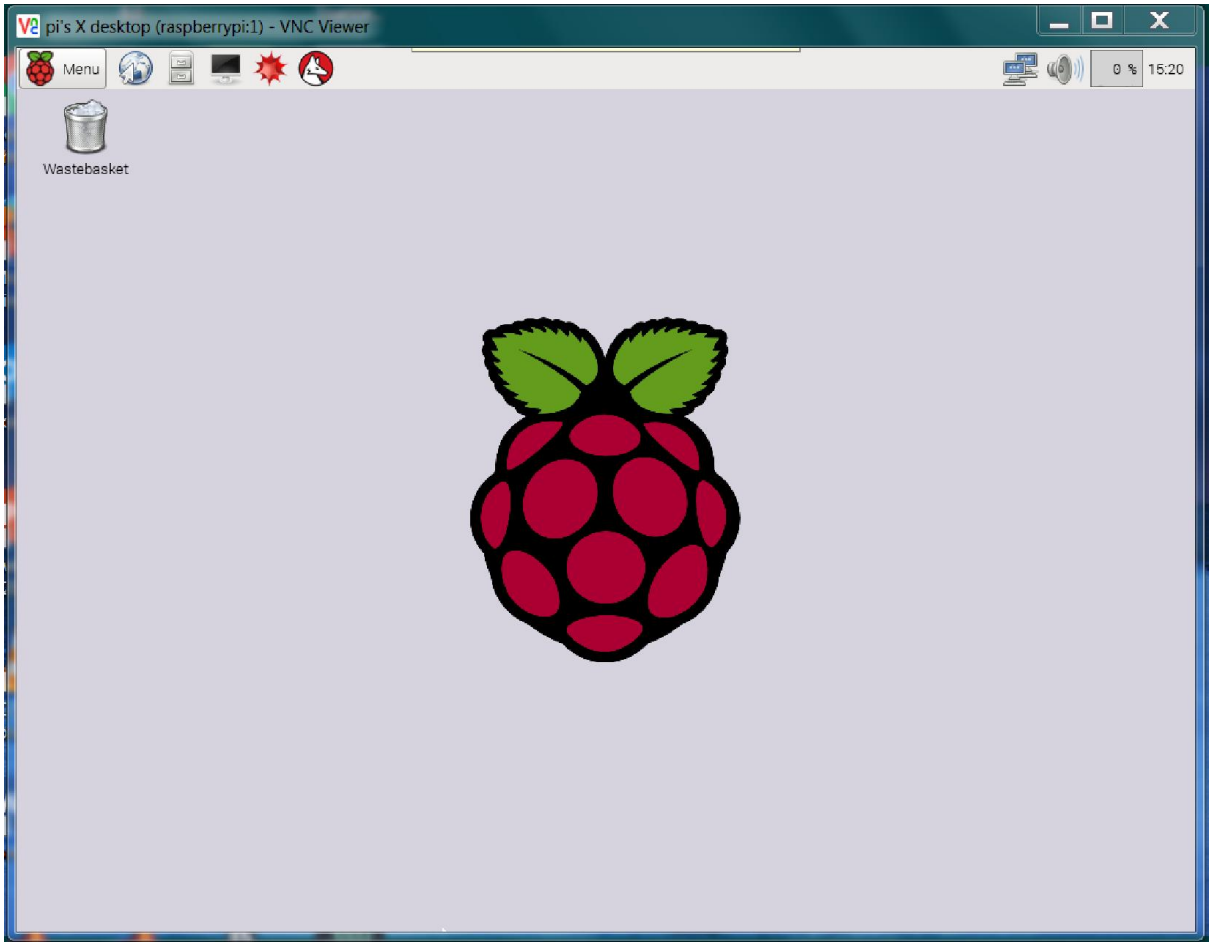

Advanced IP Scanner
File Actions Settings View Help
Scan
Like us on Facebook
10.25.155.1 - 10.25.155.254
Results
Favorites
Status Name IP Manufacturer MAC address
0 alive, 0 dead, 0 unknown



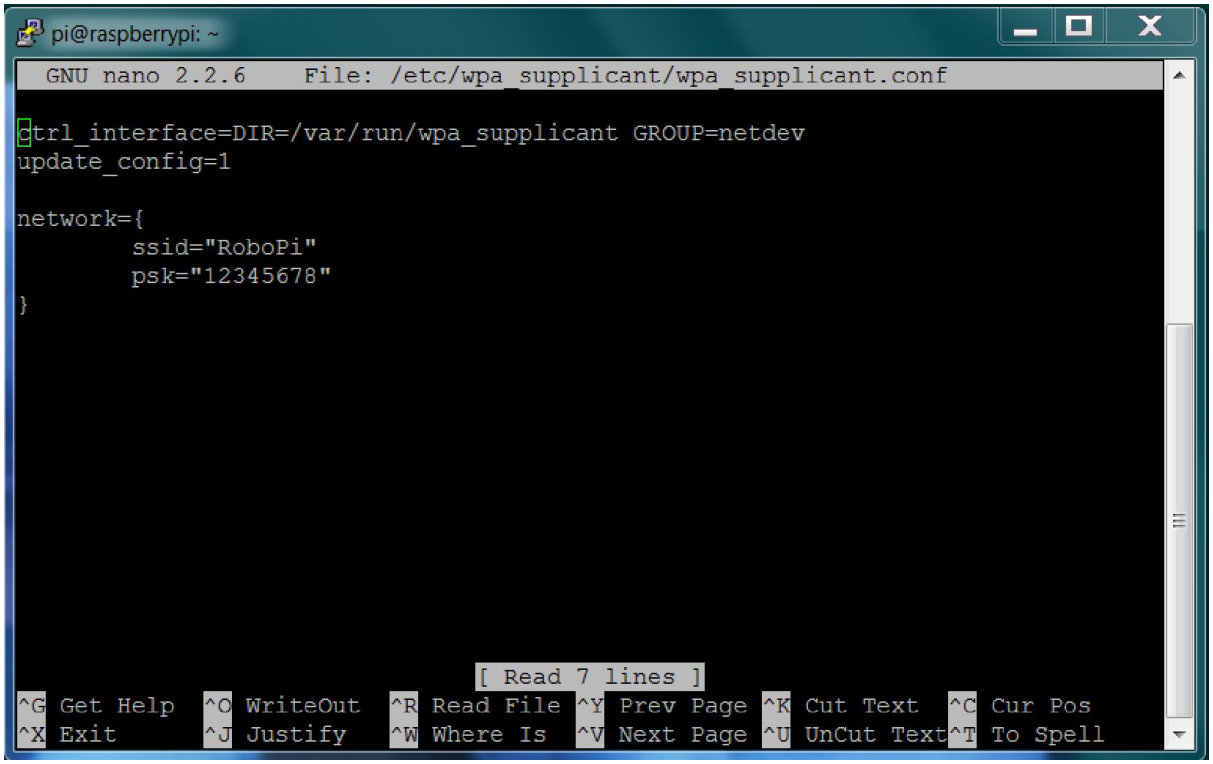

Power
USB
HDMI
Camera
micro
SD Card
GPIO

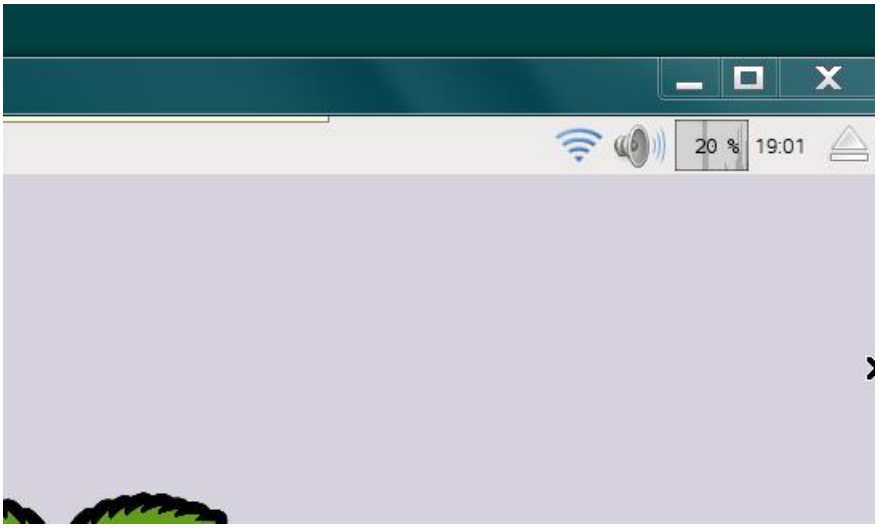

CABLES UNLIMITED
USB 2.0 4Port HUB


USB2.0 4Port HUB
HDMI

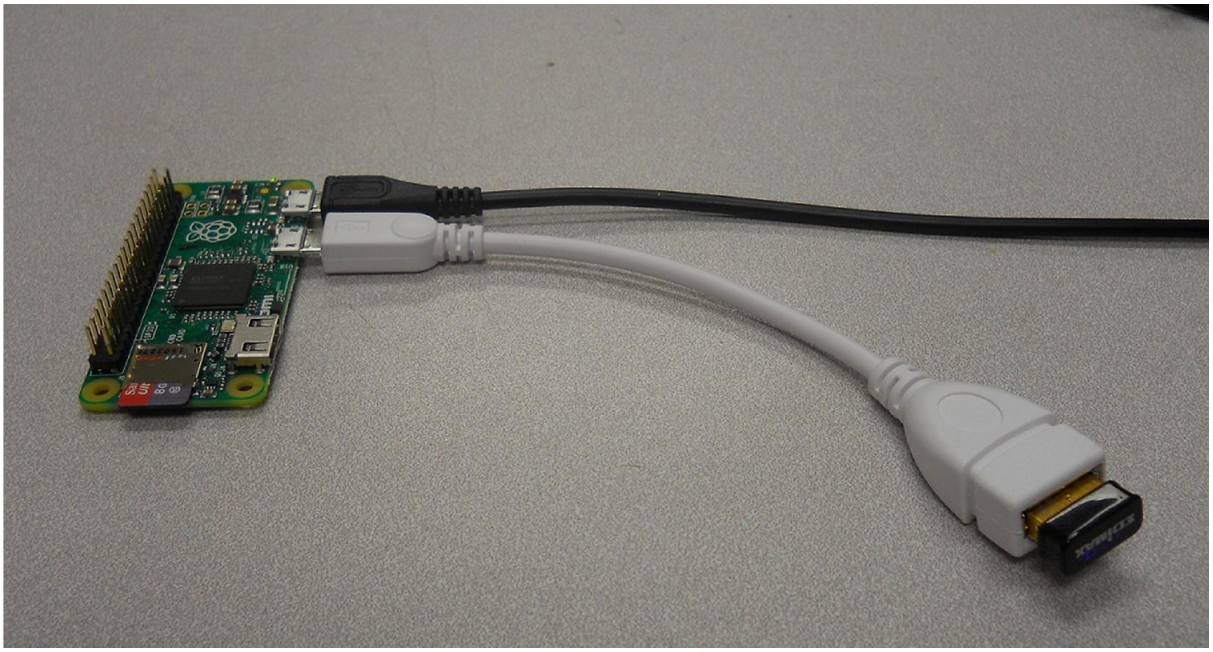

pi's X desktop (raspberrypi:1) - VNC Viewer
Menu
0 %
15:20
Wastebasket


EDIMAX


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

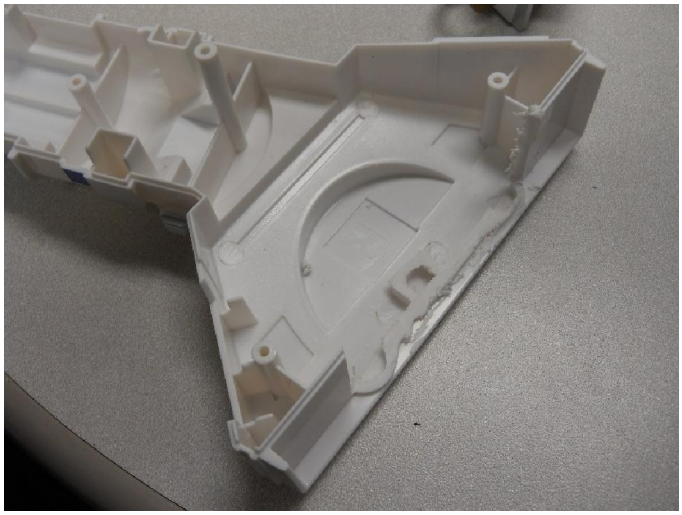

20 %
19:01

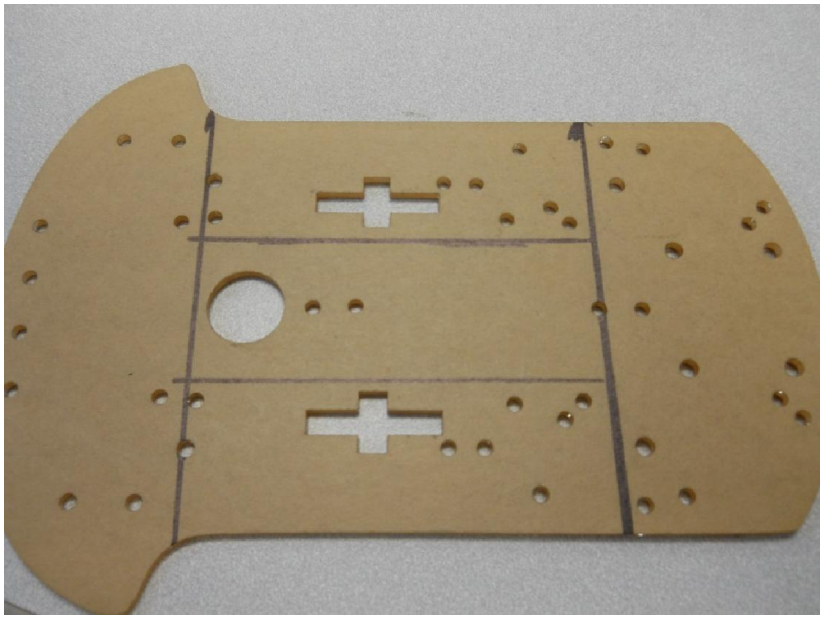

SABRENT

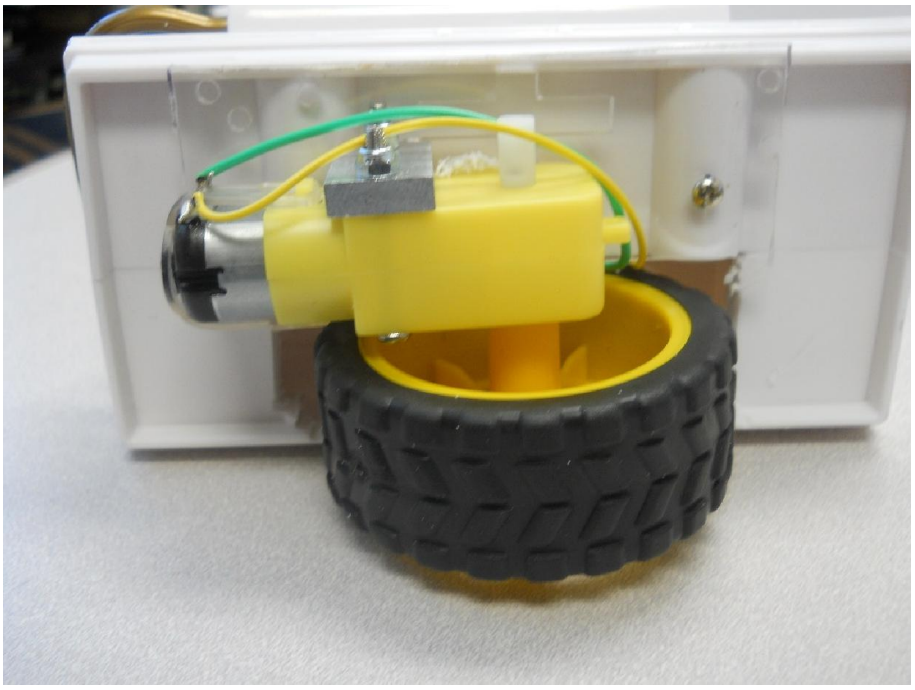


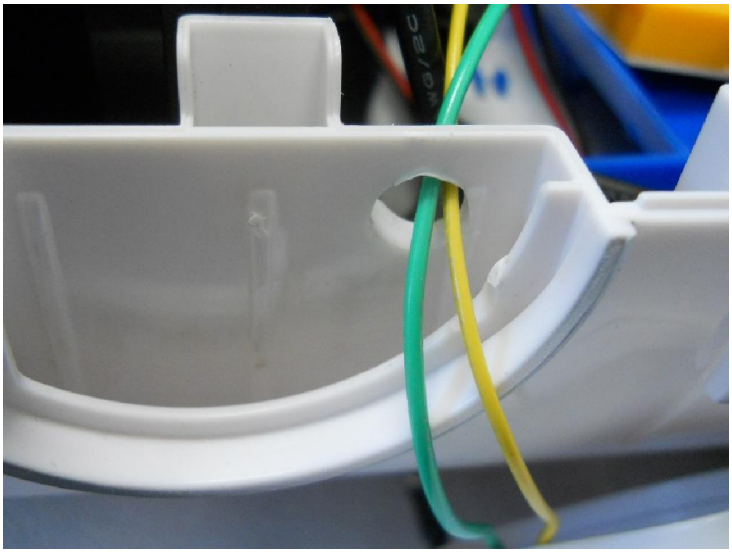
Chapter 2: Building Your Own Futuristic Robot


FORWARD

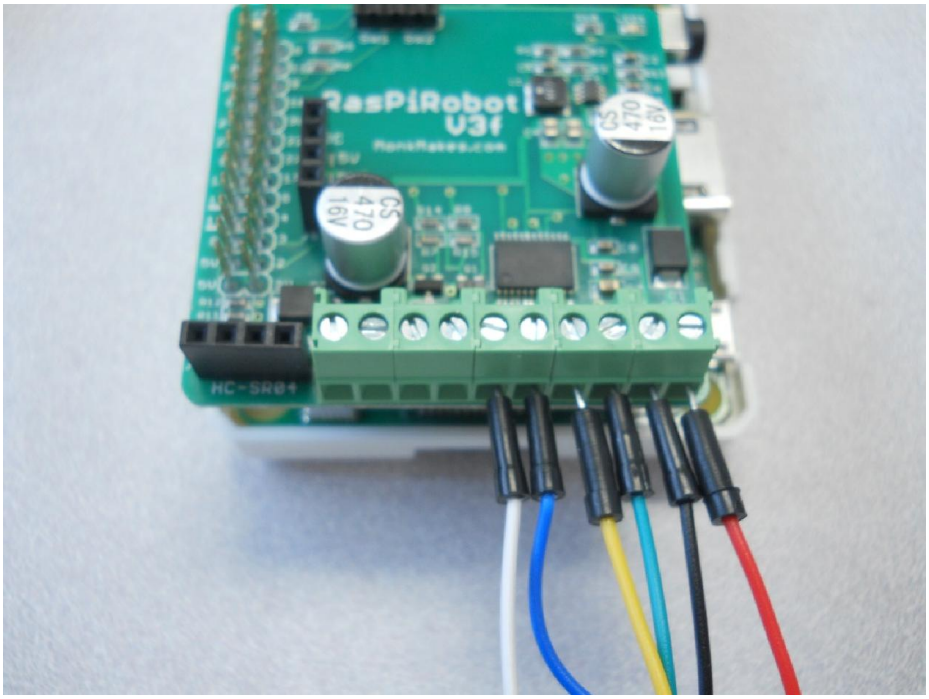


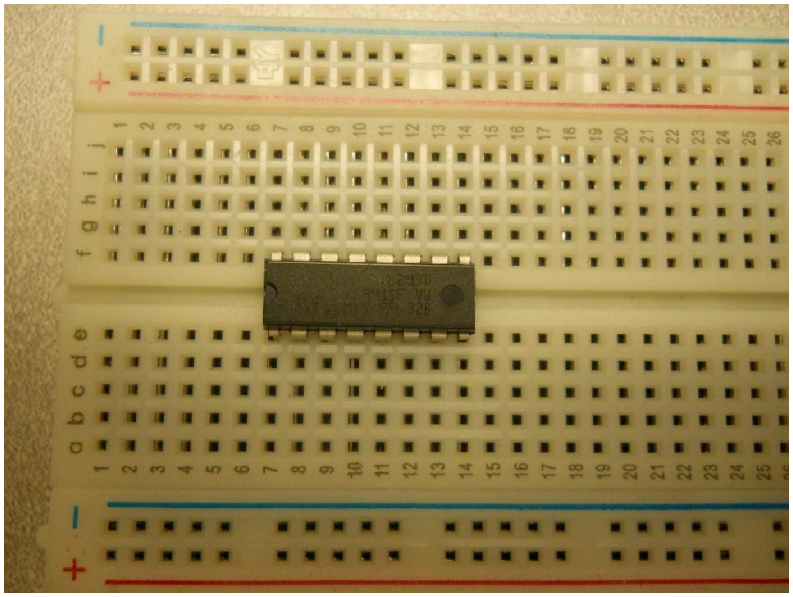


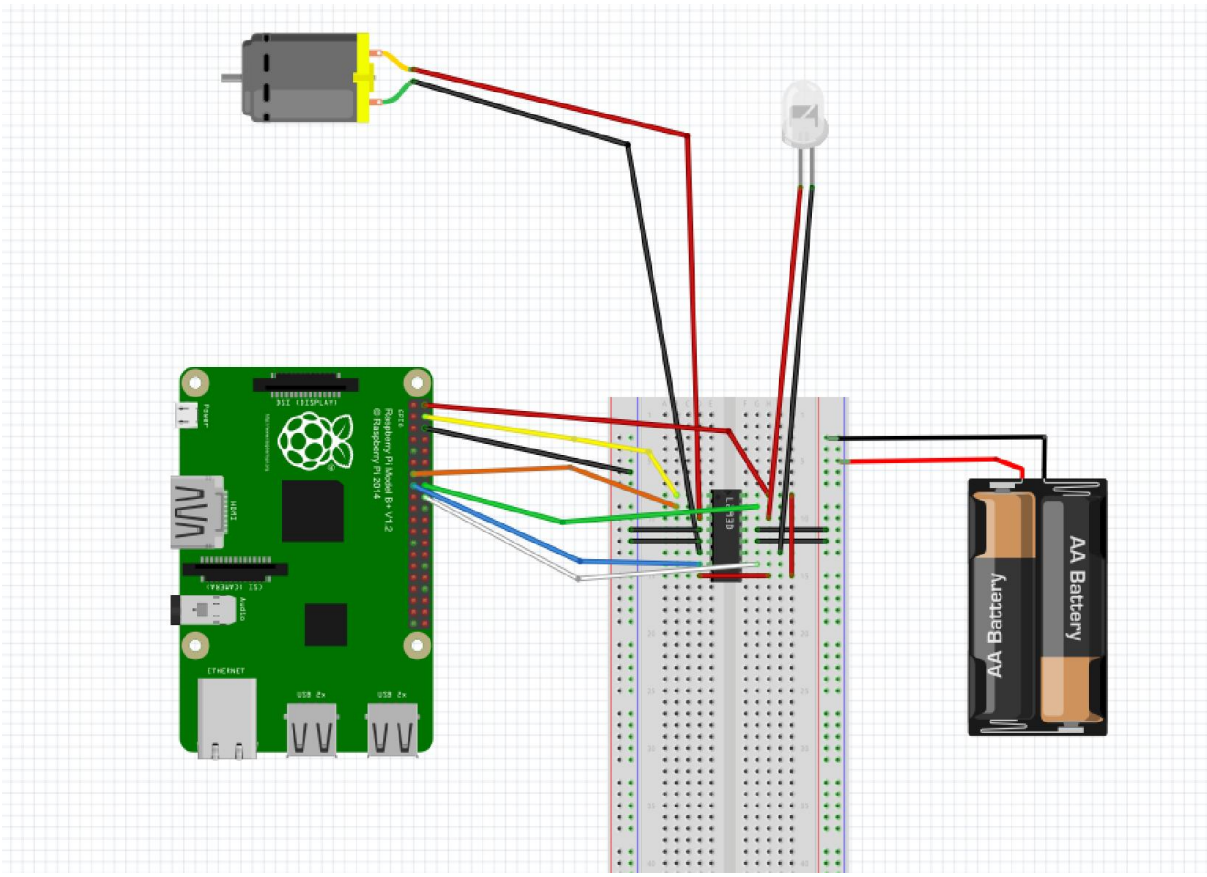




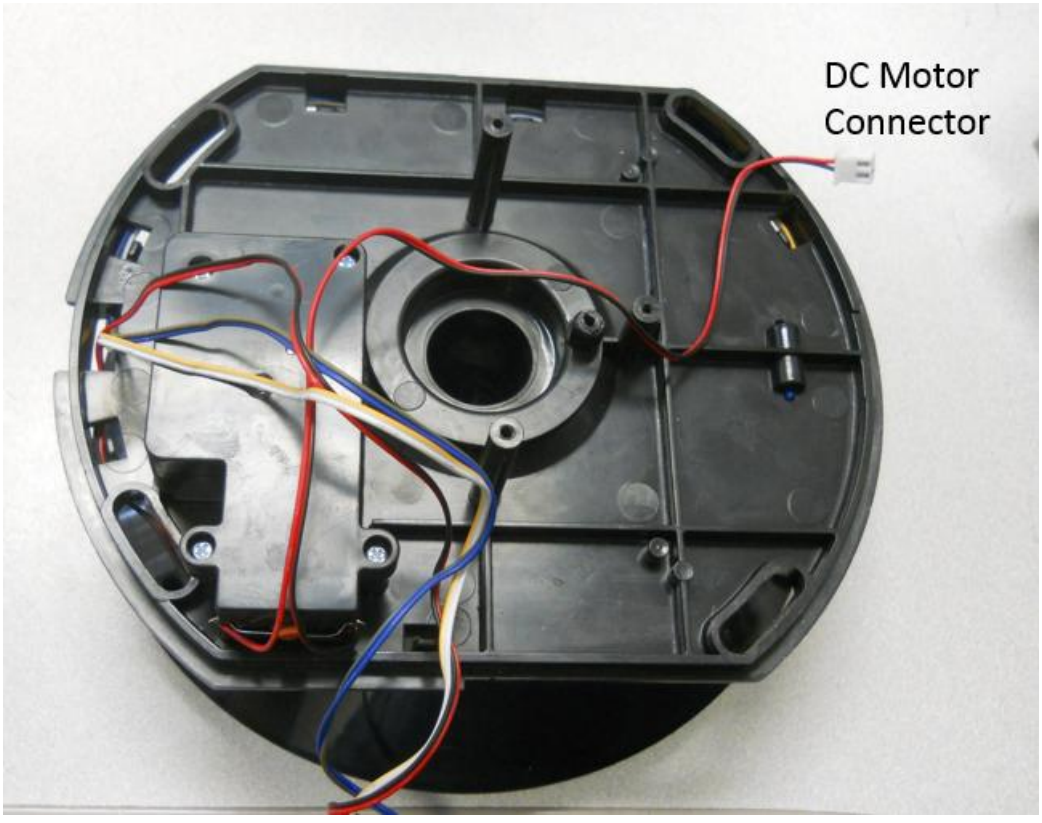

RasPiRobot
V3f
MonkMakes.com
SW1 SW2
I2C
5V
GND
D
C
SONAR
5V T E GND
OC1 + OC2 L R GND +V
9-12V
CS
470
16V

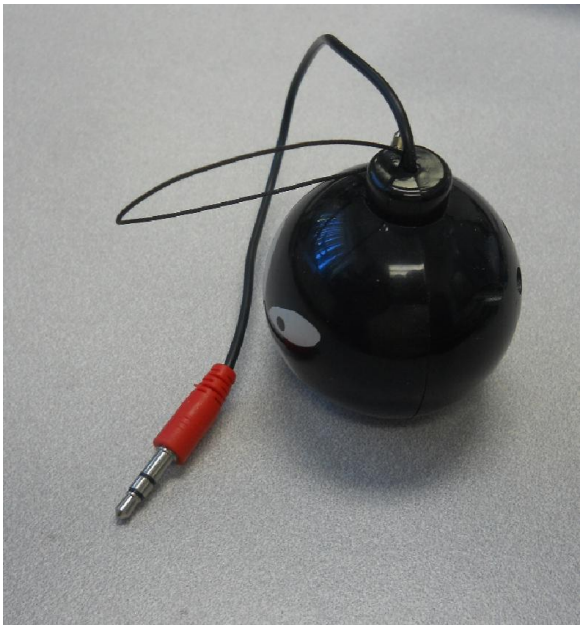

RasPiRobot
V3f
HC-SR04
CS
470
16V

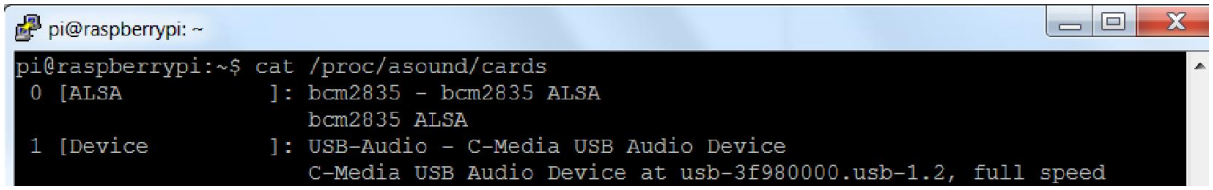


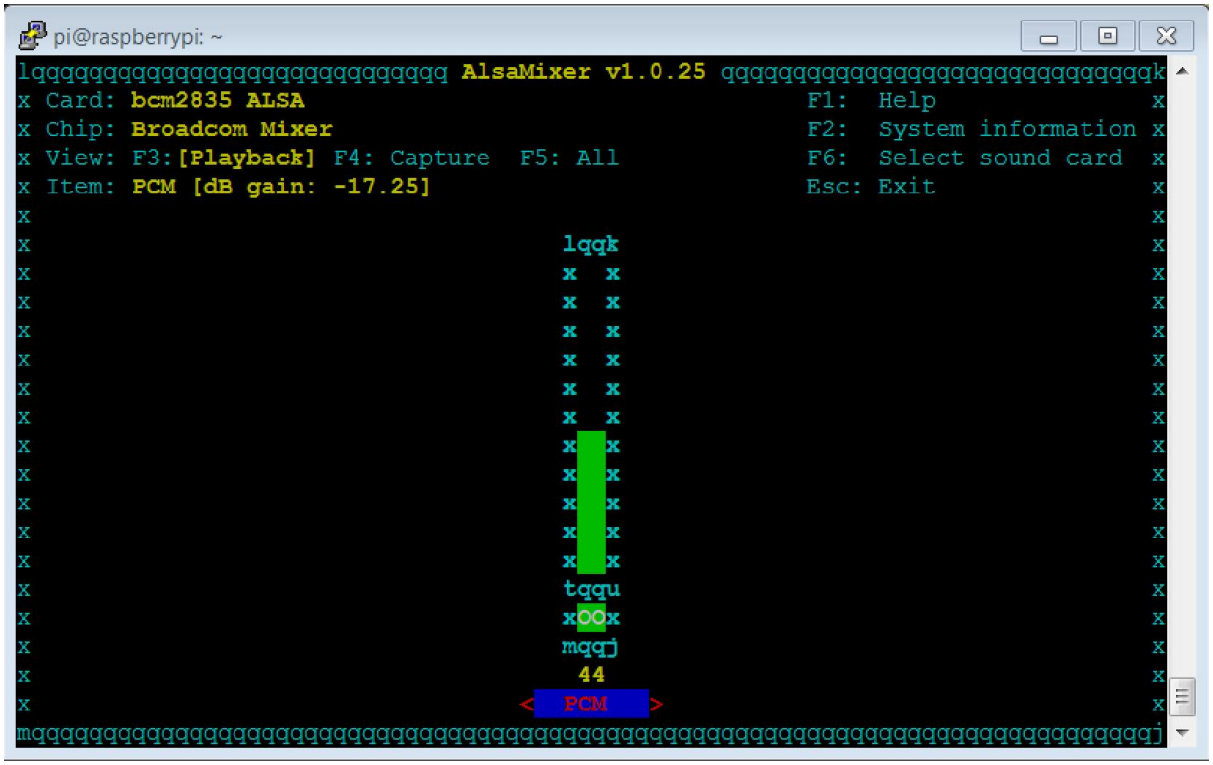

AA Battery
AA Battery

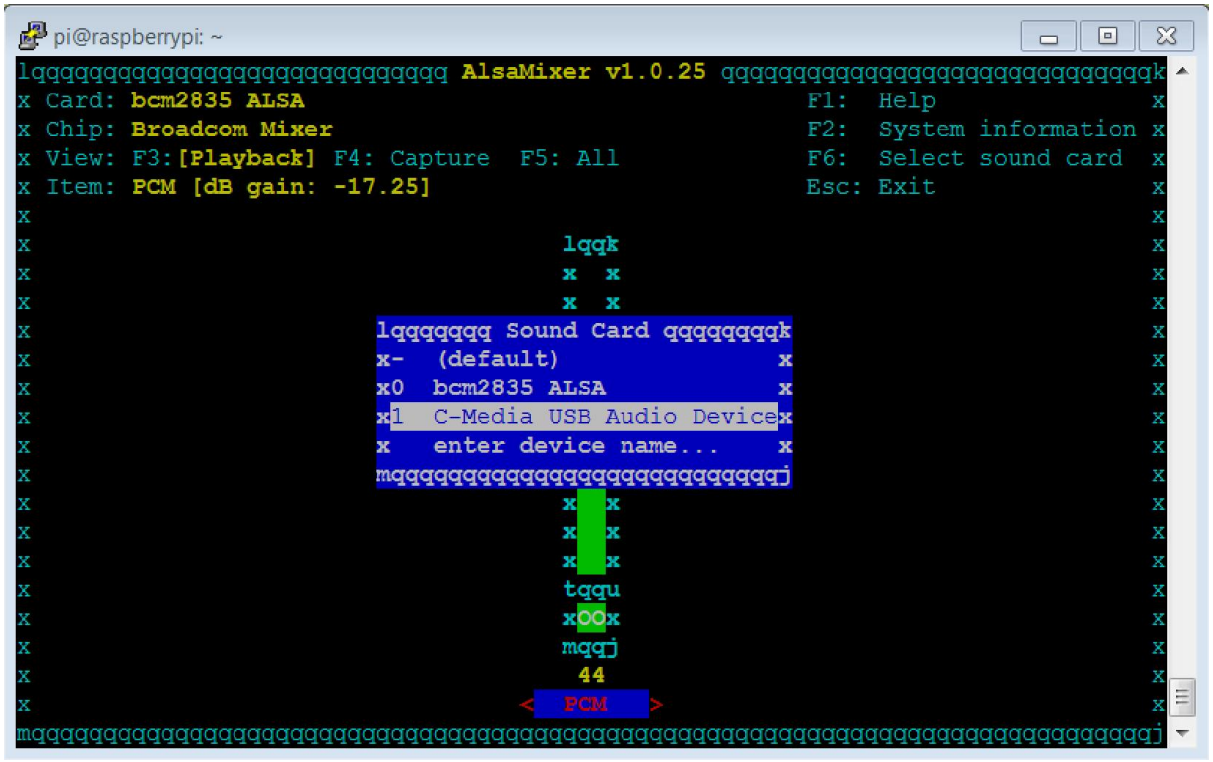
Pin 1 3.3V		Pin 2 5V
Pin 3 GPIO2		Pin 4 5V
Pin 5 GPIO3		Pin 6 GND
Pin 7 GPIO4		Pin 8 GPIO14
Pin 9 GND		Pin 10 GPIO15
Pin 11 GPIO17		Pin 12 GPIO18
Pin 13 GPIO27		Pin 14 GND
Pin 15 GPIO22		Pin 16 GPIO23
Pin 17 3.3V		Pin 18 GPIO24
Pin 19 GPIO10		Pin 20 GND
Pin 21 GPIO9		Pin 22 GPIO25
Pin 23 GPIO11		Pin 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

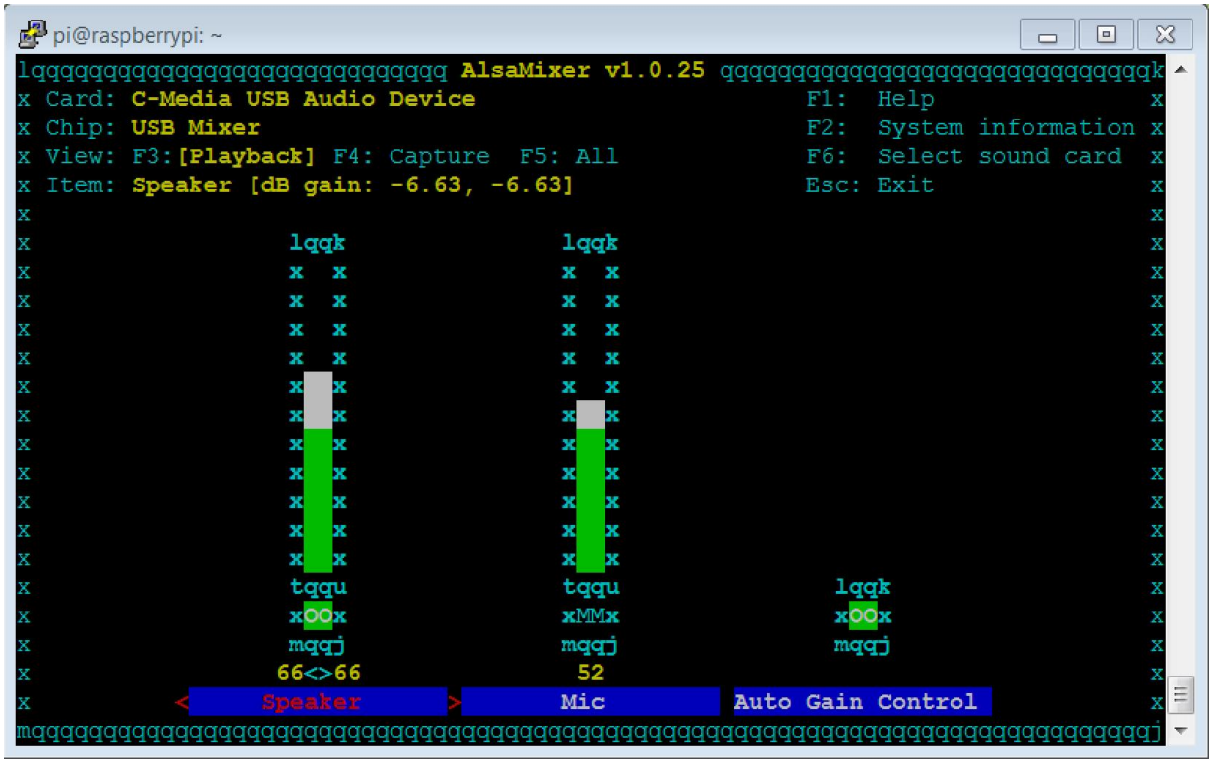


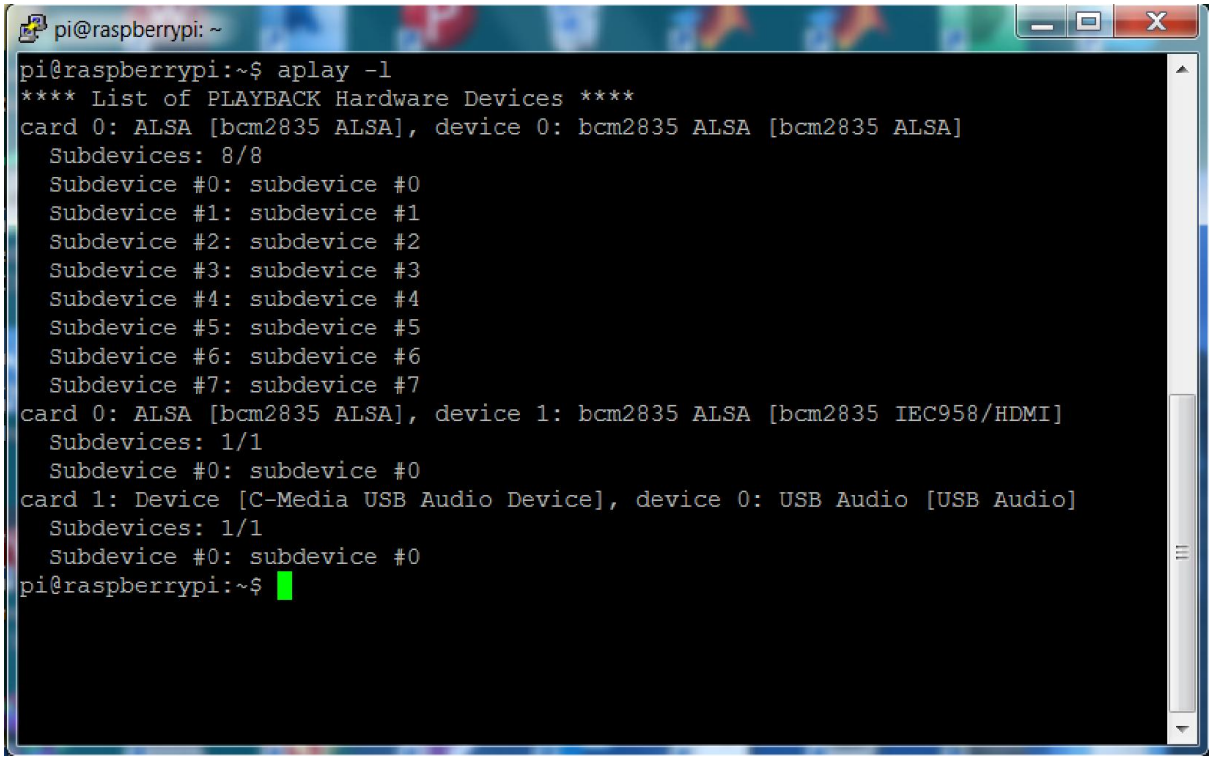


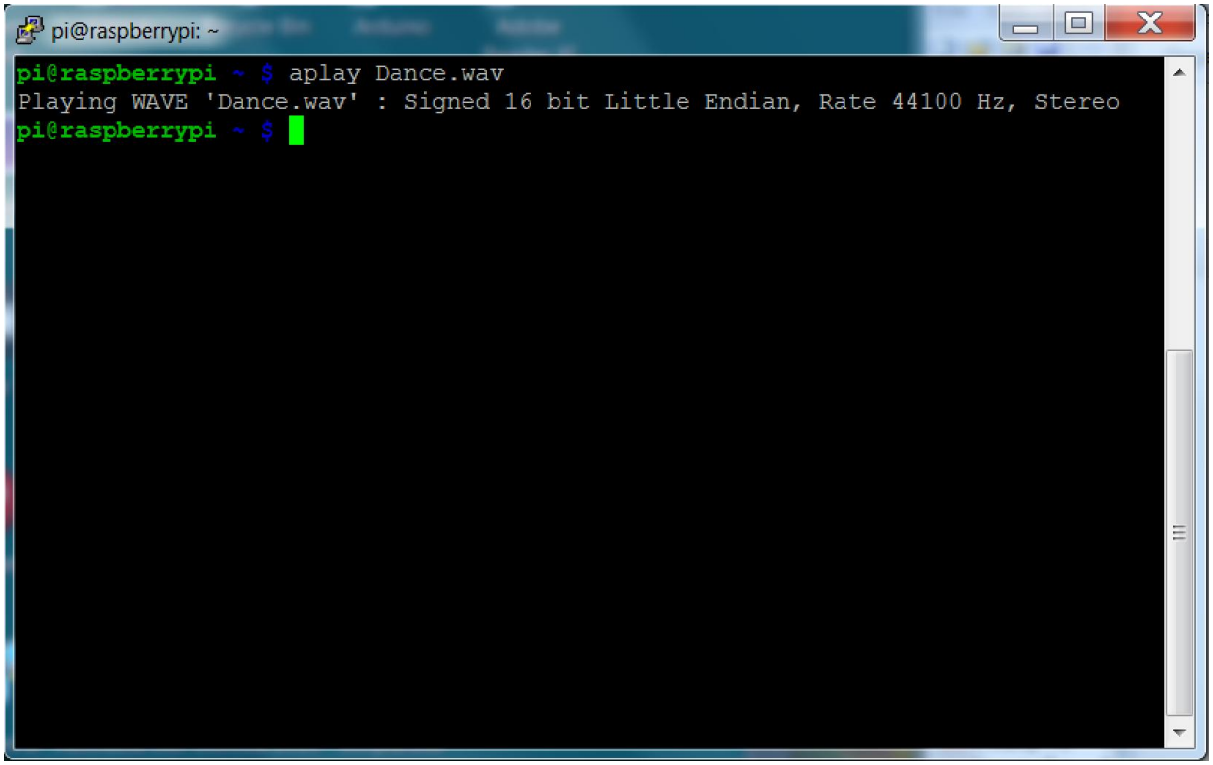

pi@raspberrypi: ~
pi@raspberrypi:~$ cat /proc/asound/cards
0 [ALSA]: bcm2835 - bcm2835 ALSA
bcm2835 ALSA
1 [Device]: USB-Audio - C-Media USB Audio Device
C-Media USB Audio Device at usb-3f980000.usb-1.2, full speed

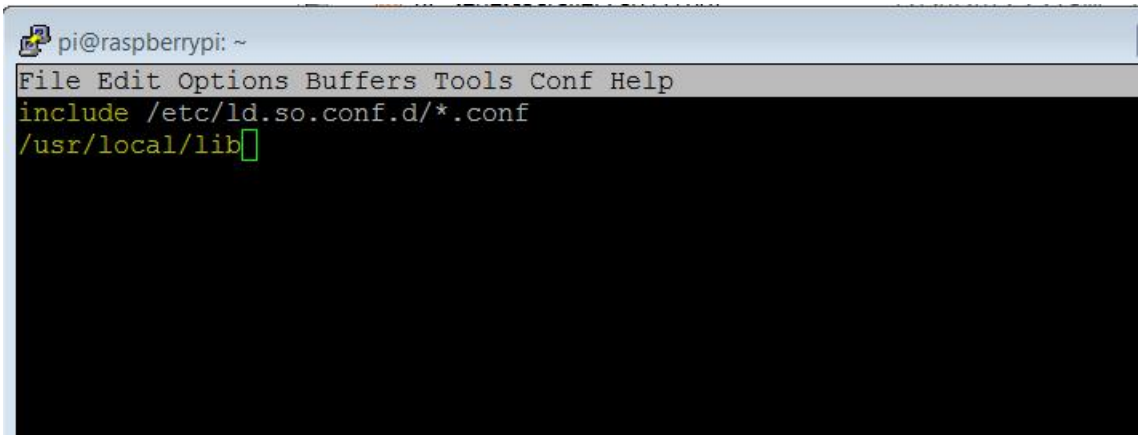

pi@raspberrypi: ~
AlsaMixer v1.0.25
Card: bcm2835 ALSA
Chip: Broadcom Mixer
View: F3:[Playback] F4: Capture F5: All
Item: PCM [dB gain: -17.25]
F1: Help
F2: System information
F6: Select sound card
Esc: Exit
44
PCM

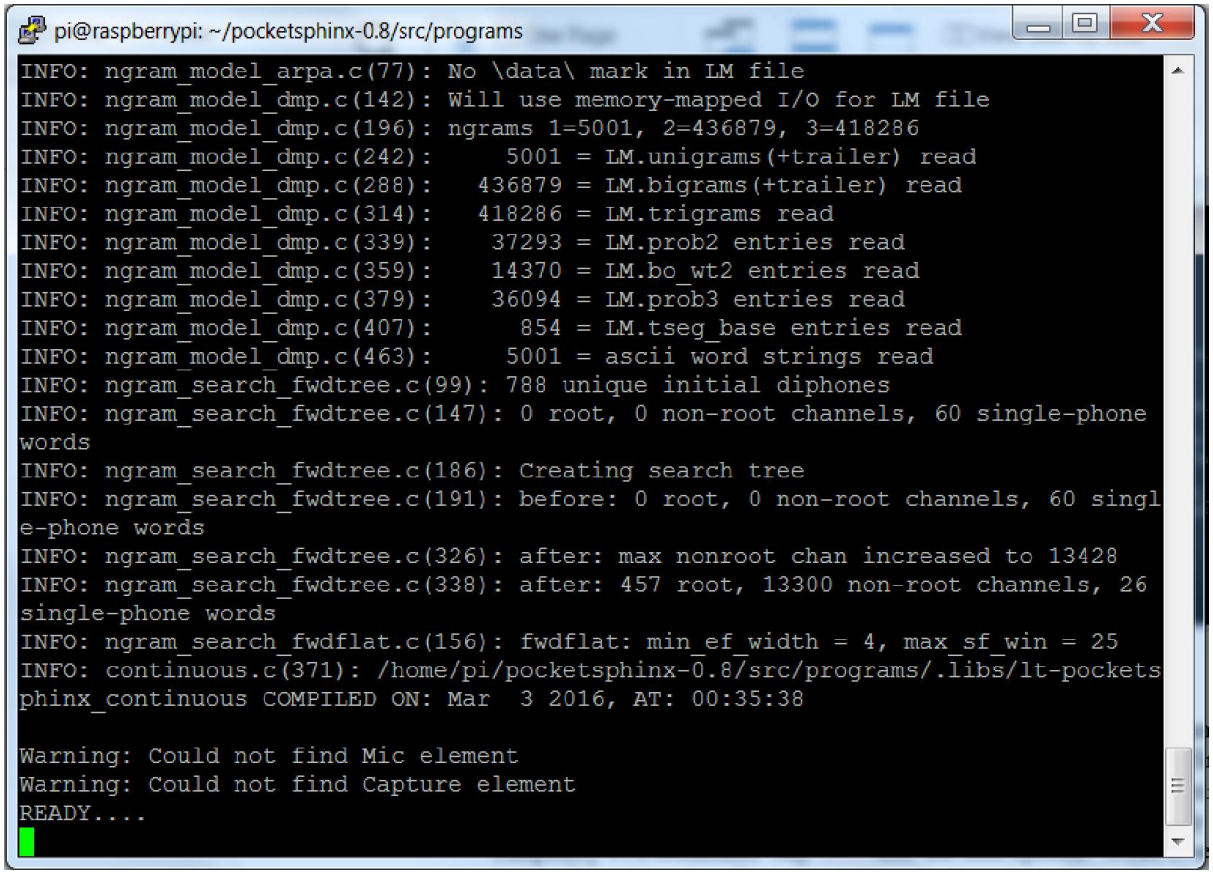

pi@raspberrypi: ~
AlsaMixer v1.0.25
Card: bcm2835 ALSA
Chip: Broadcom Mixer
View: F3:[Playback] F4: Capture F5: All
Item: PCM [dB gain: -17.25]
F1: Help
F2: System information
F6: Select sound card
Esc: Exit
Sound Card
(default)
bcm2835 ALSA
C-Media USB Audio Device
enter device name...
44
PCM

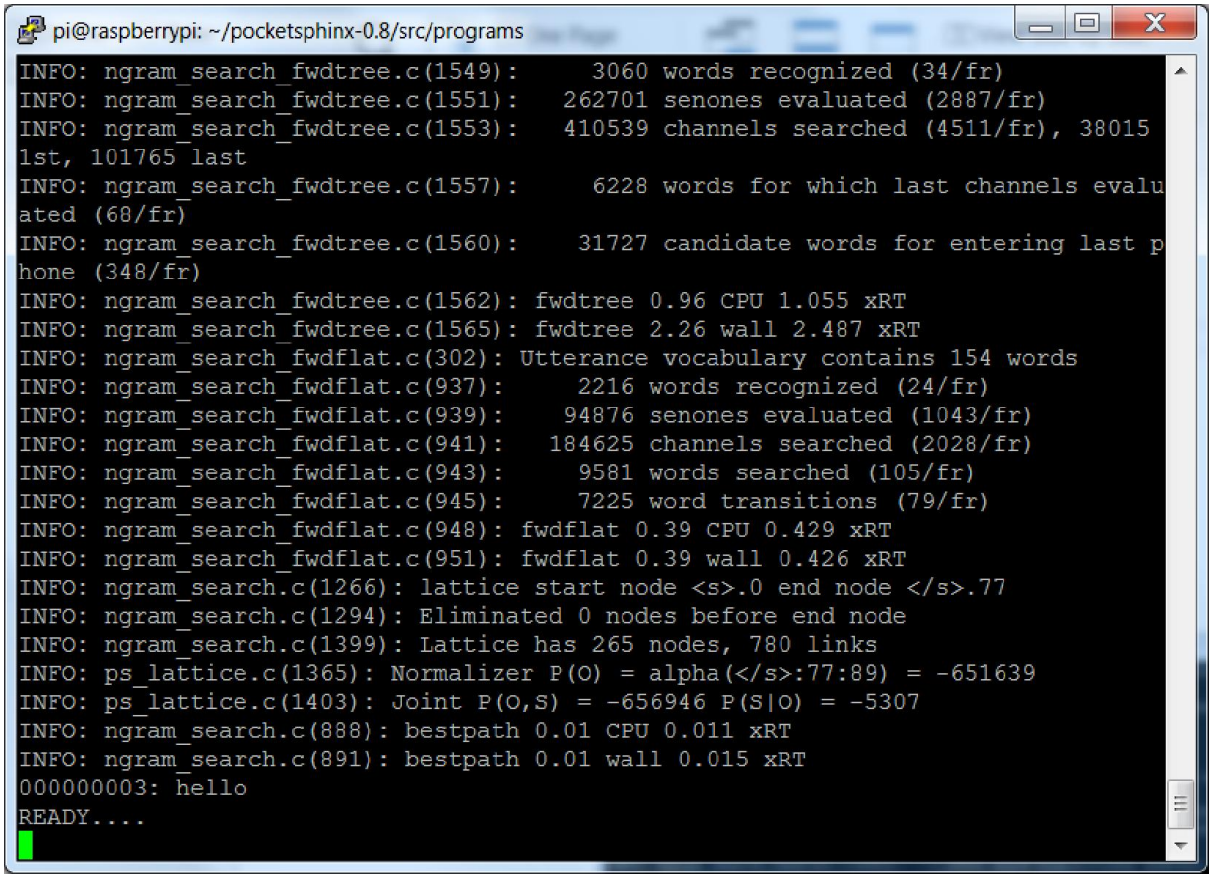

pi@raspberrypi: ~
AlsaMixer v1.0.25
Card: C-Media USB Audio Device
Chip: USB Mixer
View: F3:[Playback] F4: Capture F5: All
Item: Speaker [dB gain: -6.63, -6.63]
F1: Help
F2: System information
F6: Select sound card
Esc: Exit
66<>66
52
Speaker
Mic
Auto Gain Control

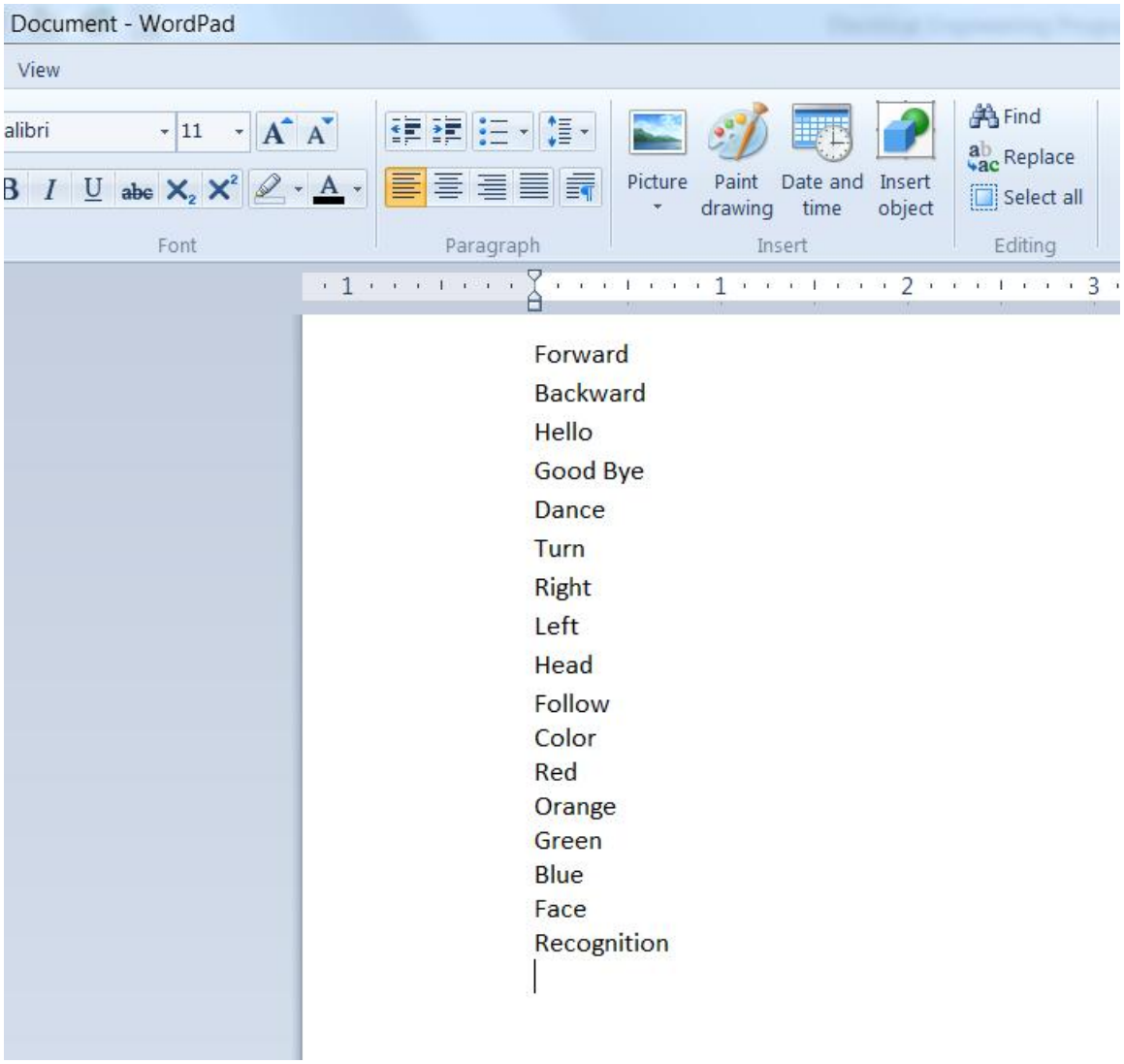

pi@raspberrypi: ~
pi@raspberrypi:~$ aplay -l
**** List of PLAYBACK Hardware Devices ****
card 0: ALSA [bcm2835 ALSA], device 0: bcm2835 ALSA [bcm2835 ALSA]
Subdevices: 8/8
Subdevice #0: subdevice #0
Subdevice #1: subdevice #1
Subdevice #2: subdevice #2
Subdevice #3: subdevice #3
Subdevice #4: subdevice #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:~$

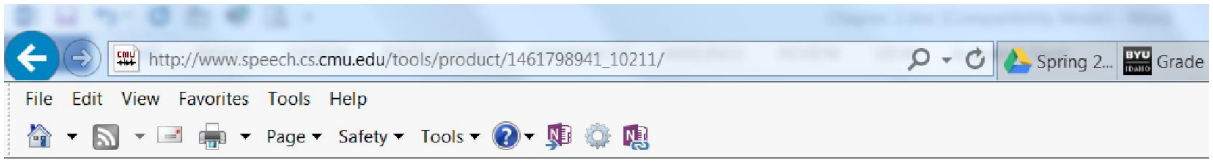

pi@raspberrypi: ~
pi@raspberrypi ~ $ aplay Dance.wav
Playing WAVE 'Dance.wav' : Signed 16 bit Little Endian, Rate 44100 Hz, Stereo
pi@raspberrypi ~ $


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_arpa.c(77): No \data\ mark in LM file
INFO: ngram_model_dmp.c(142): Will use memory-mapped I/O for LM file
INFO: ngram_model_dmp.c(196): ngrams 1=5001, 2=436879, 3=418286
INFO: ngram_model_dmp.c(242): 5001 = LM.unigrams(+trailer) read
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: Mar 3 2016, AT: 00:35:38
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(1549):   3060 words recognized (34/fr)
INFO: ngram_search_fwdtree.c(1551):   262701 senones evaluated (2887/fr)
INFO: ngram_search_fwdtree.c(1553):   410539 channels searched (4511/fr), 38015
1st, 101765 last
INFO: ngram_search_fwdtree.c(1557):   6228 words for which last channels evalu
ated (68/fr)
INFO: ngram_search_fwdtree.c(1560):   31727 candidate words for entering last p
hone (348/fr)
INFO: ngram_search_fwdtree.c(1562): fwdtree 0.96 CPU 1.055 xRT
INFO: ngram_search_fwdtree.c(1565): fwdtree 2.26 wall 2.487 xRT
INFO: ngram_search_fwdflat.c(302): Utterance vocabulary contains 154 words
INFO: ngram_search_fwdflat.c(937):   2216 words recognized (24/fr)
INFO: ngram_search_fwdflat.c(939):   94876 senones evaluated (1043/fr)
INFO: ngram_search_fwdflat.c(941):   184625 channels searched (2028/fr)
INFO: ngram_search_fwdflat.c(943):   9581 words searched (105/fr)
INFO: ngram_search_fwdflat.c(945):   7225 word transitions (79/fr)
INFO: ngram_search_fwdflat.c(948): fwdflat 0.39 CPU 0.429 xRT
INFO: ngram_search_fwdflat.c(951): fwdflat 0.39 wall 0.426 xRT
INFO: ngram_search.c(1266): lattice start node <s>.0 end node </s>.77
INFO: ngram_search.c(1294): Eliminated 0 nodes before end node
INFO: ngram_search.c(1399): Lattice has 265 nodes, 780 links
INFO: ps_lattice.c(1365): Normalizer P(O) = alpha(</s>:77:89) = -651639
INFO: ps_lattice.c(1403): Joint P(O,S) = -656946 P(S|O) = -5307
INFO: ngram_search.c(888): bestpath 0.01 CPU 0.011 xRT
INFO: ngram_search.c(891): bestpath 0.01 wall 0.015 xRT
000000003: hello
READY....


Document - WordPad
View
alibri
11
Font
Paragraph
Picture
Paint drawing
Date and time
Insert object
Insert
Find
Replace
Select all
Editing
Forward
Backward
Hello
Good Bye
Dance
Turn
Right
Left
Head
Follow
Color
Red
Orange
Green
Blue
Face
Recognition



Sphinx knowledge base generator [lmtool.3a]

Your Sphinx knowledge base compilation has been successfully processed!

The base name for this set is **6972**. TAR6972.tgz is the compressed version.
Note that this set of files is internally consistent and is best used together.

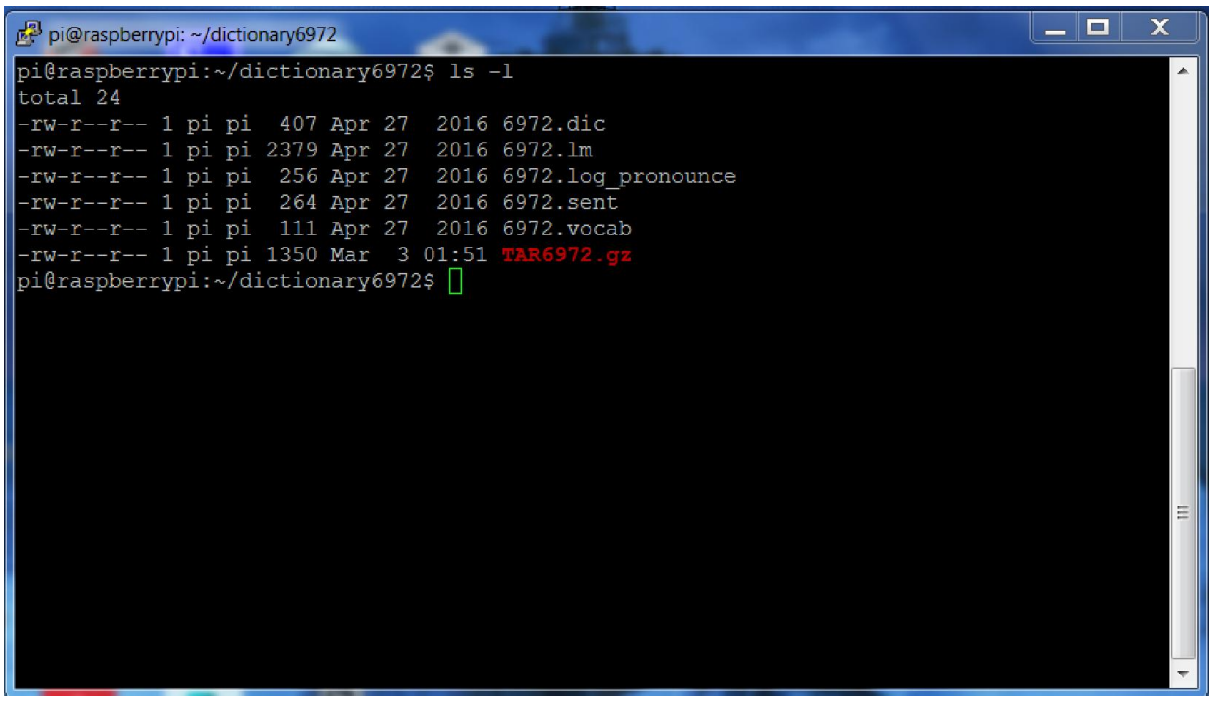
IMPORTANT: Please download these files as soon as possible; they will be deleted in approximately a half hour.

```
SESSION 1461798941_10211
[_INFO_] Found corpus: 17 sentences, 18 unique words
[_INFO_] Found 0 words in extras  (0)
[_INFO_] Language model completed  (0)
[_INFO_] Pronounce completed  (0)
[_STAT_] Elapsed time: 0.009 sec
```

Please include these messages in bug reports.

Name	Size	Description
6972.dic	407	*Pronunciation Dictionary*
6972.lm	2.3K	*Language Model*
6972.log_pronounce	256	*Log File*
6972.sent	264	*Corpus (processed)*
6972.vocab	111	*Word List*
TAR6972.tgz	1.3K	**COMPRESSED TARBALL**

Apache/2.2.22 (Ubuntu) Server at www.speech.cs.cmu.edu Port 80



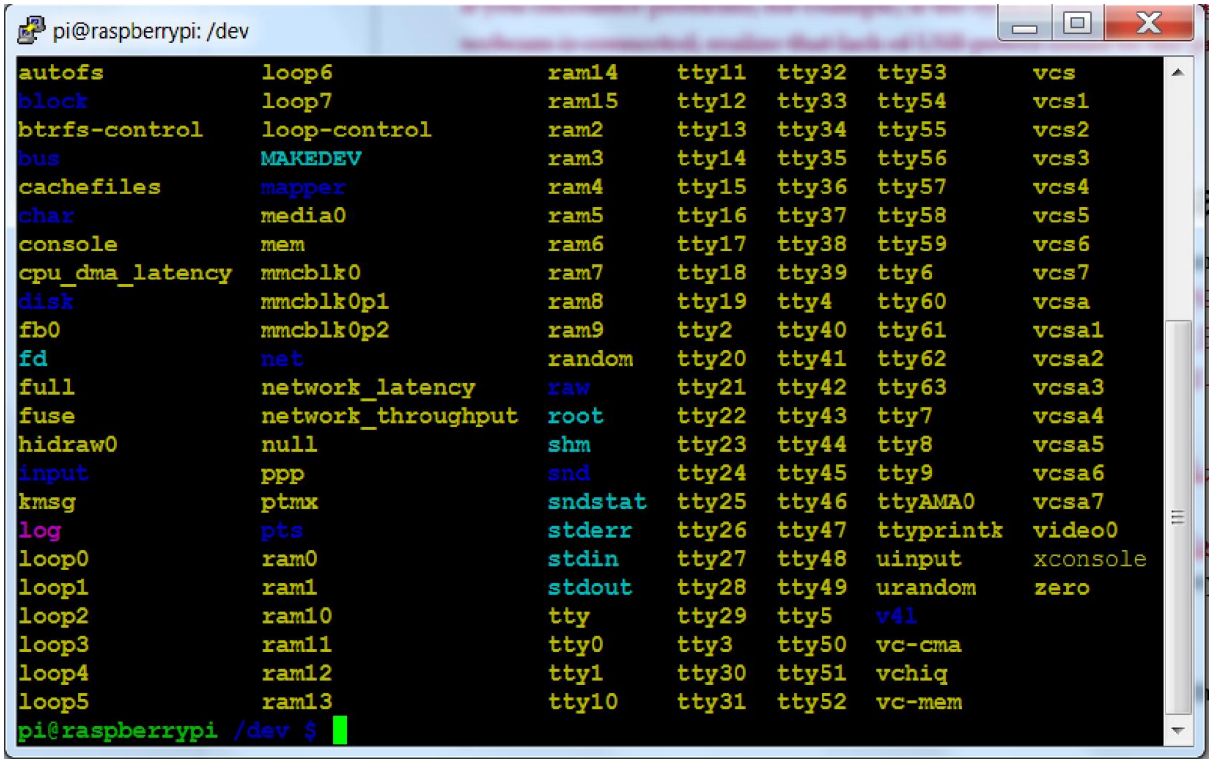
pi@raspberrypi: ~/pocketsphinx-0.8/src/programs

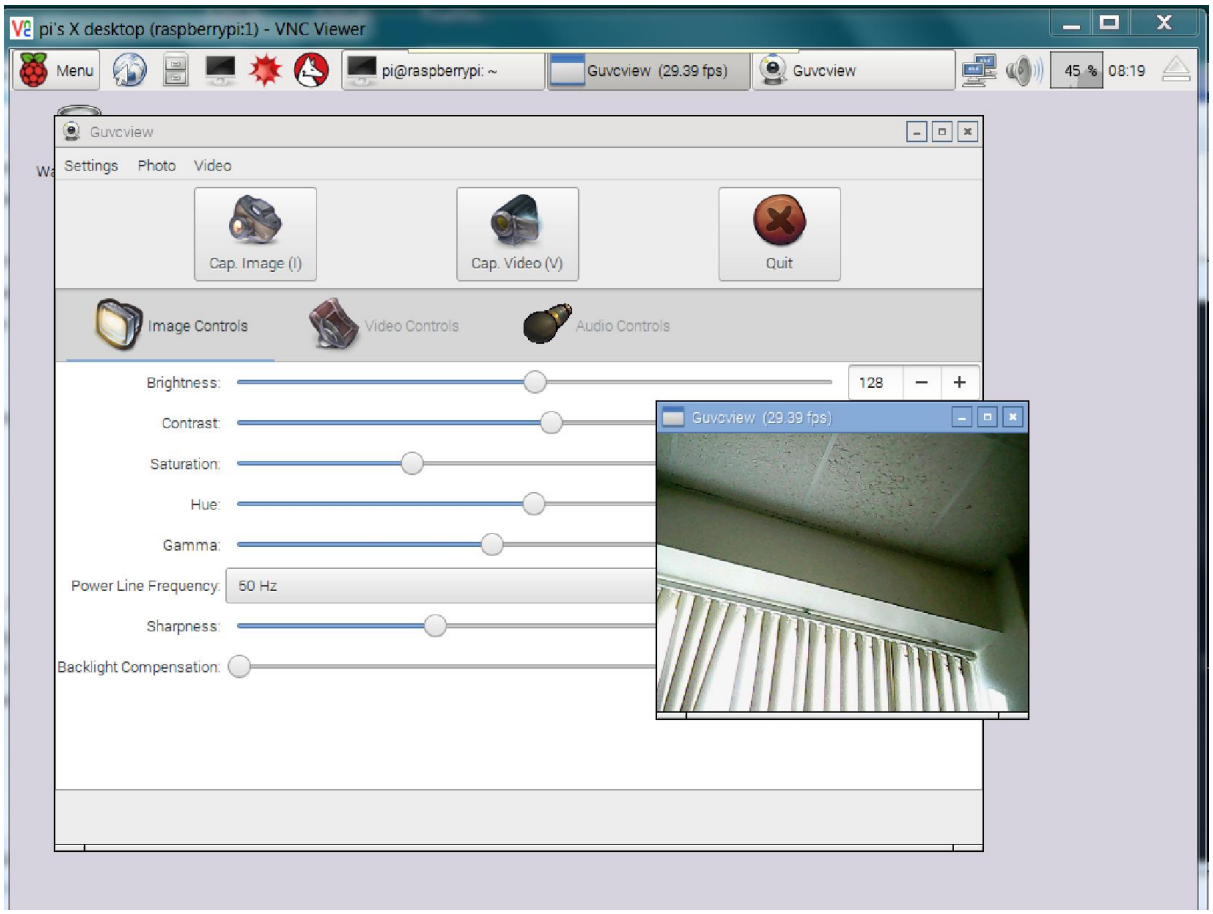
File Edit Options Buffers Tools C Help

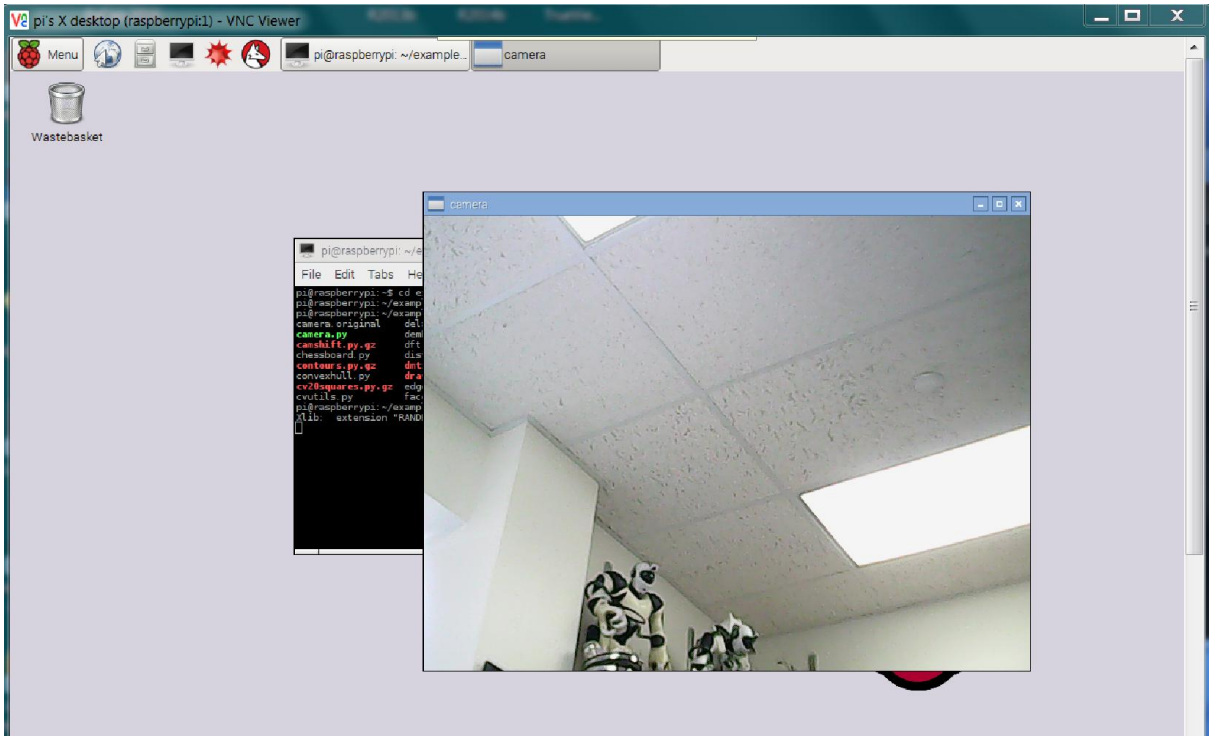
```
        ps_end_utt(ps);
        hyp = ps_get_hyp(ps, NULL, &uttid);
        printf("%s: %s\n", uttid, hyp);
        fflush(stdout);

        /* 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);
}
```

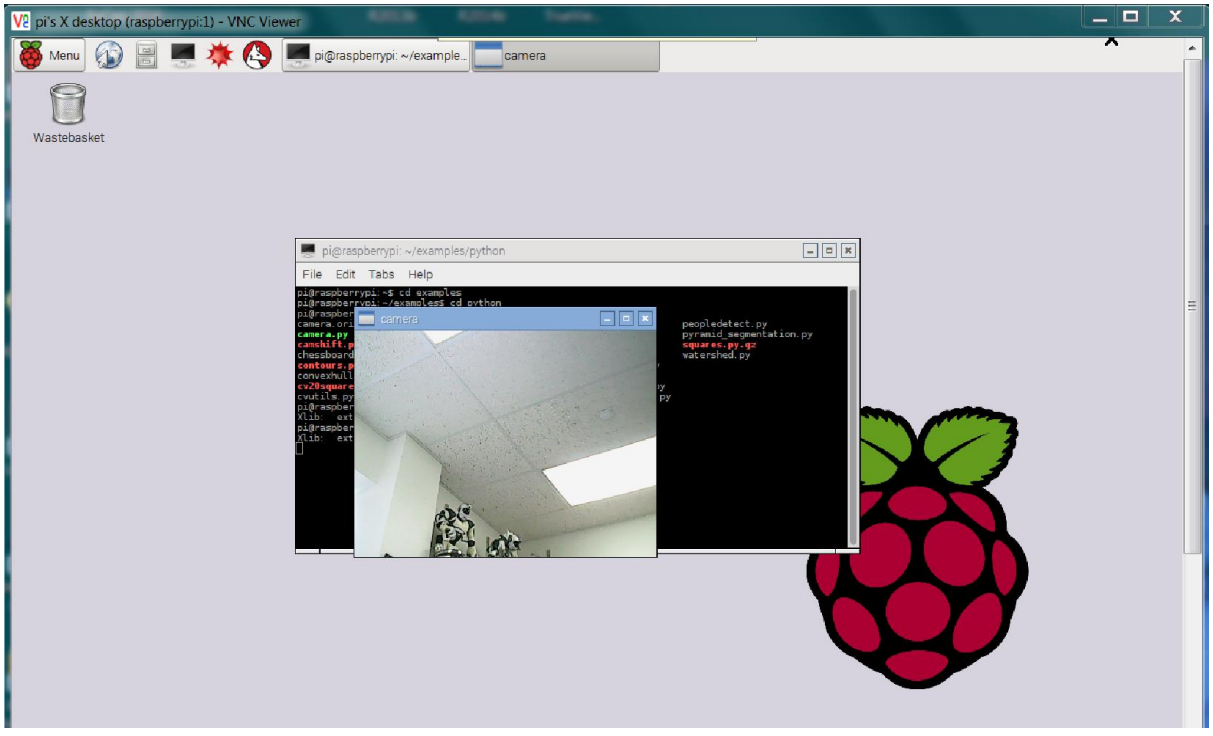
-UU-:----F1 **continuous.c** 82% L331 (C/l Abbrev)----------

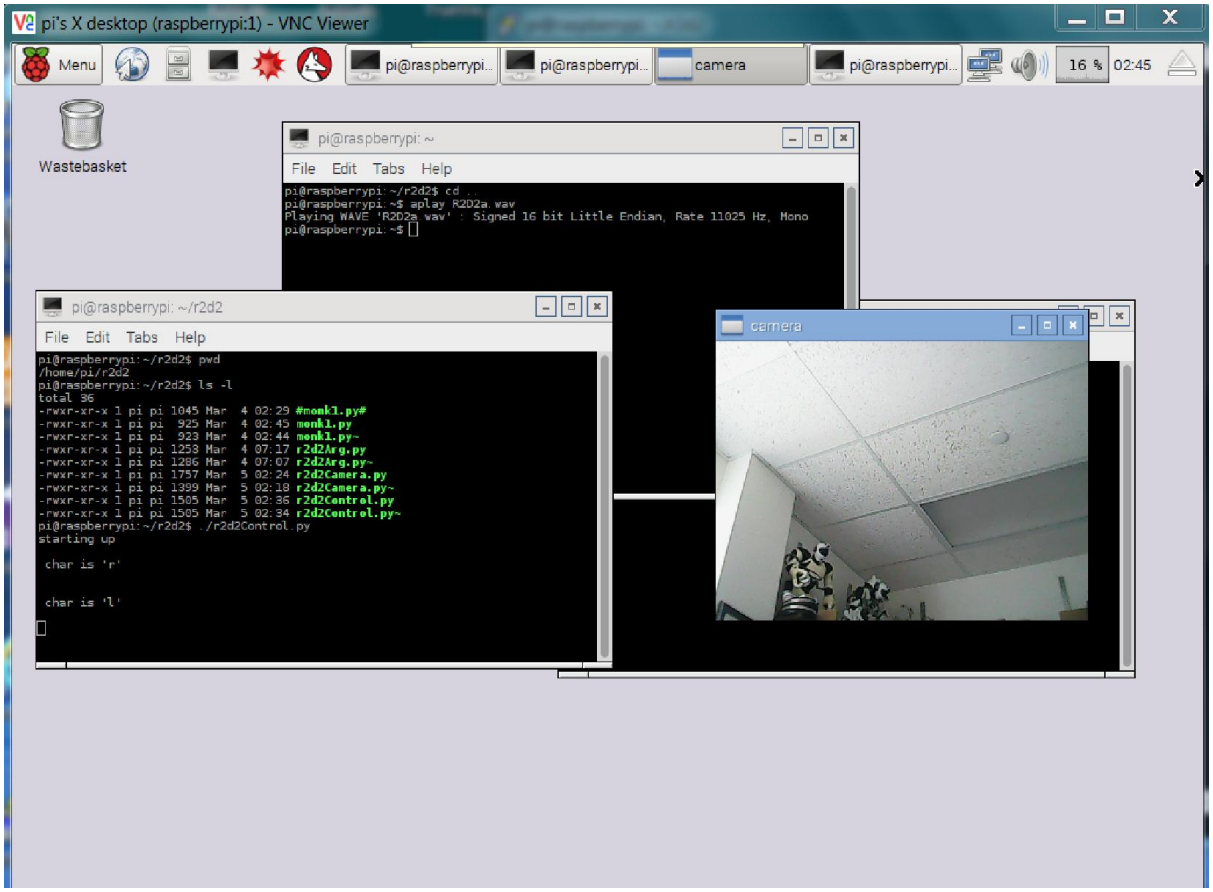

WEB CAMERA F1#2.0
f:4.8mm-∞


pi@raspberrypi: /dev
autofs loop6 ram14 tty11 tty32 tty53 vcs
block loop7 ram15 tty12 tty33 tty54 vcs1
btrfs-control loop-control ram2 tty13 tty34 tty55 vcs2
bus MAKEDEV ram3 tty14 tty35 tty56 vcs3
cachefiles mapper ram4 tty15 tty36 tty57 vcs4
char media0 ram5 tty16 tty37 tty58 vcs5
console mem ram6 tty17 tty38 tty59 vcs6
cpu_dma_latency mmcblk0 ram7 tty18 tty39 tty6 vcs7
disk mmcblk0p1 ram8 tty19 tty4 tty60 vcsa
fb0 mmcblk0p2 ram9 tty2 tty40 tty61 vcsa1
fd net random tty20 tty41 tty62 vcsa2
full network_latency raw tty21 tty42 tty63 vcsa3
fuse network_throughput root tty22 tty43 tty7 vcsa4
hidraw0 null shm tty23 tty44 tty8 vcsa5
input ppp snd tty24 tty45 tty9 vcsa6
kmsg ptmx sndstat tty25 tty46 ttyAMA0 vcsa7
log pts stderr tty26 tty47 ttyprintk video0
loop0 ram0 stdin tty27 tty48 uinput xconsole
loop1 ram1 stdout tty28 tty49 urandom zero
loop2 ram10 tty tty29 tty5 v4l
loop3 ram11 tty0 tty3 tty50 vc-cma
loop4 ram12 tty1 tty30 tty51 vchiq
loop5 ram13 tty10 tty31 tty52 vc-mem
pi@raspberrypi /dev $

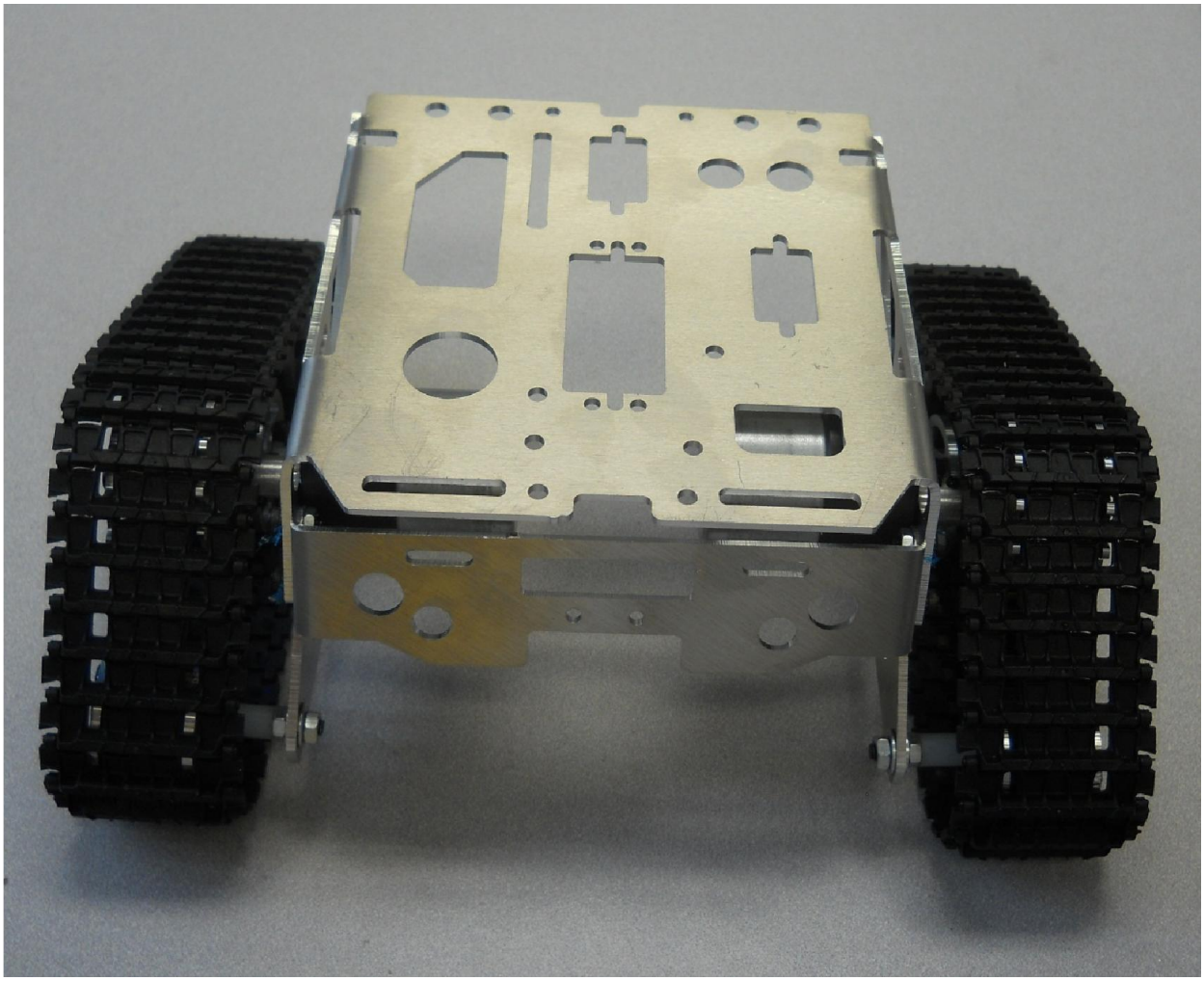

pi's X desktop (raspberrypi:1) - VNC Viewer
Menu
pi@raspberrypi: ~
Guvcview (29.39 fps)
Guvcview
45 %
08:19
Guvcview
Settings Photo Video
Cap. Image (I)
Cap. Video (V)
Quit
Image Controls
Video Controls
Audio Controls
Brightness:
128
Contrast:
Saturation:
Hue:
Gamma:
Power Line Frequency:
50 Hz
Sharpness:
Backlight Compensation:
Guvcview (29.39 fps)

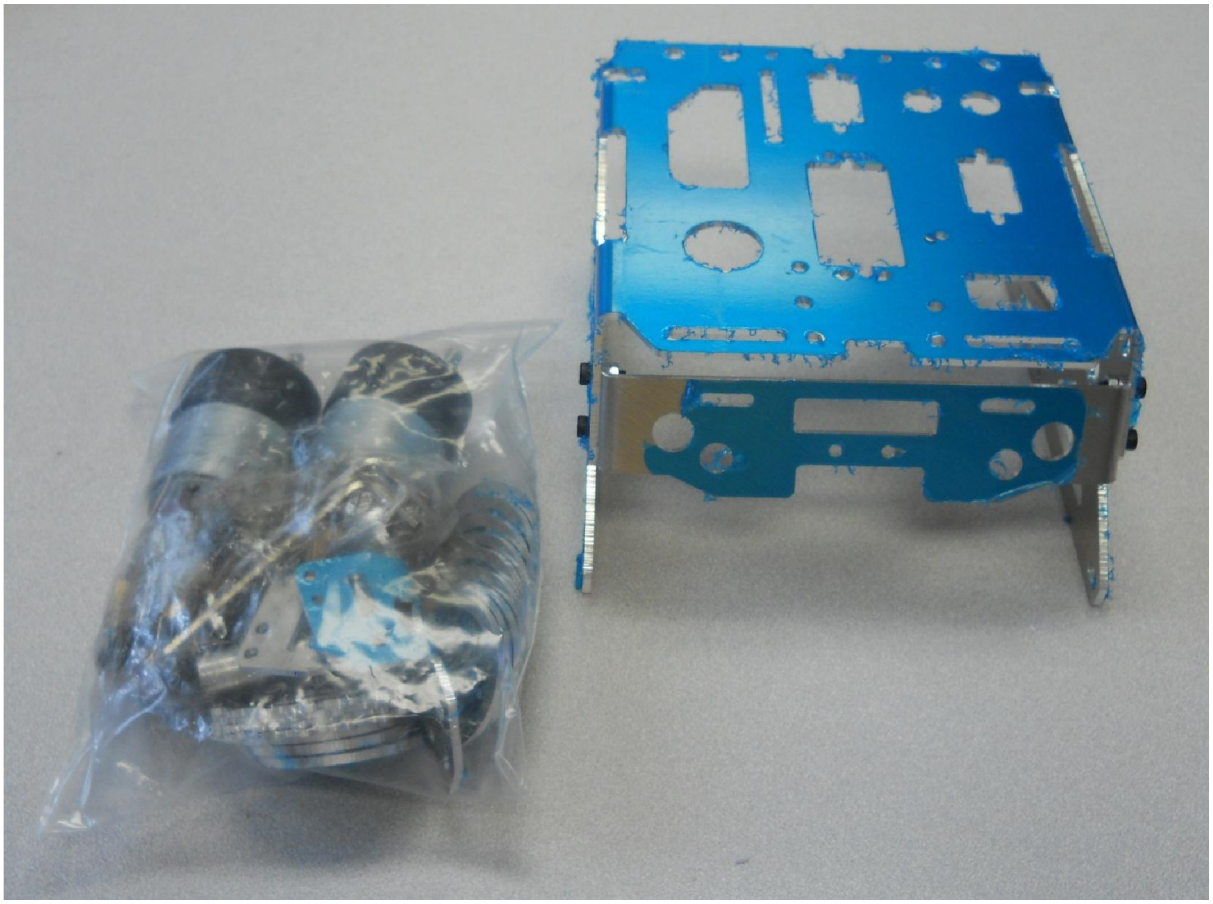

pi's X desktop (raspberrypi:1) - VNC Viewer
Menu
pi@raspberrypi: ~/example..
camera
Wastebasket
camera
File Edit Tabs He

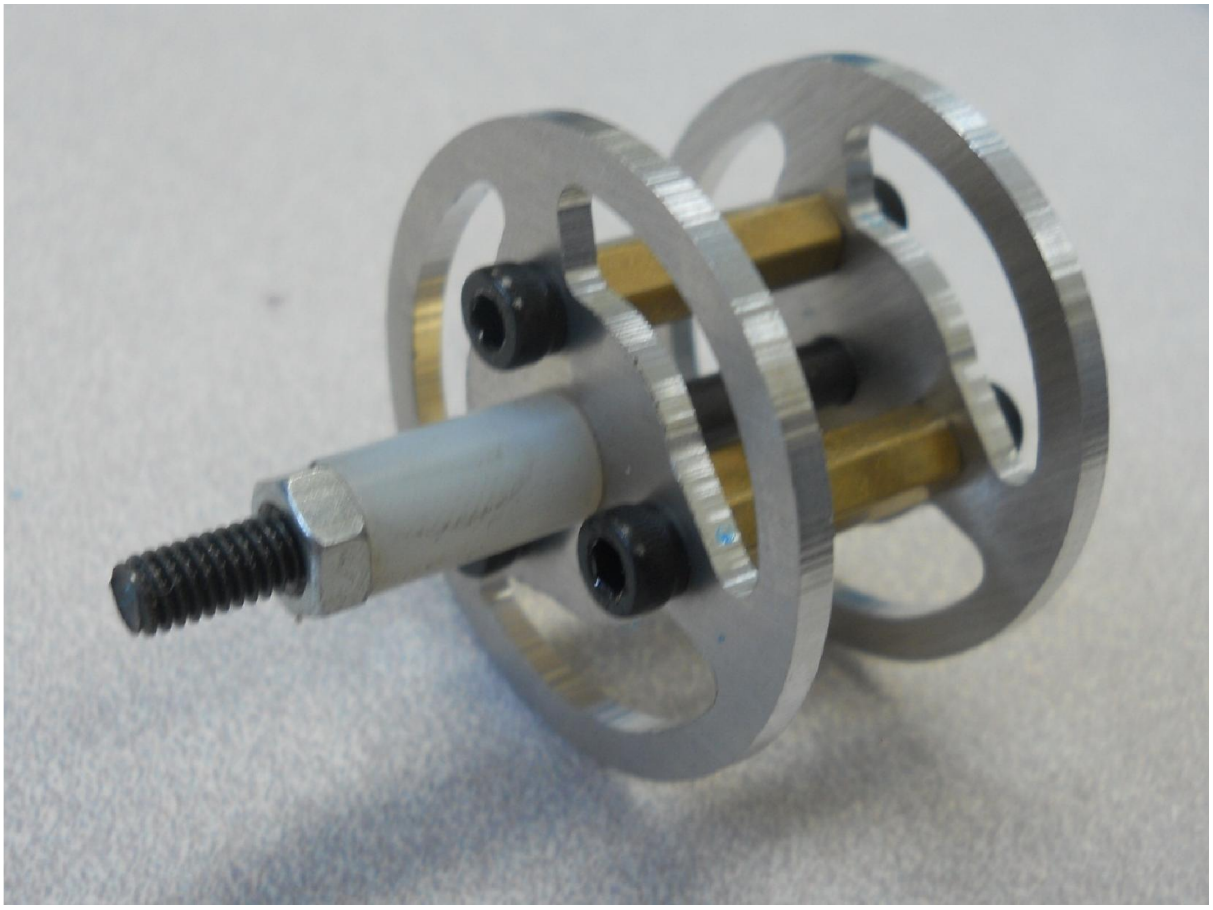

pi's X desktop (raspberrypi:1) - VNC Viewer
Menu
pi@raspberrypi: ~/example..
camera
Wastebasket
pi@raspberrypi: ~/examples/python
File Edit Tabs Help
camera
peopledetect.py
pyramid_segmentation.py
squares.py.gz
watershed.py

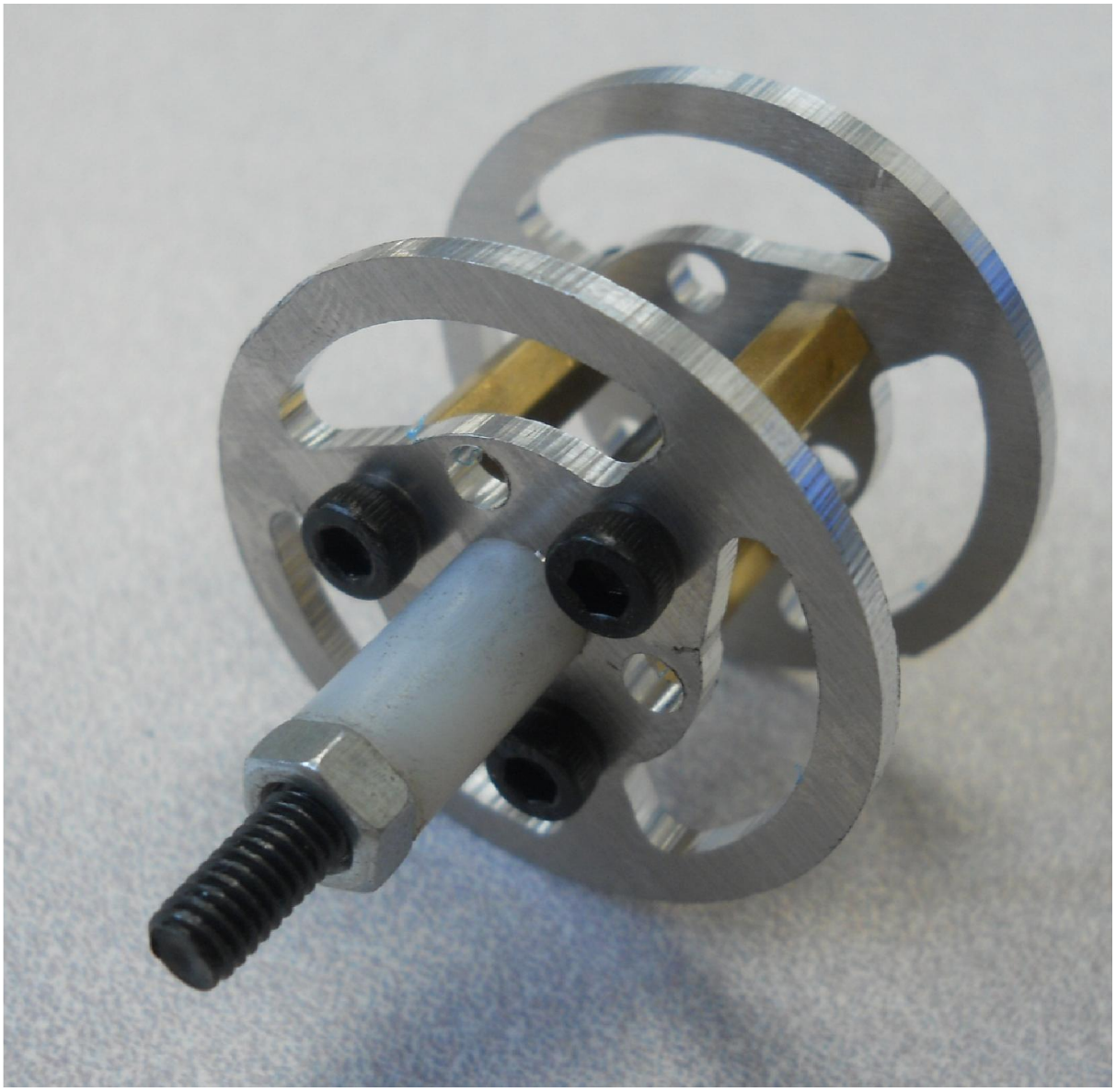

pi's X desktop (raspberrypi:1) - VNC Viewer
Menu
pi@raspberrypi...
pi@raspberrypi...
camera
pi@raspberrypi...
16 %
02:45
Wastebasket
pi@raspberrypi: ~
File Edit Tabs Help
pi@raspberrypi:~/r2d2$ cd ..
pi@raspberrypi:~$ aplay R2D2a.wav
Playing WAVE 'R2D2a.wav' : Signed 16 bit Little Endian, Rate 11025 Hz, Mono
pi@raspberrypi:~$
pi@raspberrypi: ~/r2d2
File Edit Tabs Help
pi@raspberrypi:~/r2d2$ pwd
/home/pi/r2d2
pi@raspberrypi:~/r2d2$ ls -l
total 36
-rwxr-xr-x 1 pi pi 1045 Mar 4 02:29 #monk1.py#
-rwxr-xr-x 1 pi pi 925 Mar 4 02:45 monk1.py
-rwxr-xr-x 1 pi pi 923 Mar 4 02:44 monk1.py~
-rwxr-xr-x 1 pi pi 1258 Mar 4 07:17 r2d2Arg.py
-rwxr-xr-x 1 pi pi 1286 Mar 4 07:07 r2d2Arg.py~
-rwxr-xr-x 1 pi pi 1757 Mar 5 02:24 r2d2Camera.py
-rwxr-xr-x 1 pi pi 1399 Mar 5 02:18 r2d2Camera.py~
-rwxr-xr-x 1 pi pi 1505 Mar 5 02:36 r2d2Control.py
-rwxr-xr-x 1 pi pi 1505 Mar 5 02:34 r2d2Control.py~
pi@raspberrypi:~/r2d2$ ./r2d2Control.py
starting up
char is 'r'
char is 'l'
camera

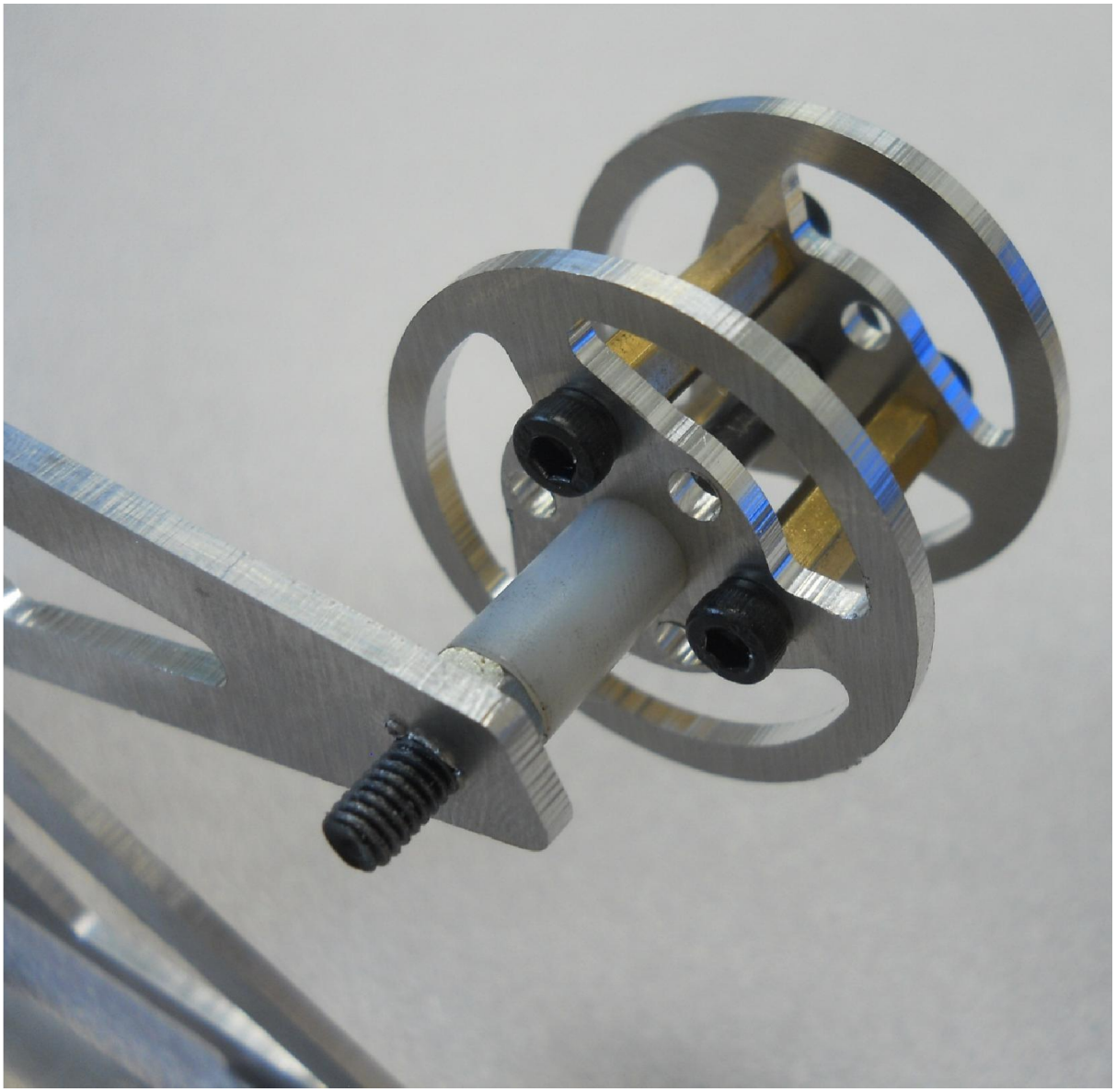
Chapter 3: Building a Wall-E Robot

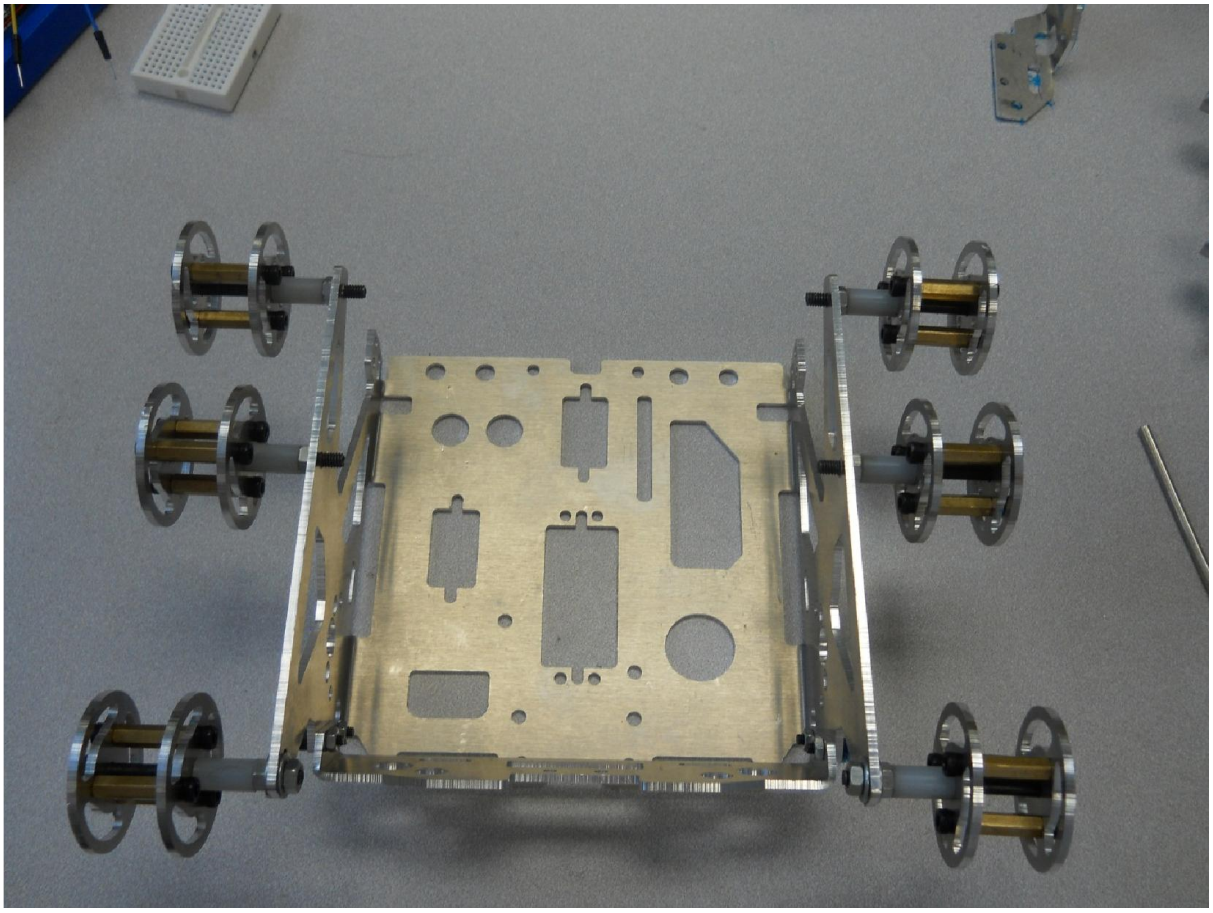


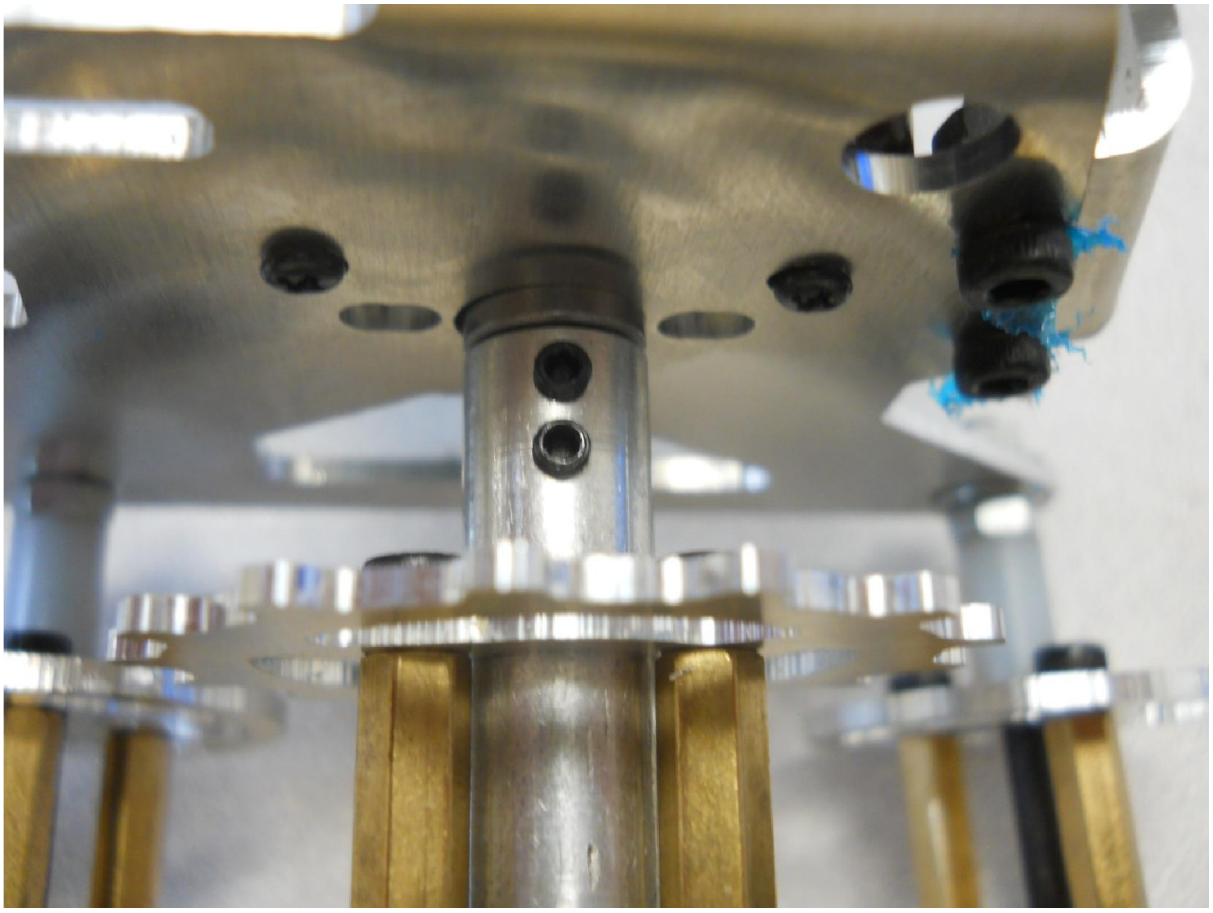


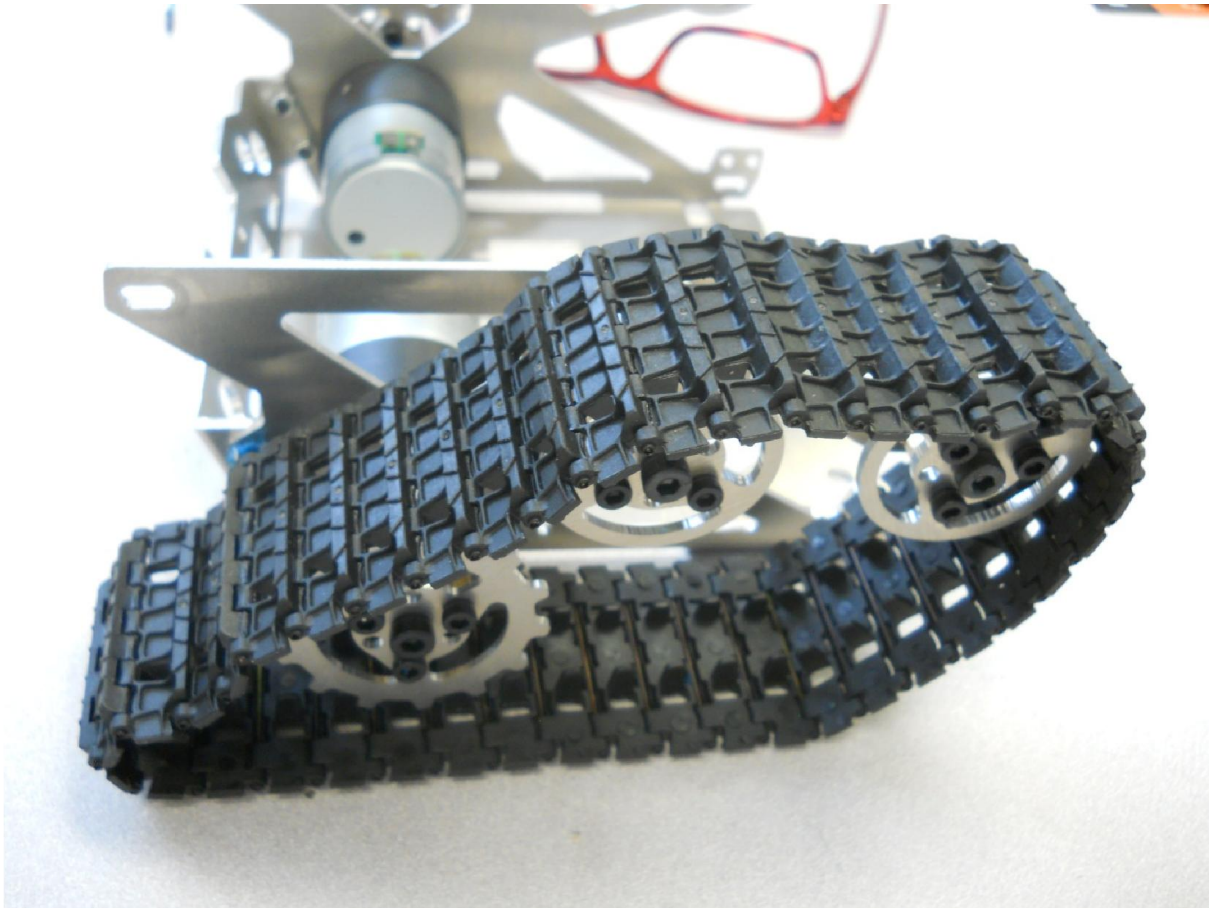


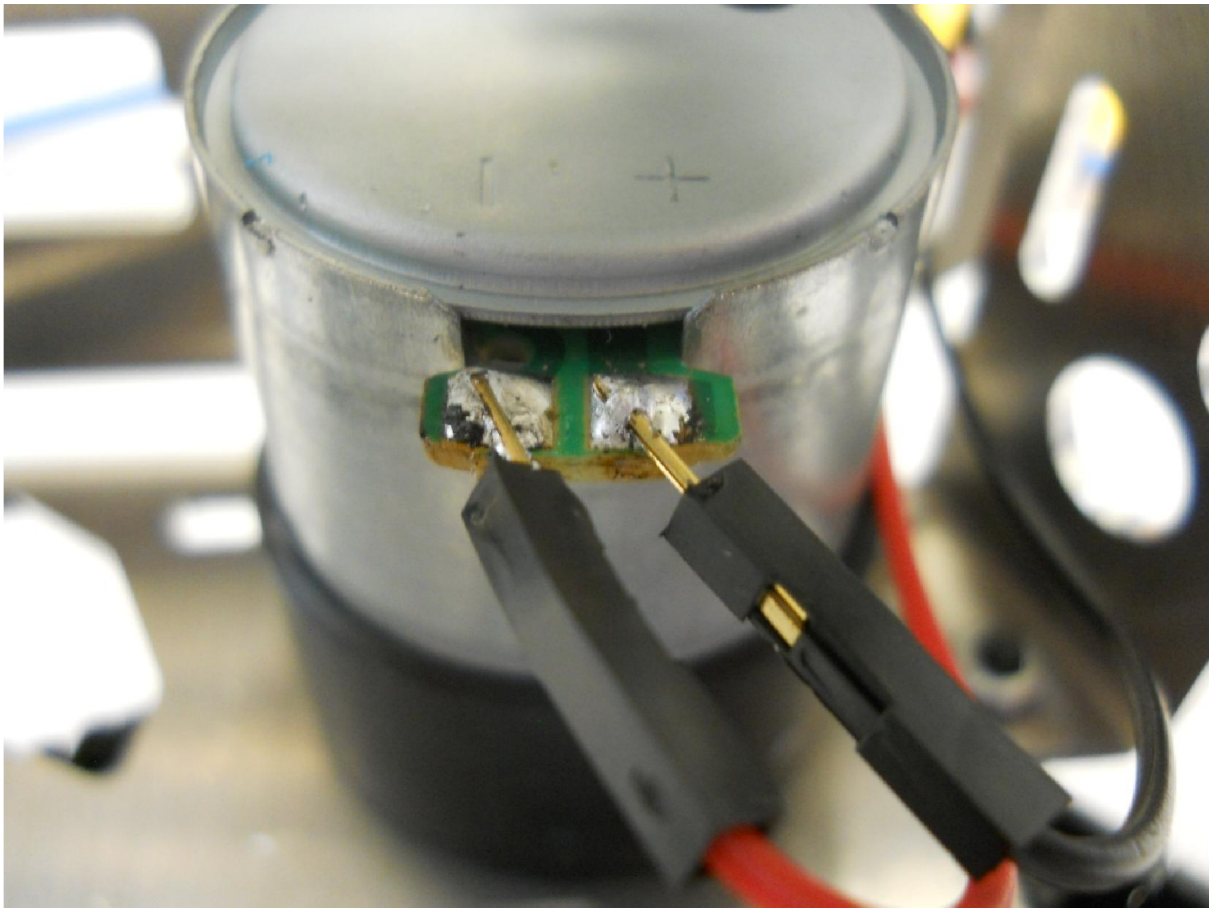


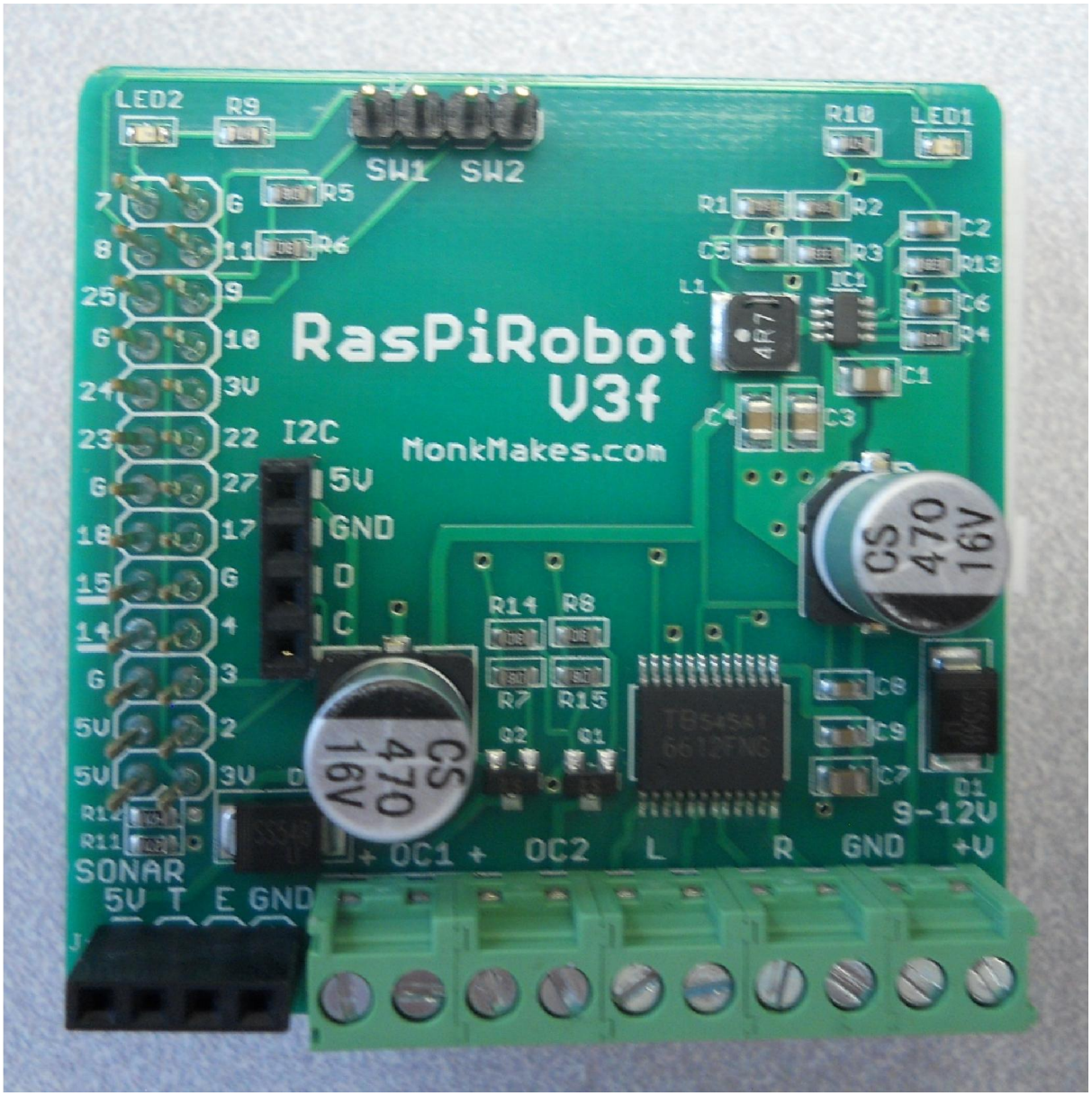




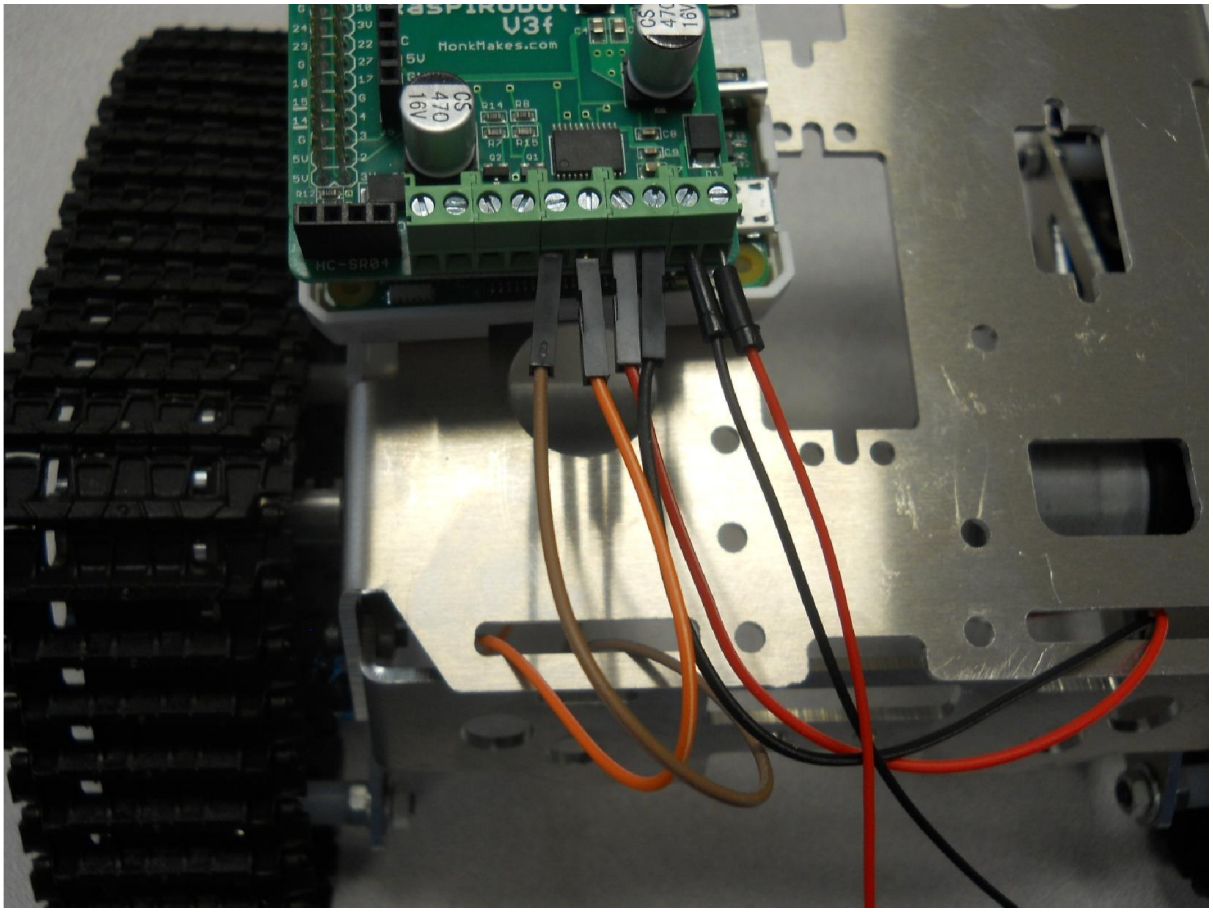


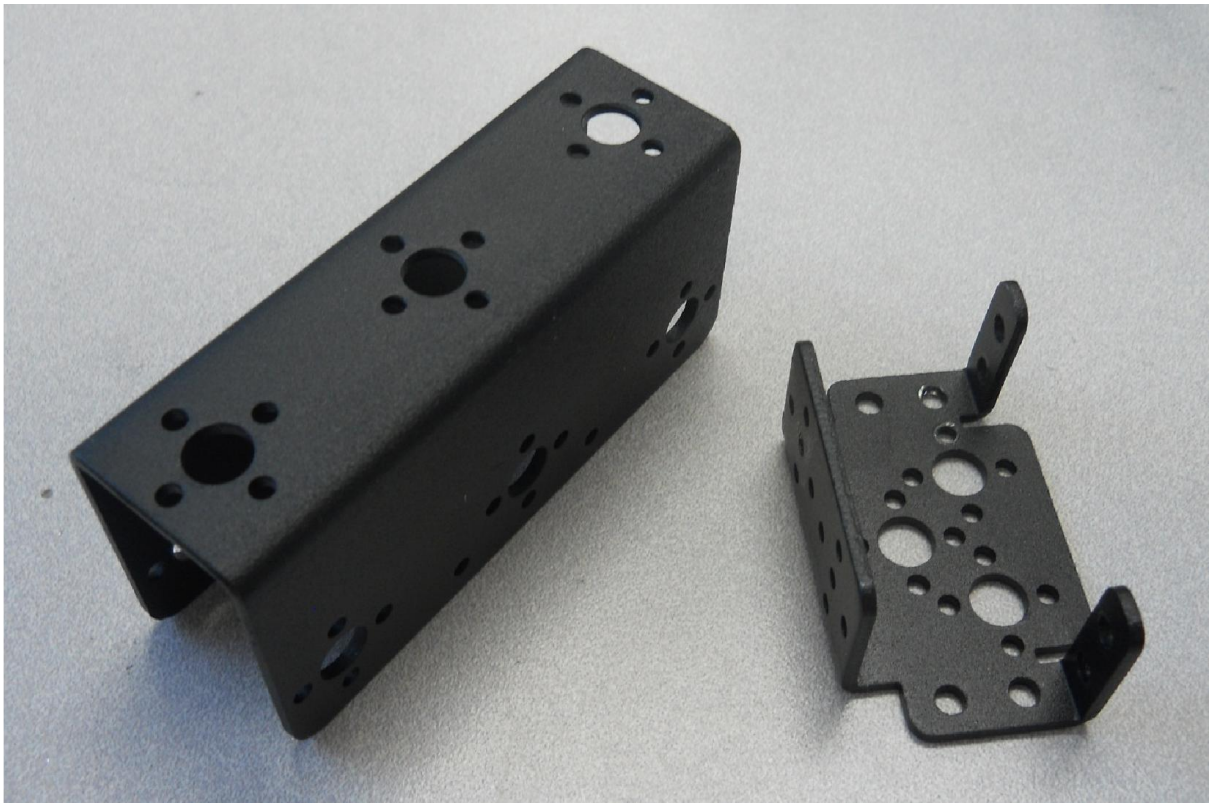


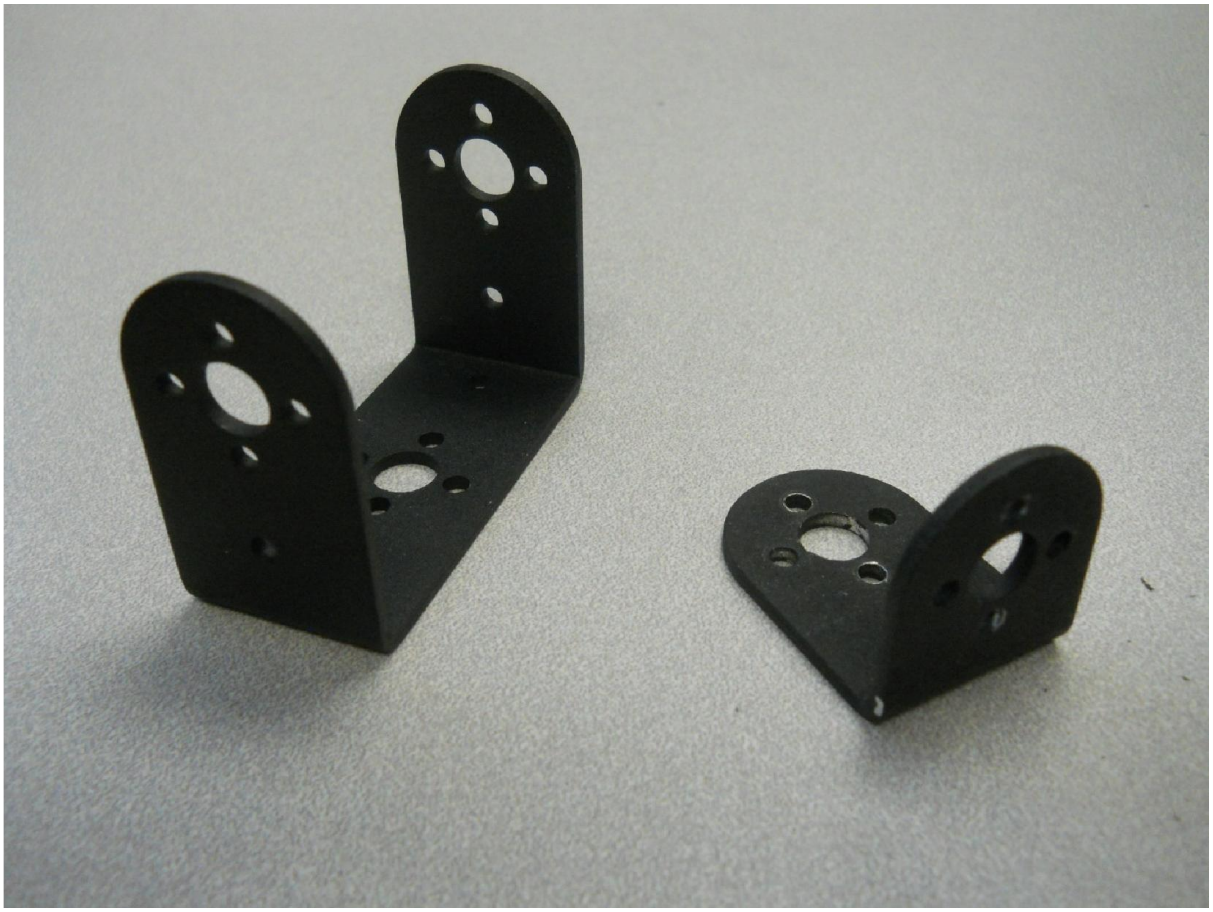



LED2
R9
SW1
SW2
R10
LED1
R5
R6
R1
R2
C2
C5
R3
R13
IC1
L1
4R7
C6
R4
C1
C4
C3
RasPiRobot
V3f
MonkMakes.com
I2C
5V
GND
D
C
CS
470
16V
R14
R8
R7
R15
Q2
Q1
C8
C9
C7
D1
9-12V
SONAR
5V T E GND
+ OC1 + OC2 L R GND +V


TURNIGY
nano-tech
2.2
2200mAh 25-50C DISCHARGE
HIGH DISCHARGE LI-PO BATTERY

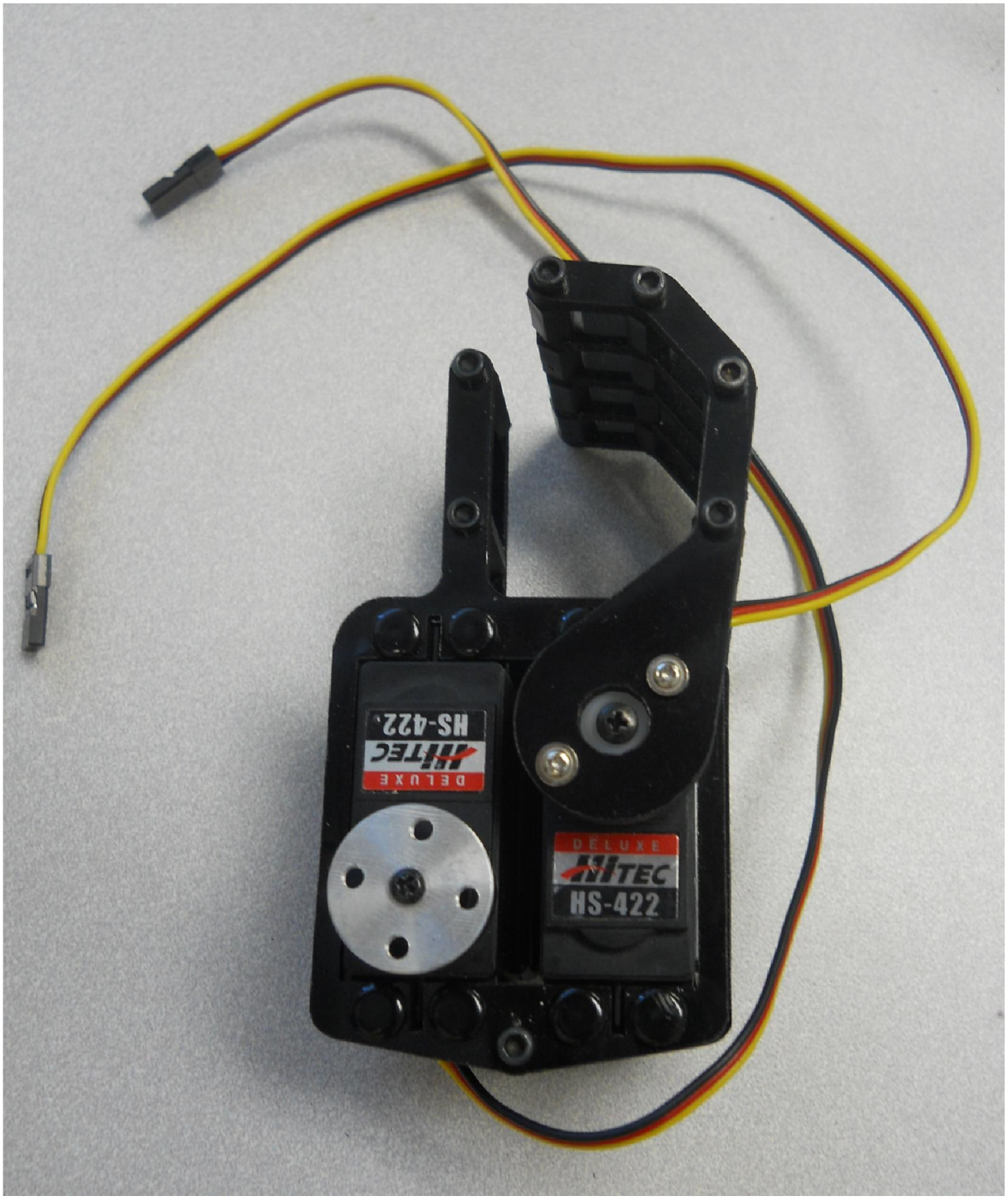

V3f
MonkMakes.com
5V
CS
470
16V
HC-SR04

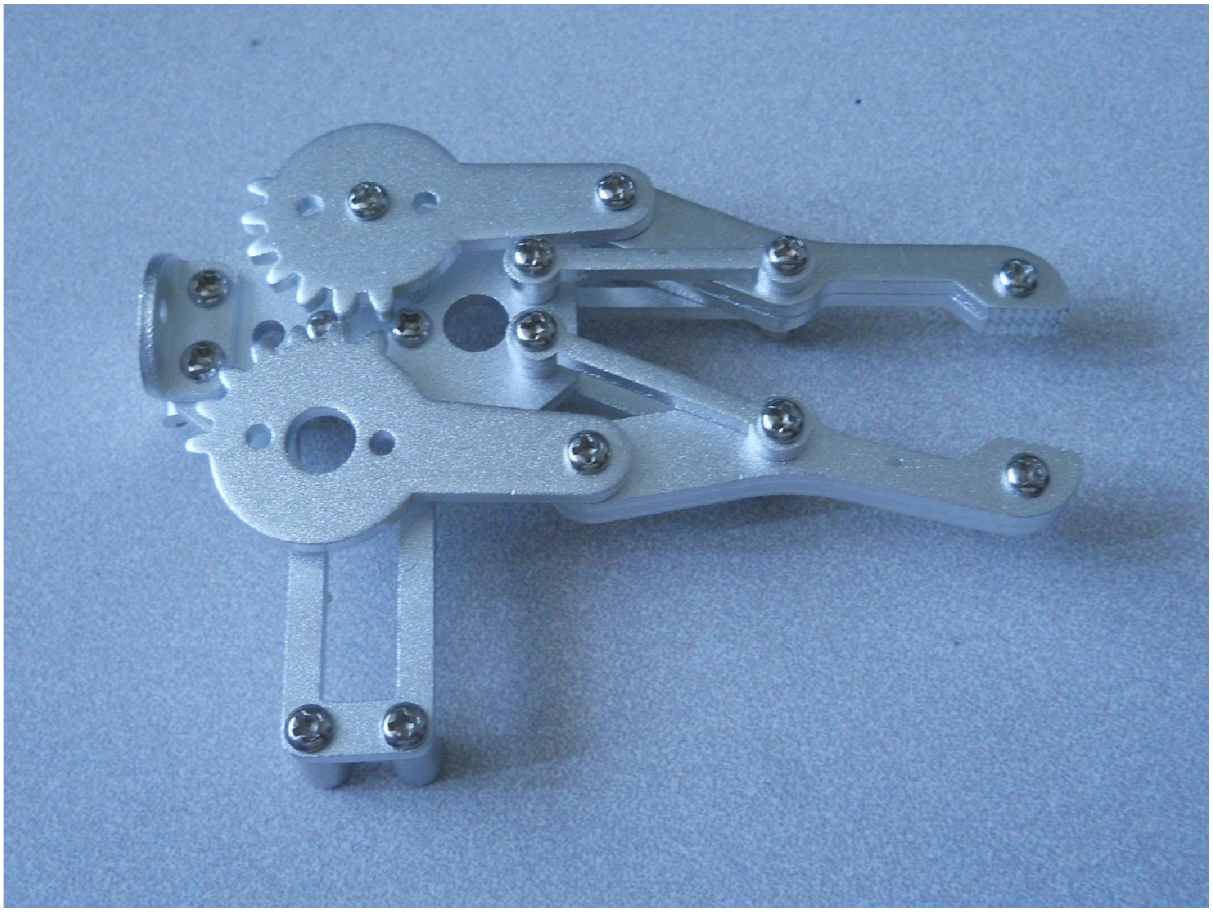


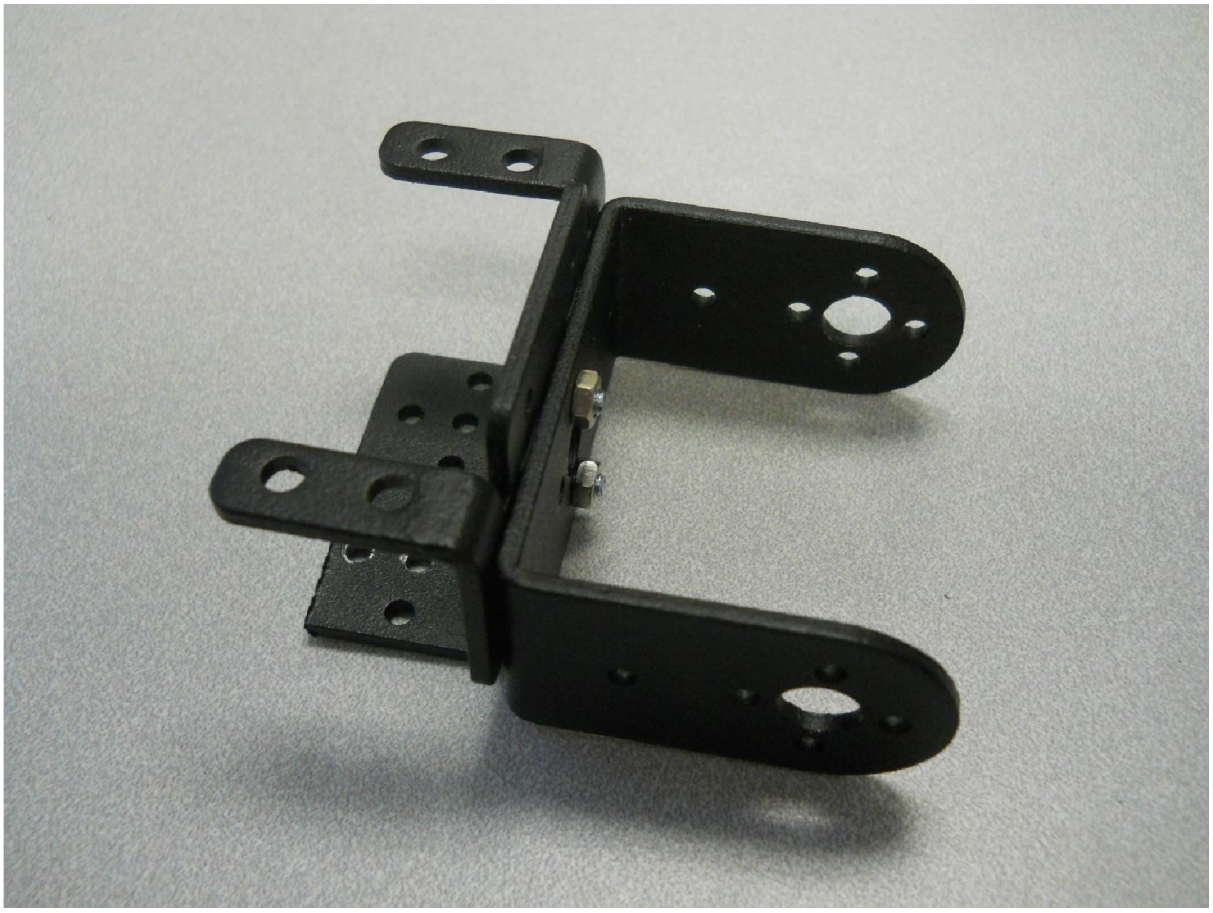


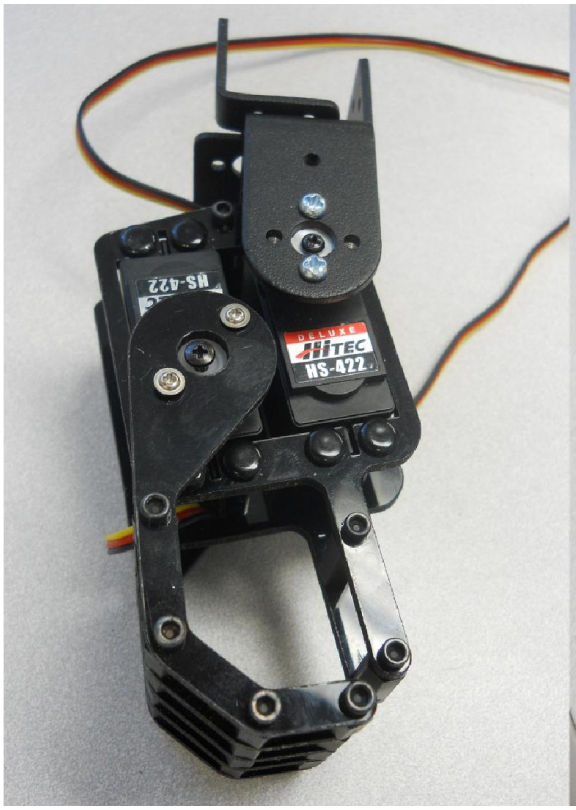

12112
Option C..
States
hop.com

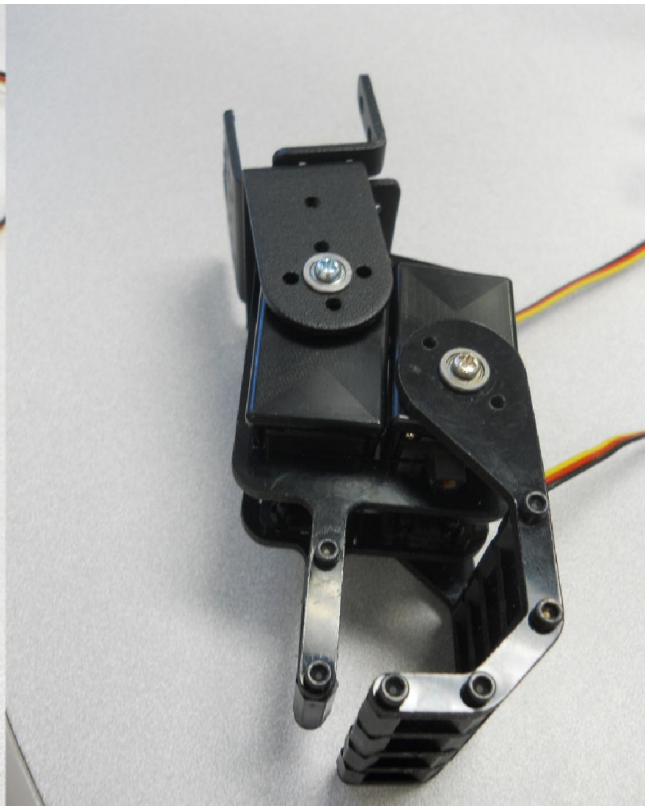

ULTRA TORQUE
HITEC
HS-645MG

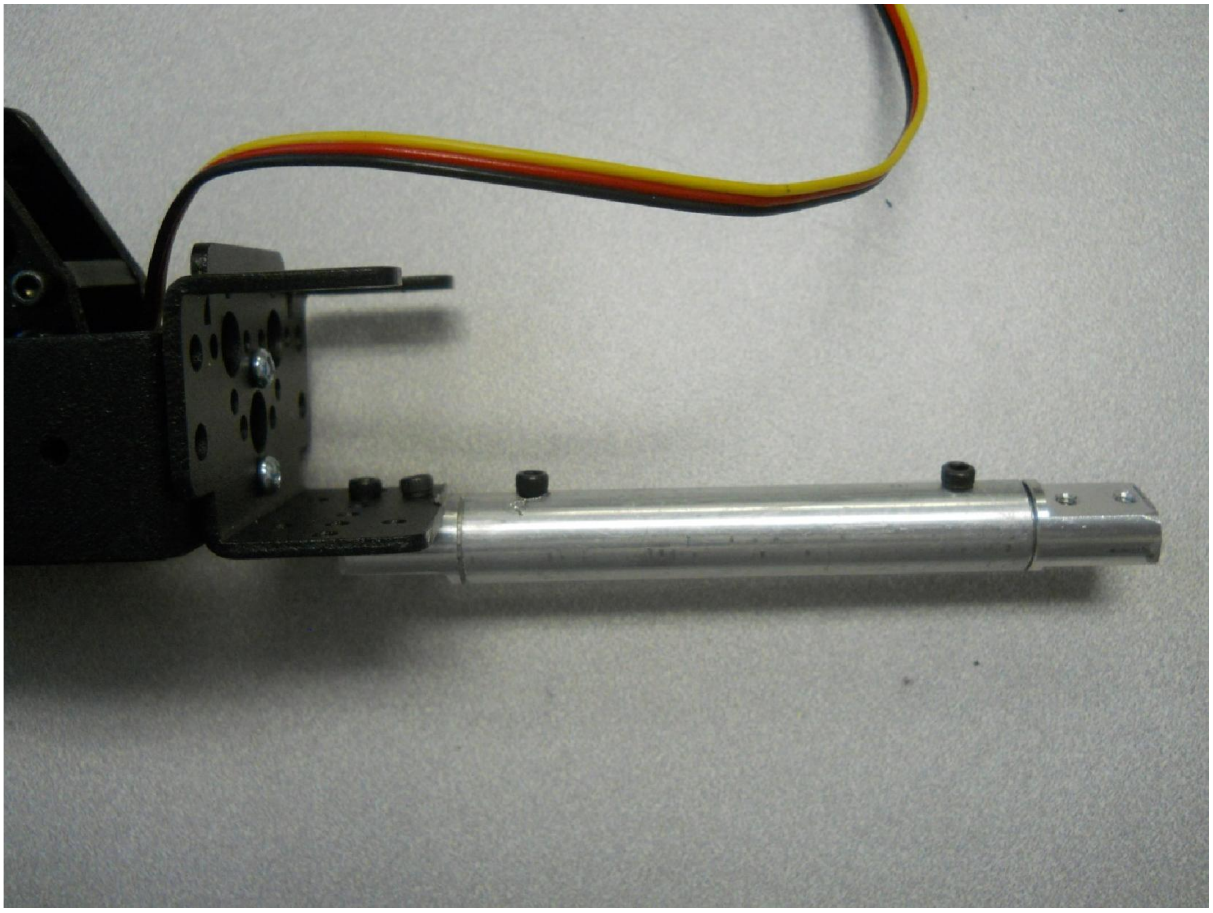

DELUXE
HITEC
HS-422

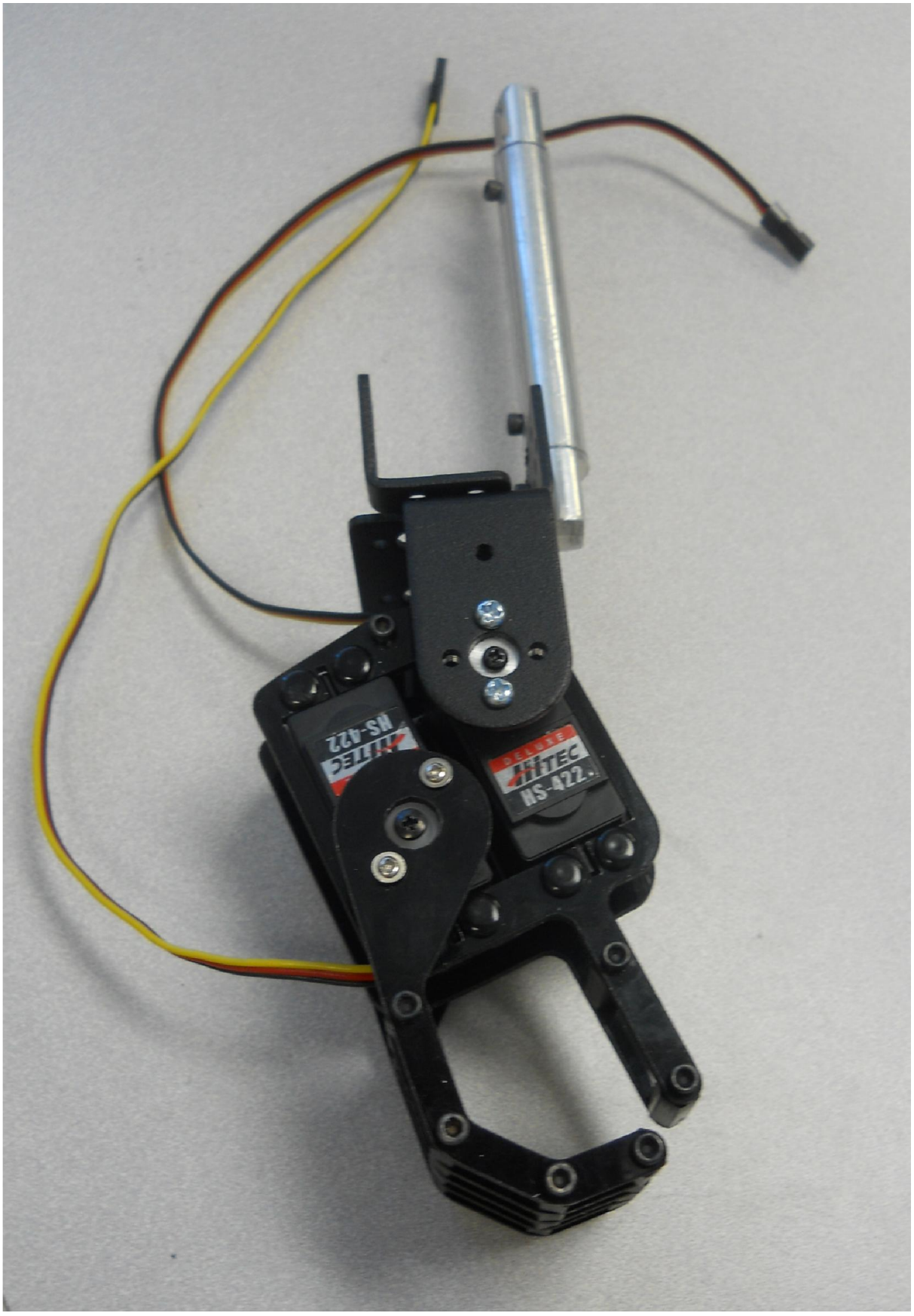


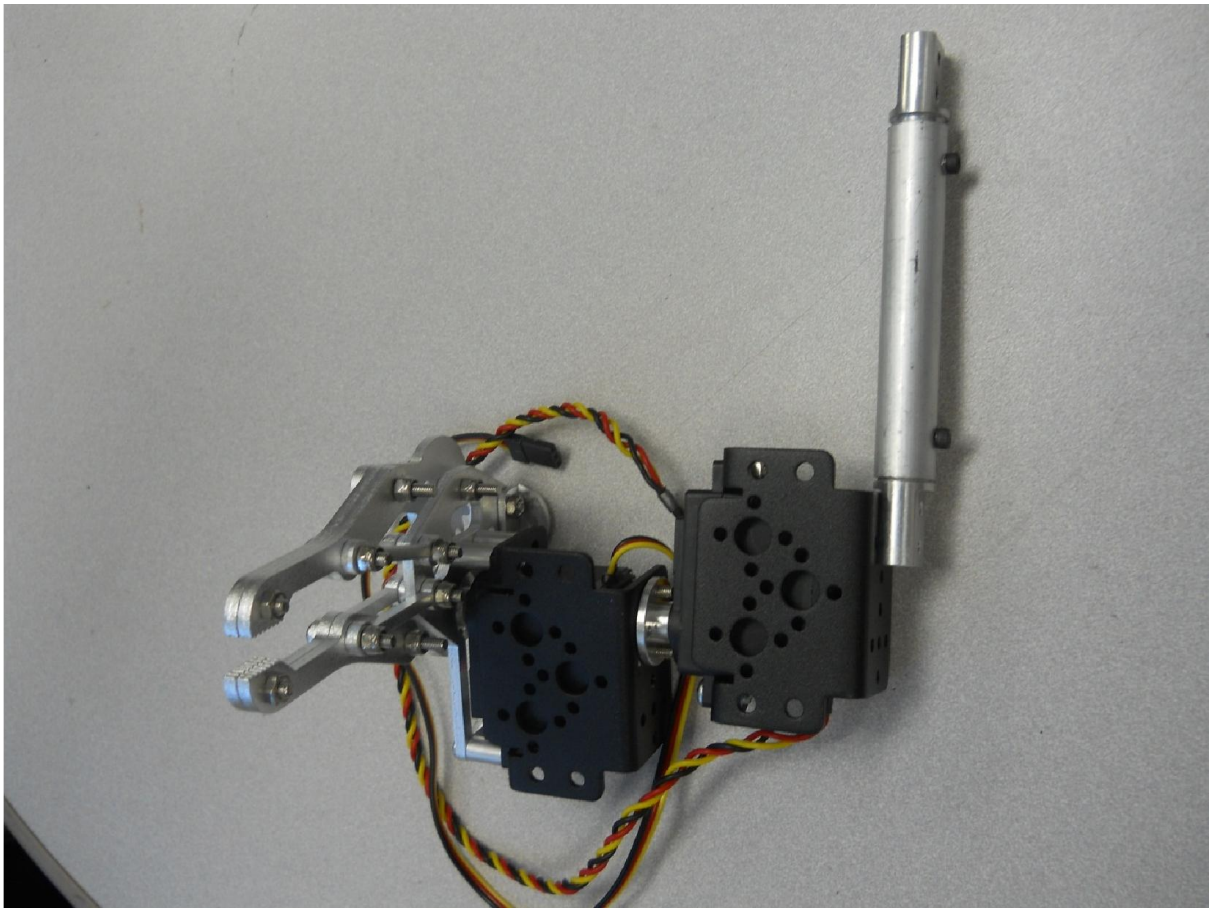


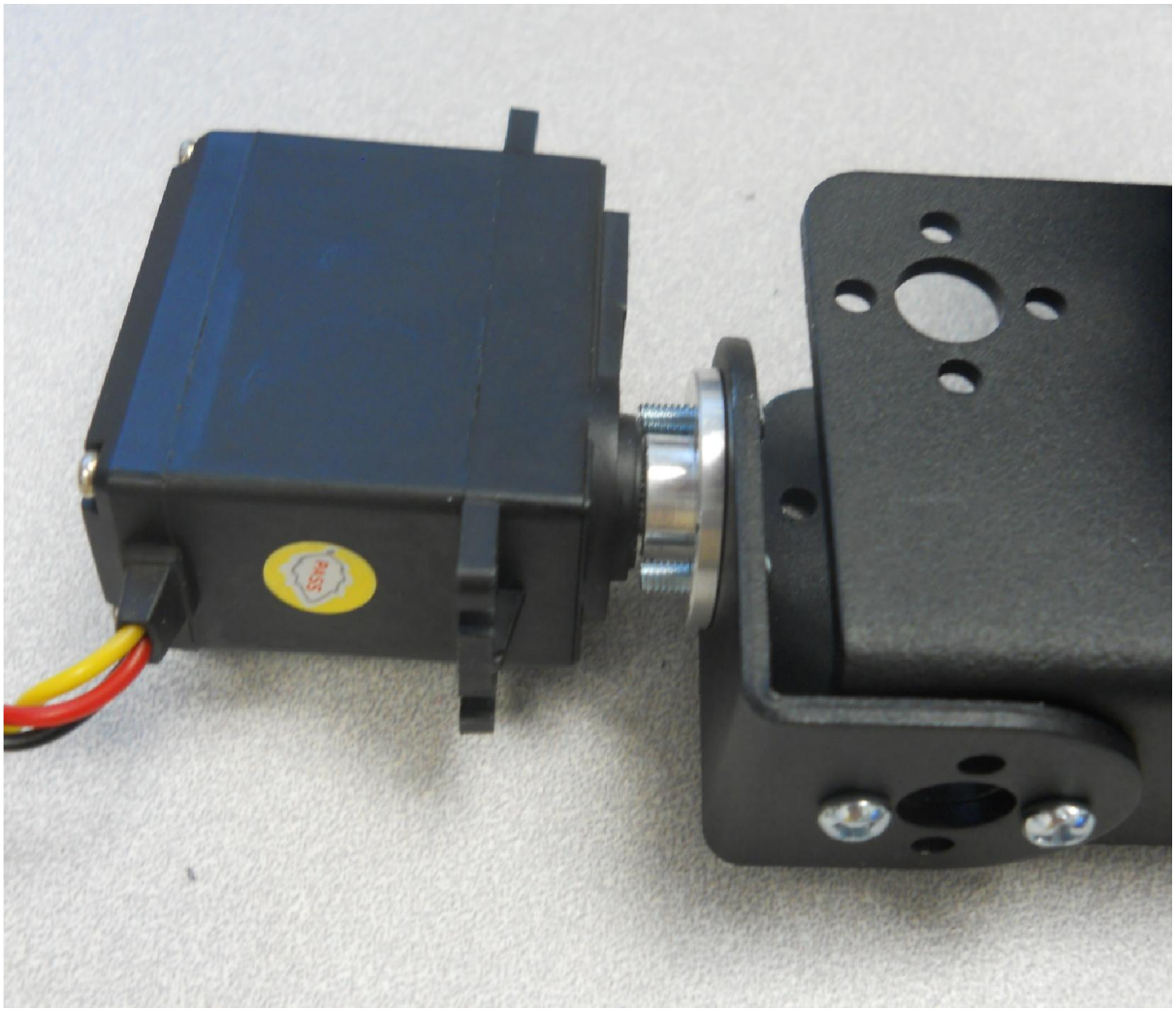

HS-422
DELUXE
HITEC
HS-422

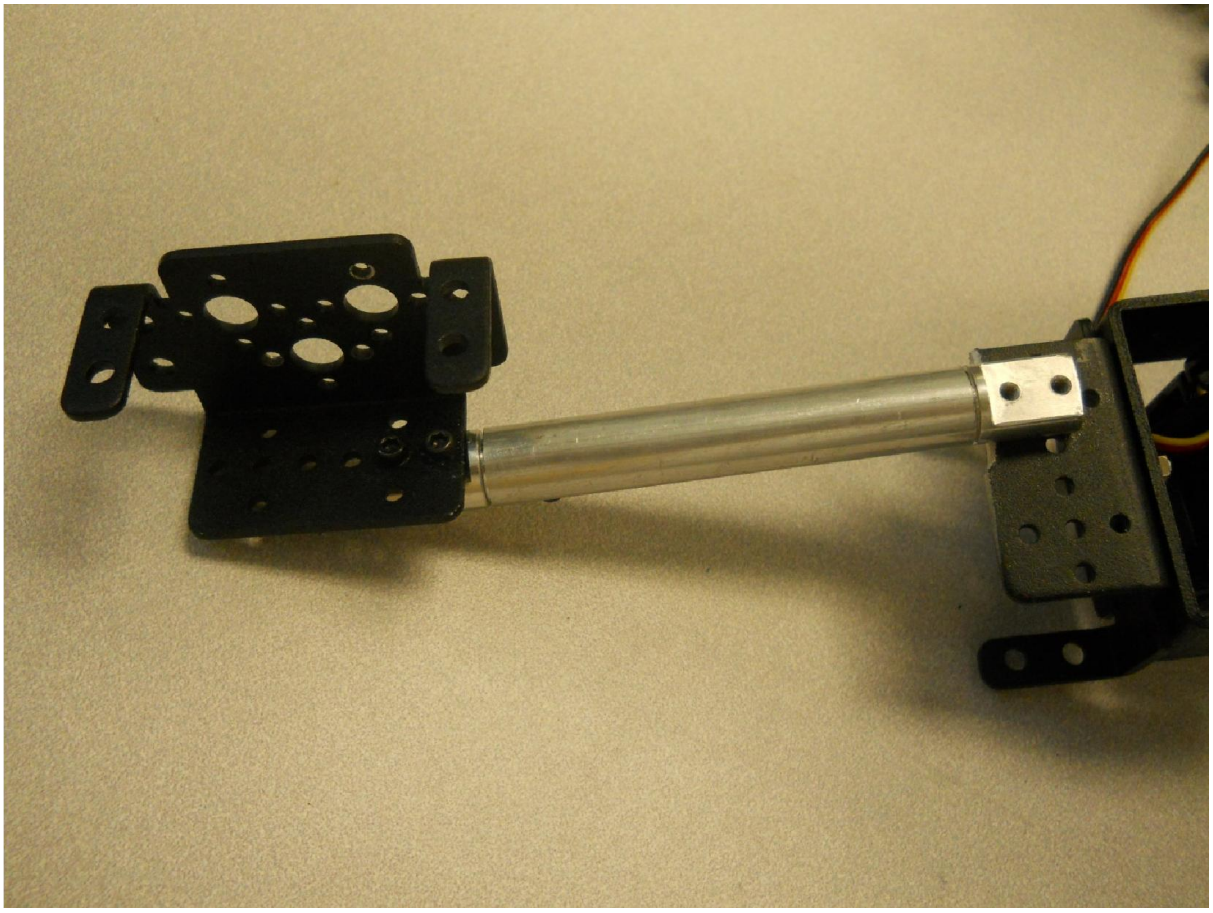


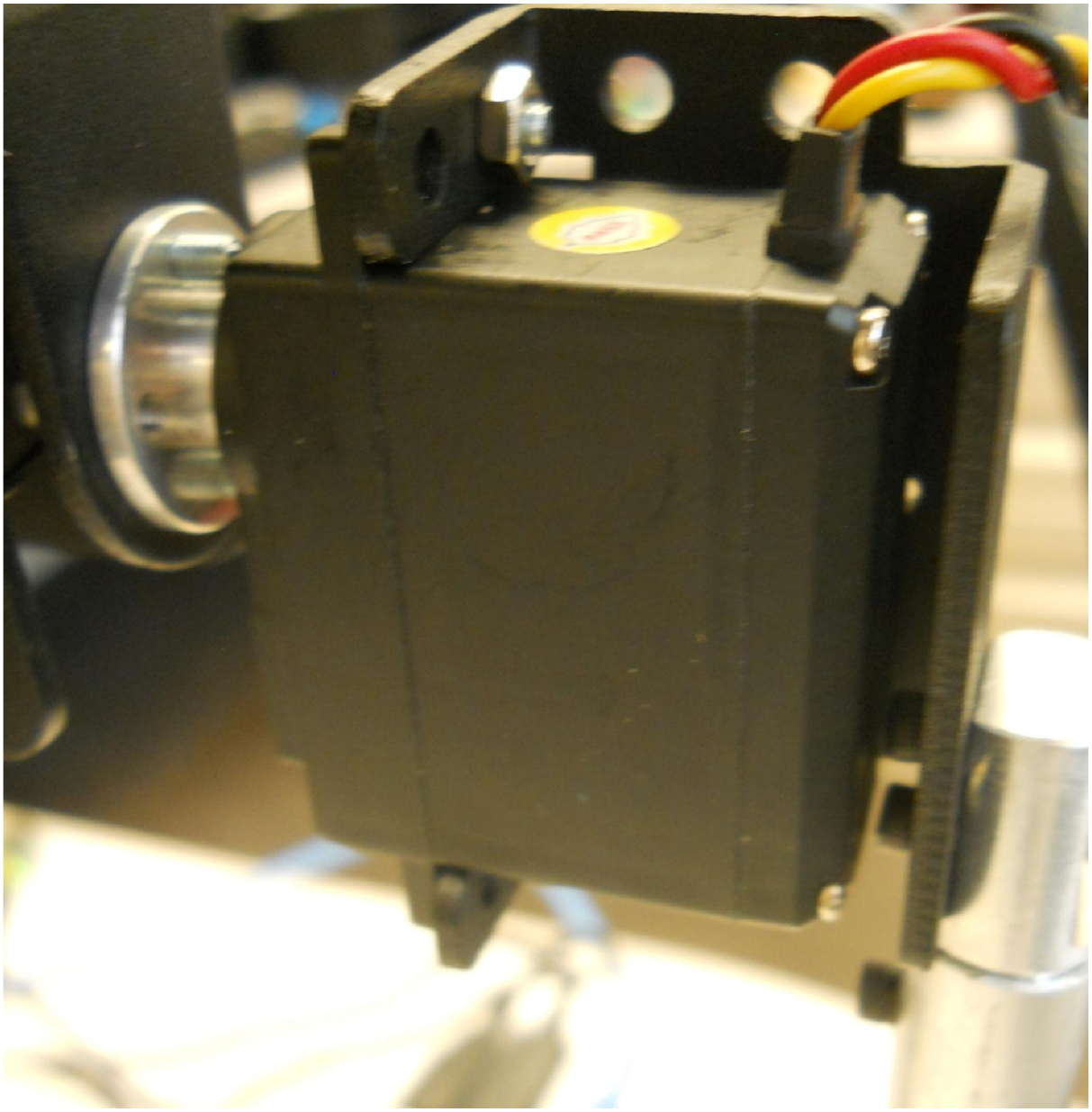


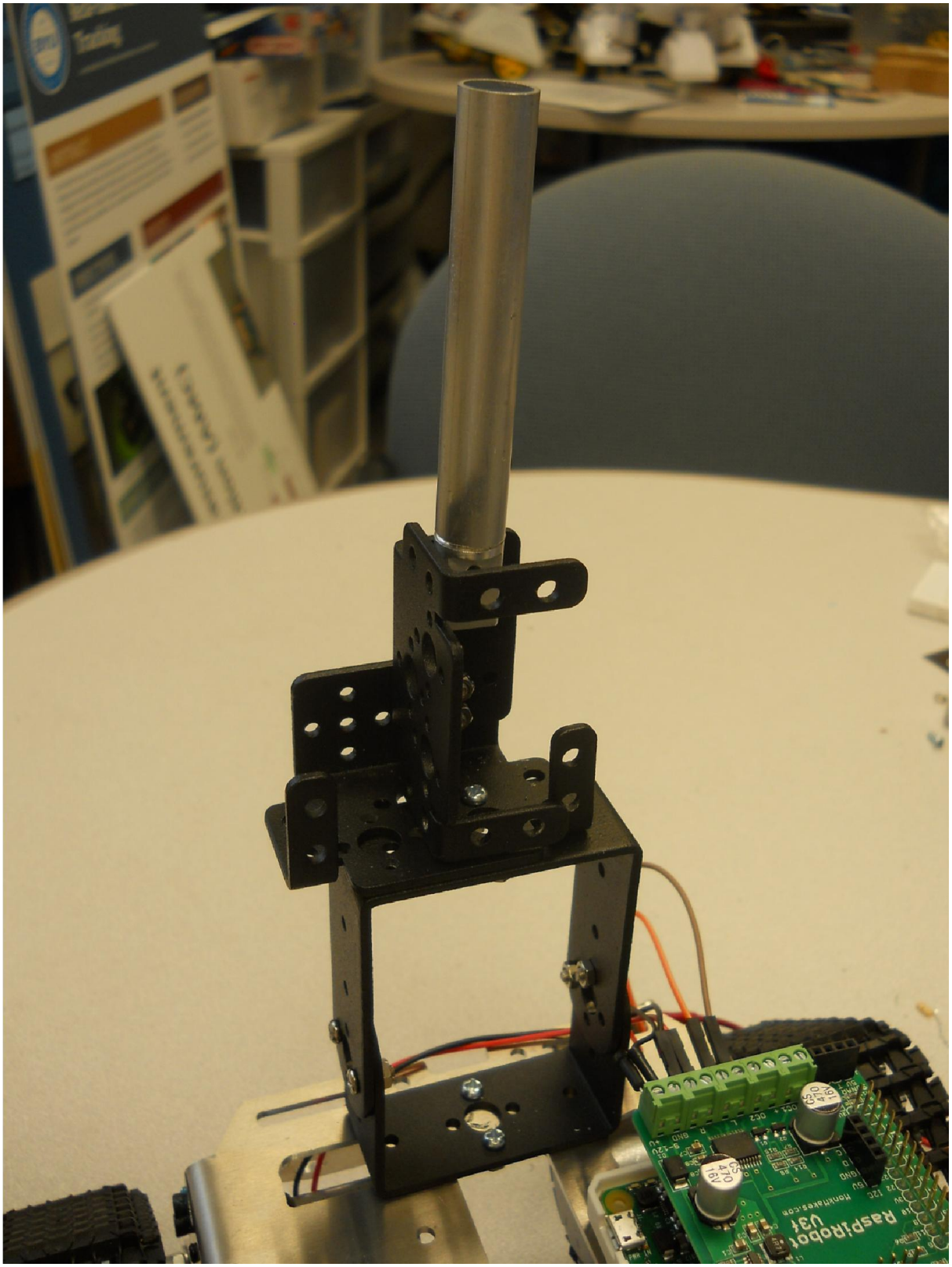

DELUXE
HITEC
HS-422

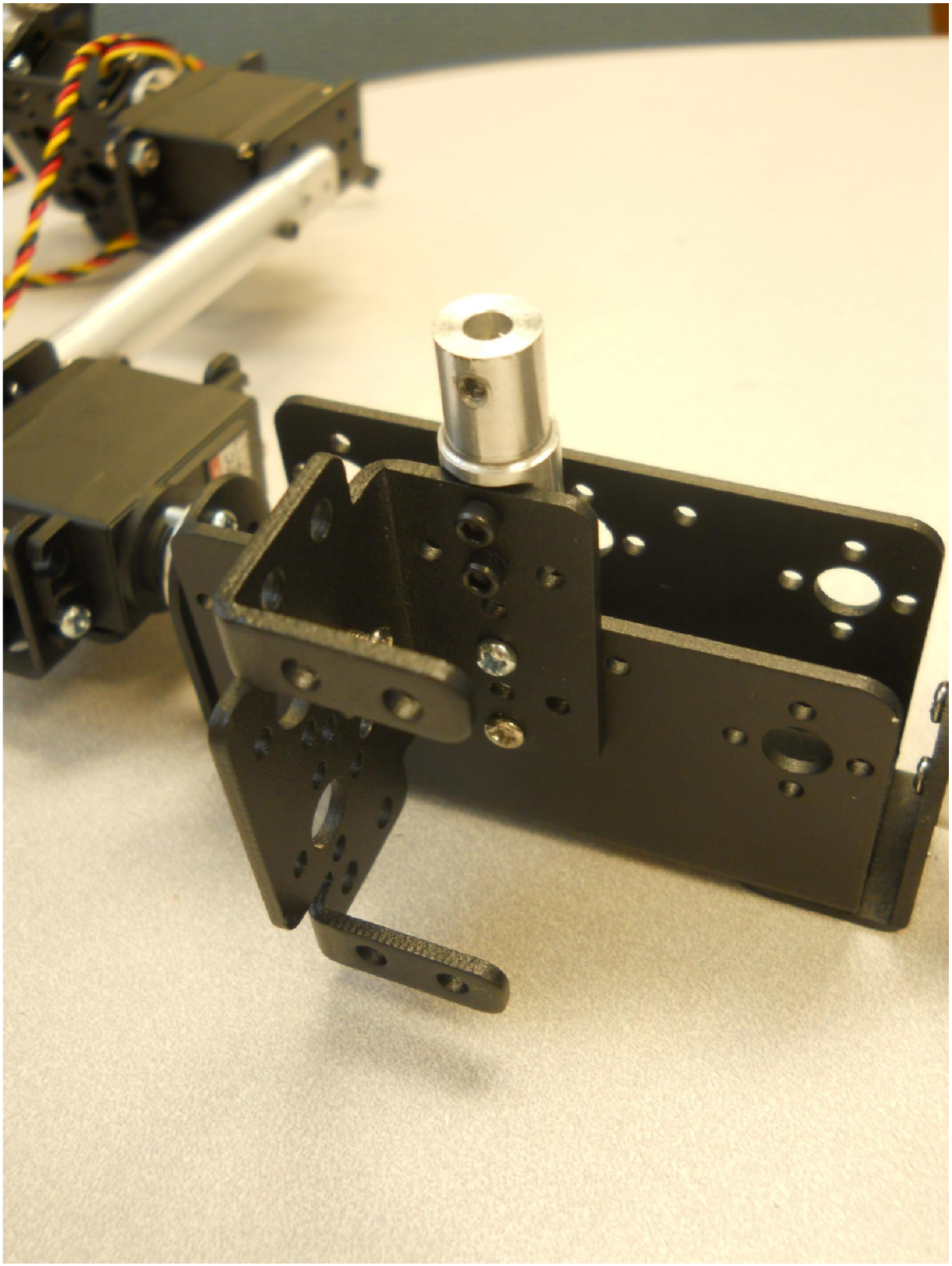


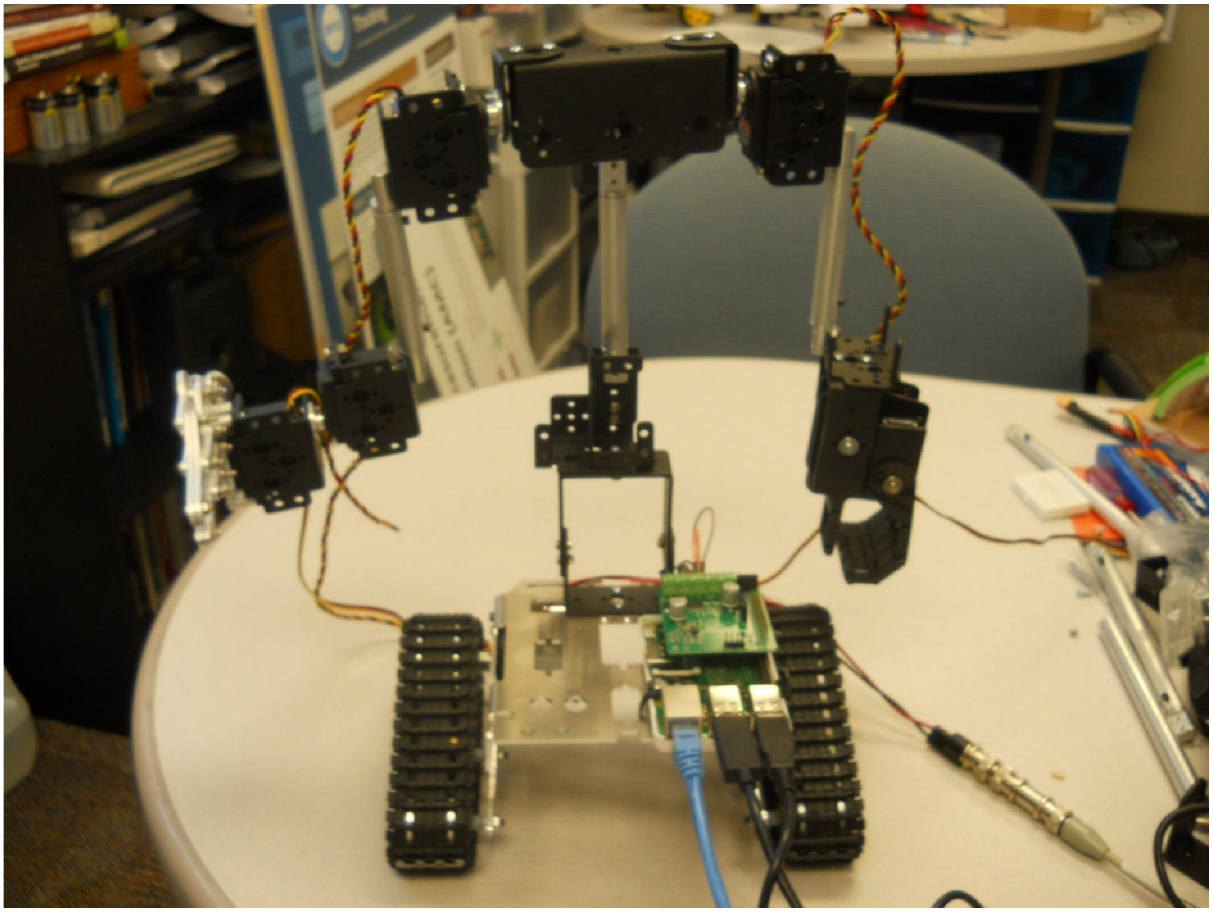


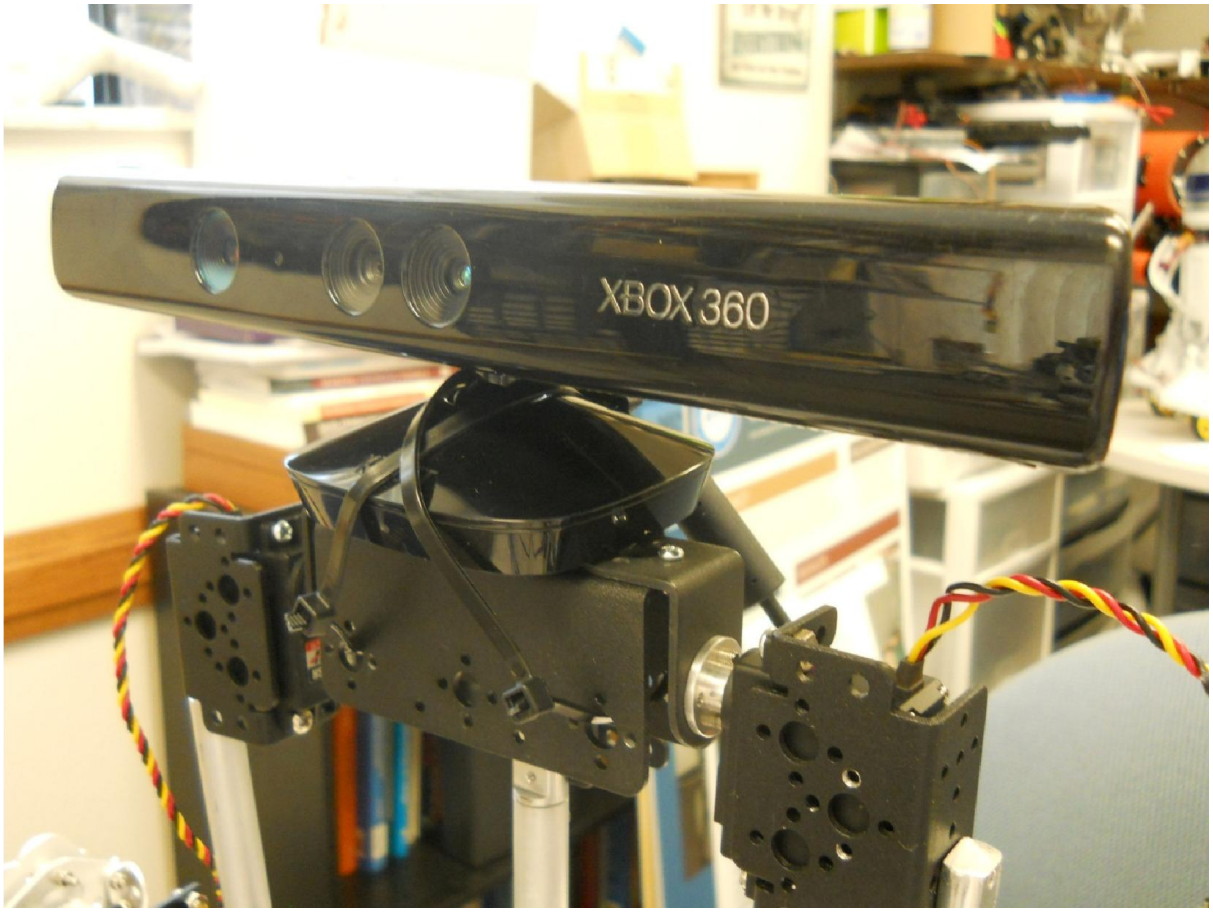


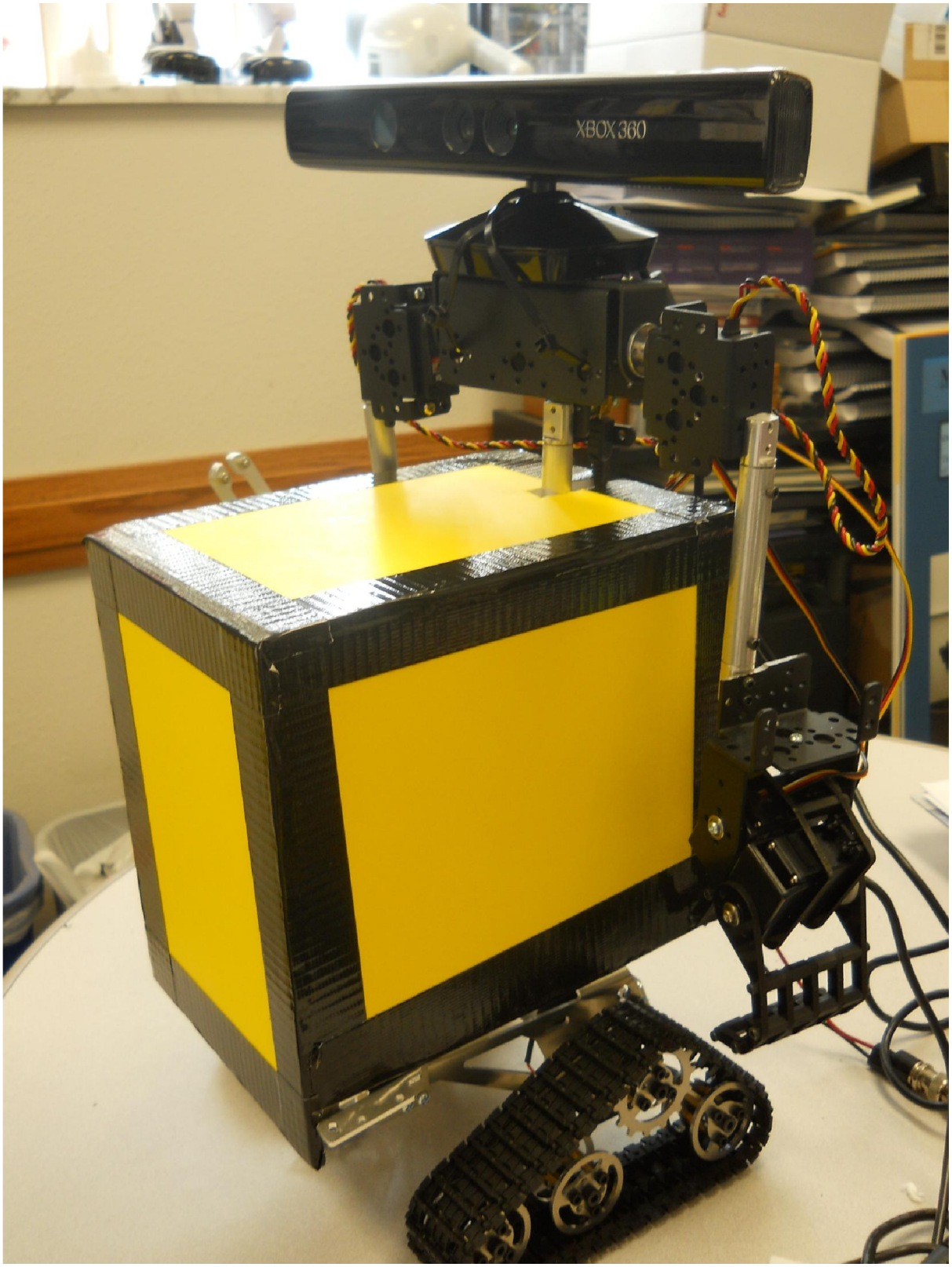


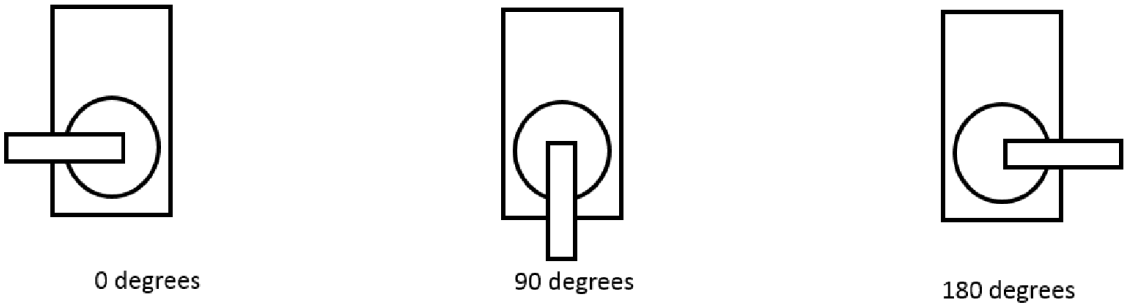

RasPiRobot
V3

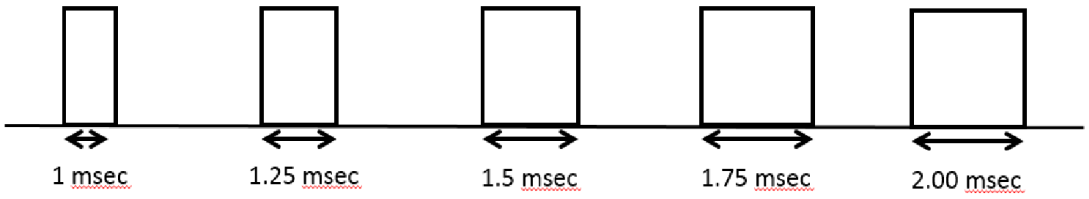





XBOX 360


XBOX 360


0 degrees
90 degrees
180 degrees


1 msec
1.25 msec
1.5 msec
1.75 msec
2.00 msec


Pololu
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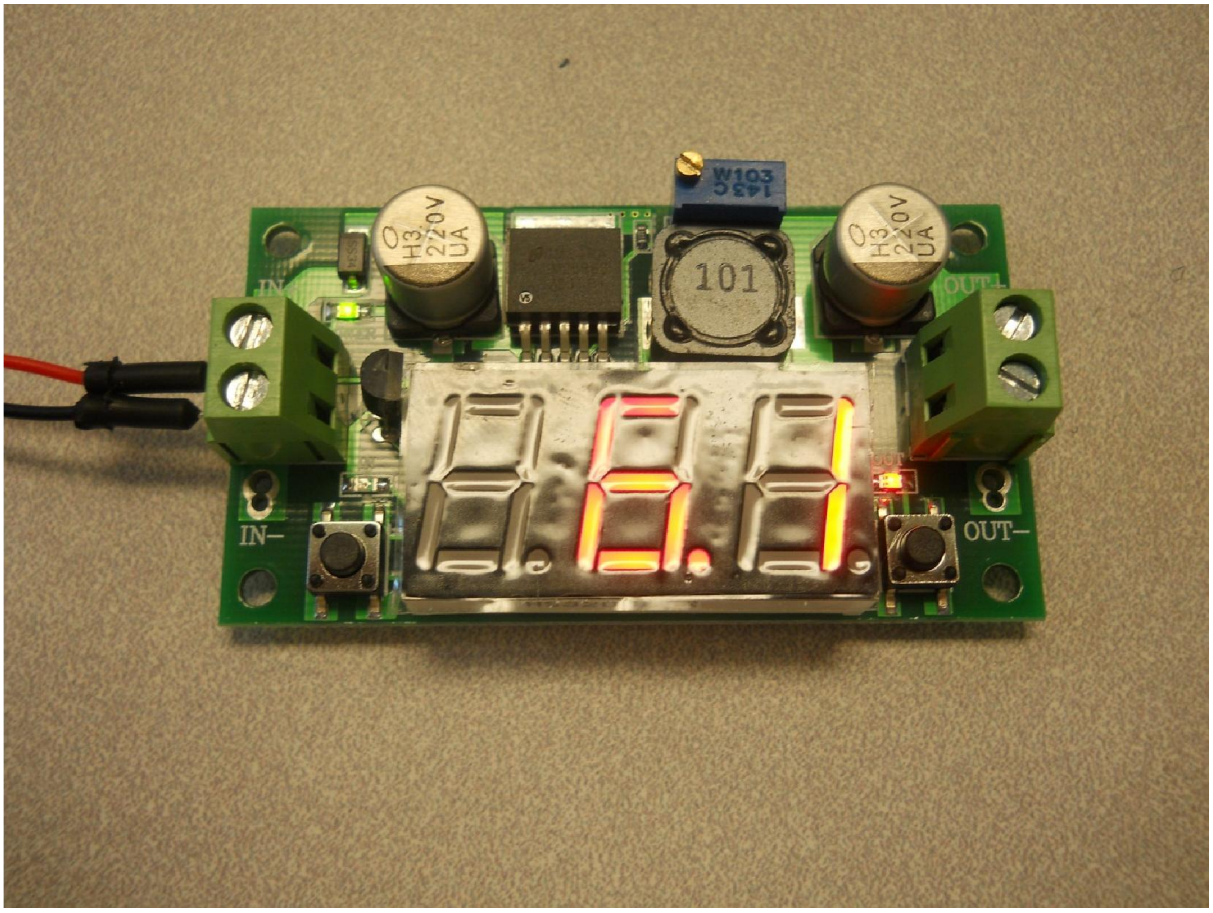
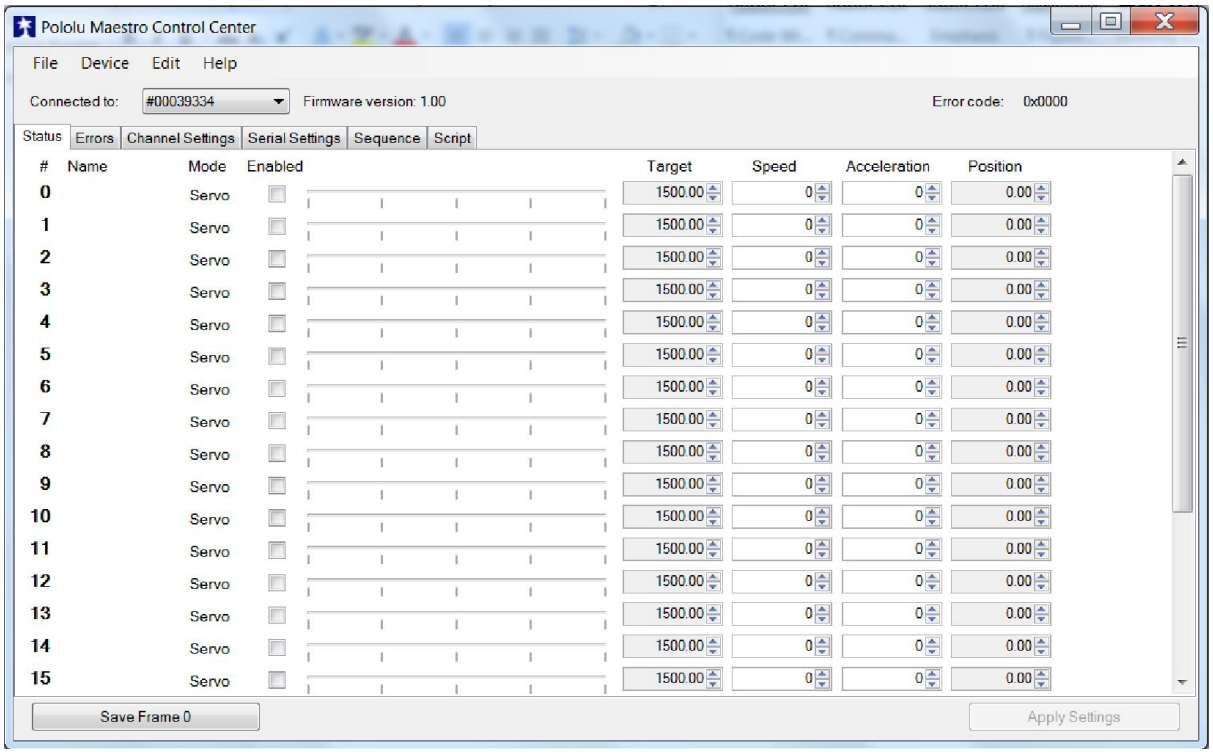
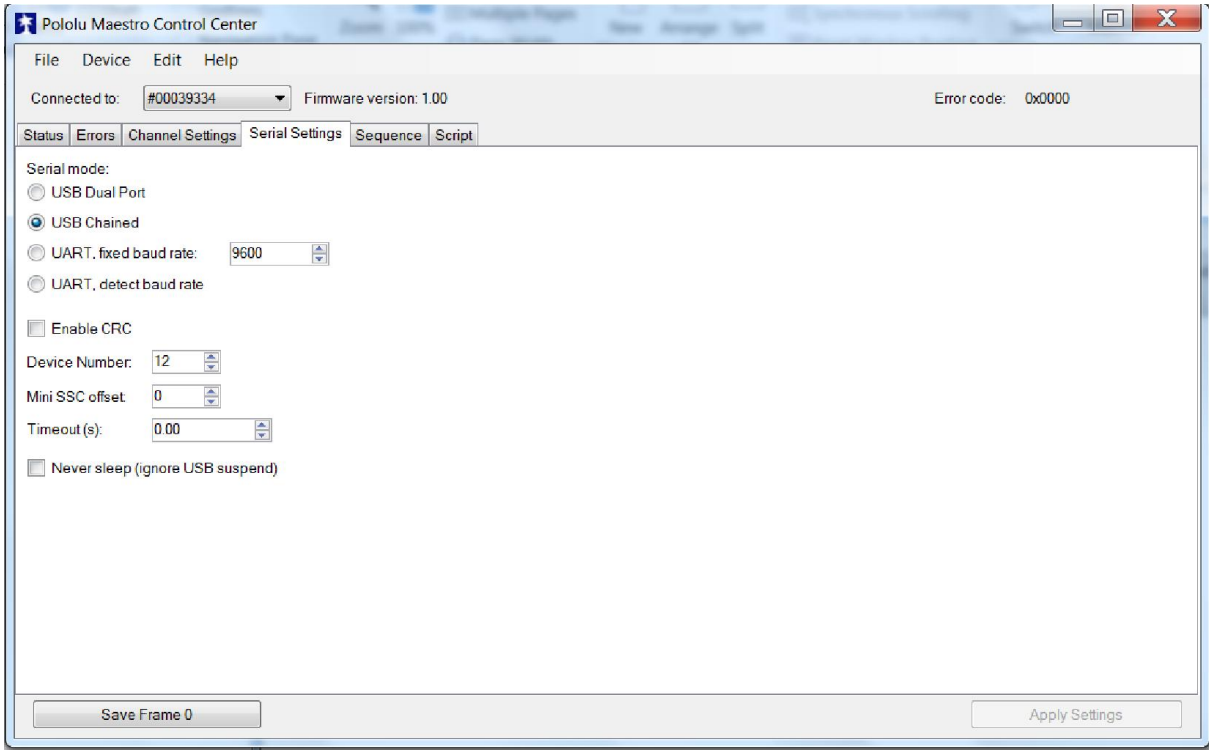
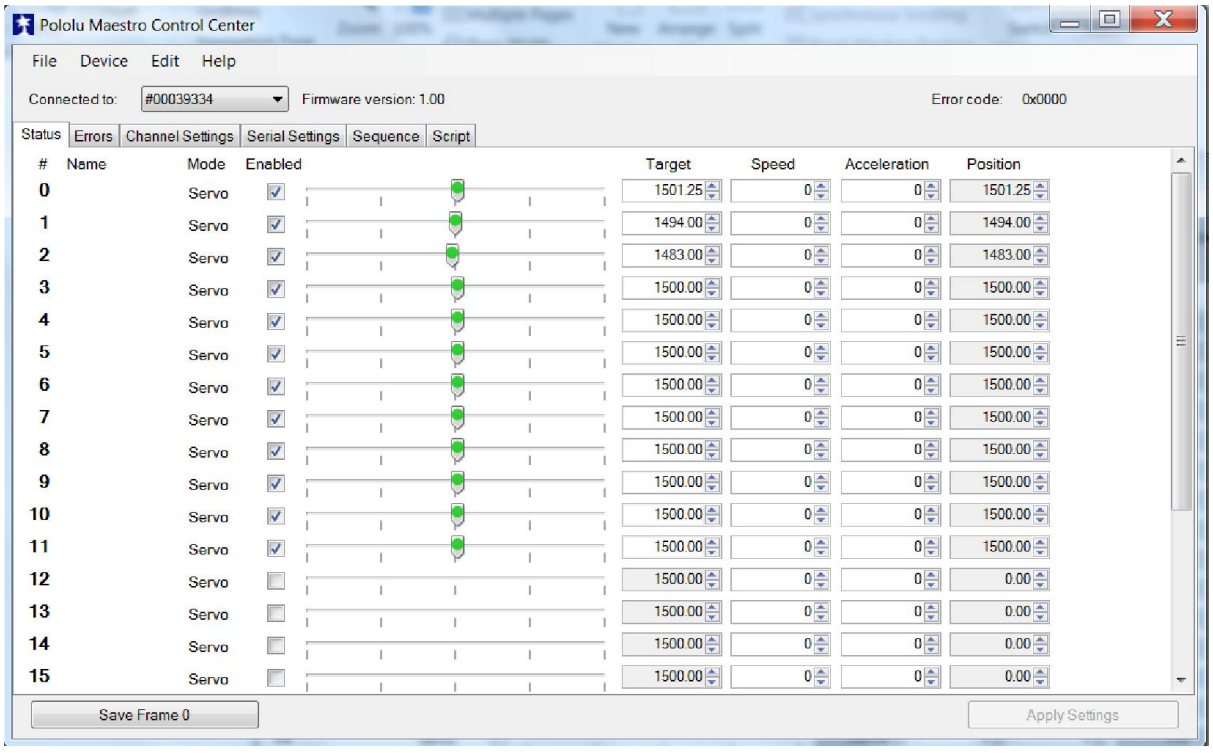
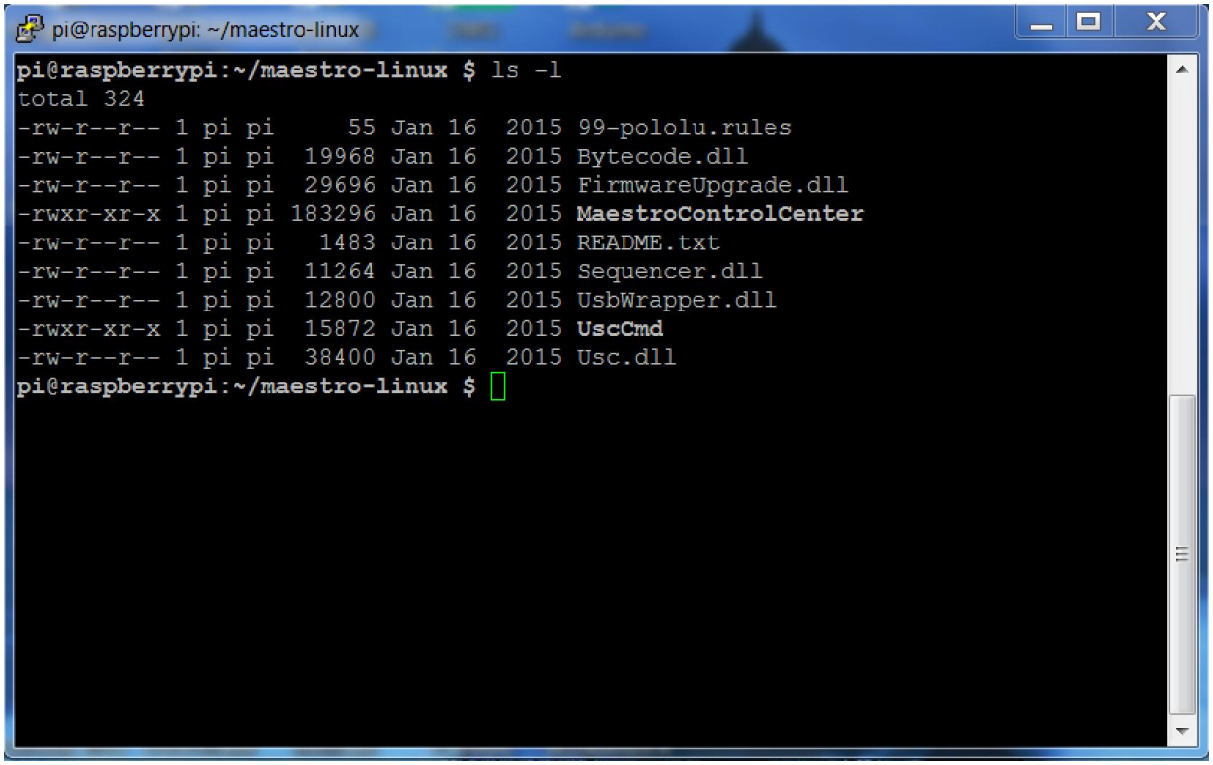
Your Brain
www.pololu.com
GND
VIN
RX
TX
RST
ERR
TXIN
(chain)
+5V
(out)
VSRV=VIN

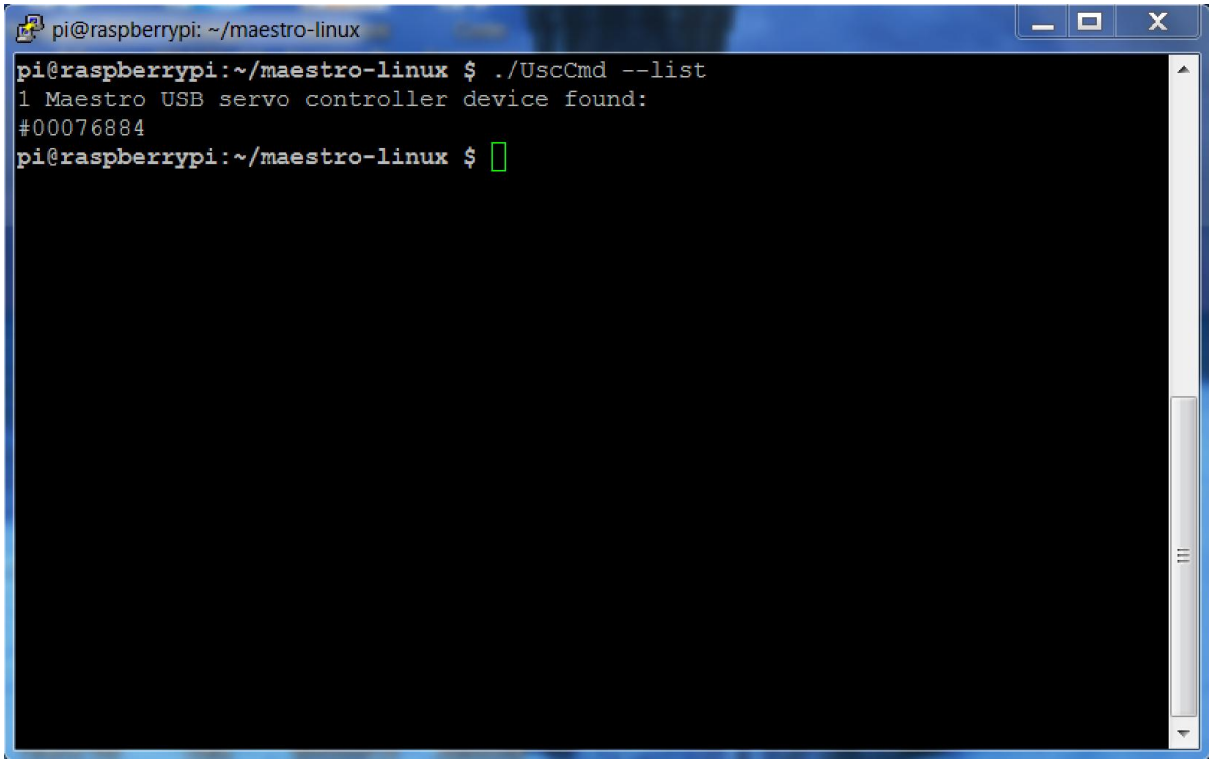

W103
143C
101
IN-
OUT-

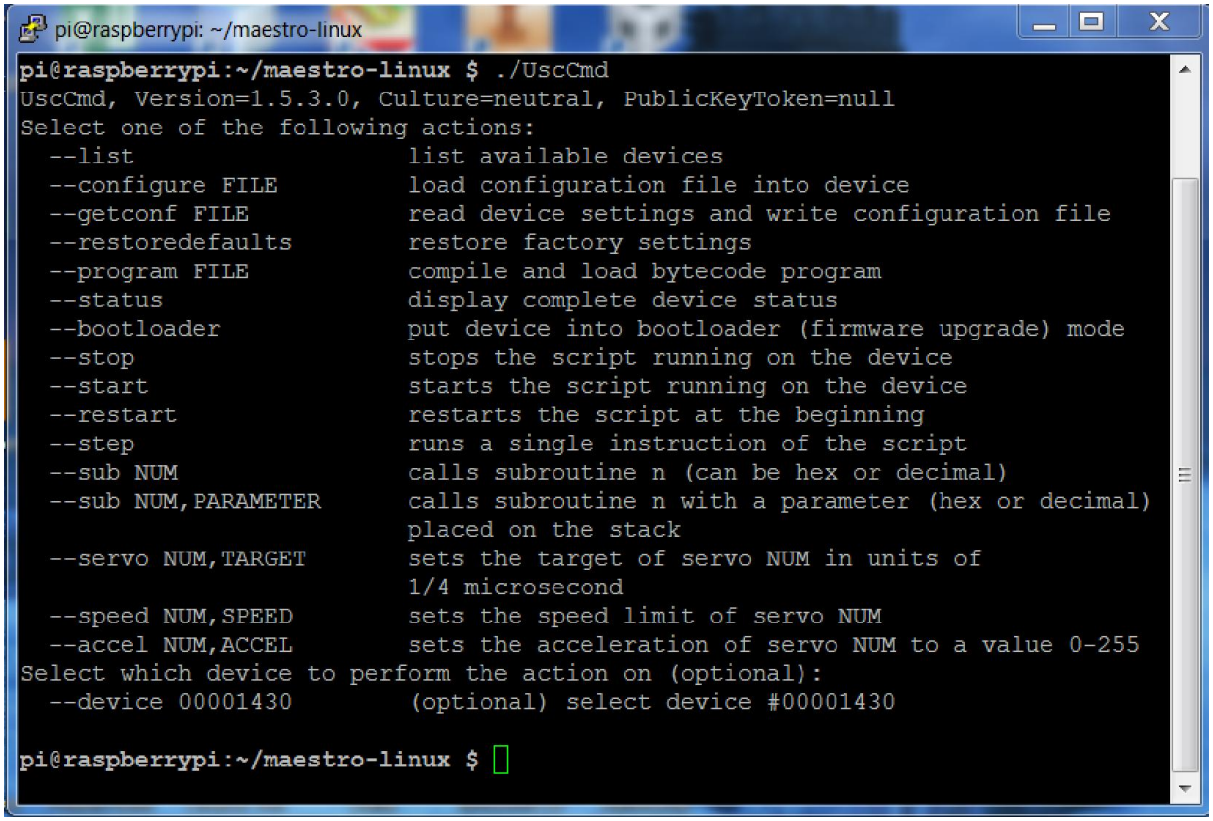

Pololu Maestro Control Center
File
Device
Edit
Help
Connected to:
#00039334
Firmware version: 1.00
Error code:
0x0000
Status
Errors
Channel Settings
Serial Settings
Sequence
Script
Name Mode Enabled Target Speed Acceleration Position
0 Servo 1500.00 0 0 0.00
1 Servo 1500.00 0 0 0.00
2 Servo 1500.00 0 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

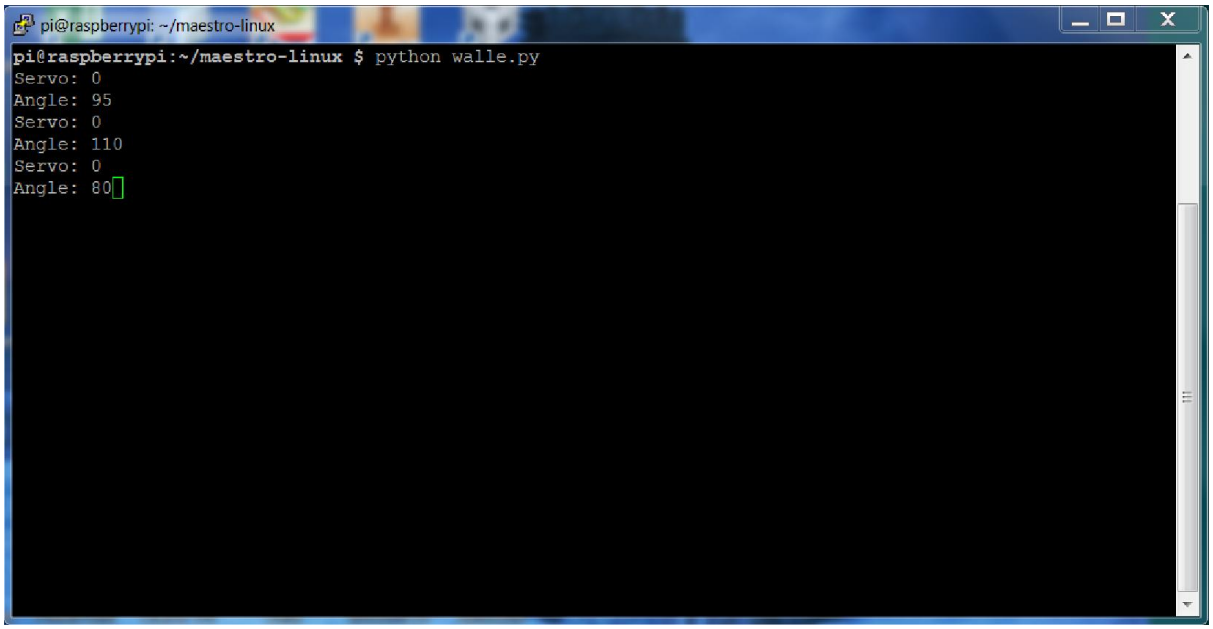

Pololu Maestro Control Center
File Device Edit Help
Connected to: #00039334 Firmware version: 1.00 Error code: 0x0000
Status Errors Channel Settings Serial Settings Sequence Script
Serial mode:
USB Dual Port
USB Chained
UART, fixed baud rate: 9600
UART, detect baud rate
Enable CRC
Device Number: 12
Mini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

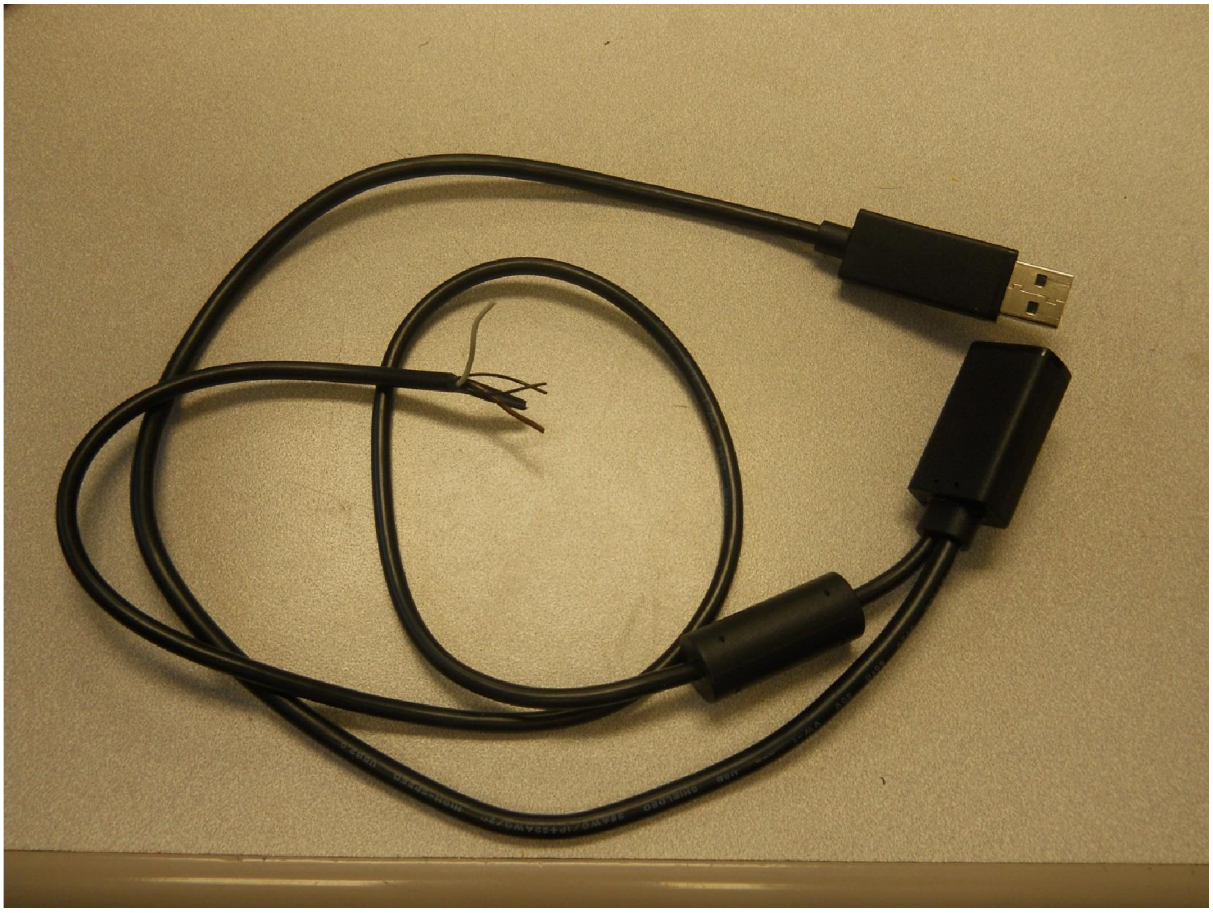

Pololu Maestro Control Center
File Device Edit Help
Connected to: #00039334 Firmware version: 1.00 Error code: 0x0000
Status Errors Channel Settings Serial Settings Sequence Script
Name Mode Enabled Target Speed Acceleration Position
0 Servo 1501.25 0 0 1501.25
1 Servo 1494.00 0 0 1494.00
2 Servo 1483.00 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

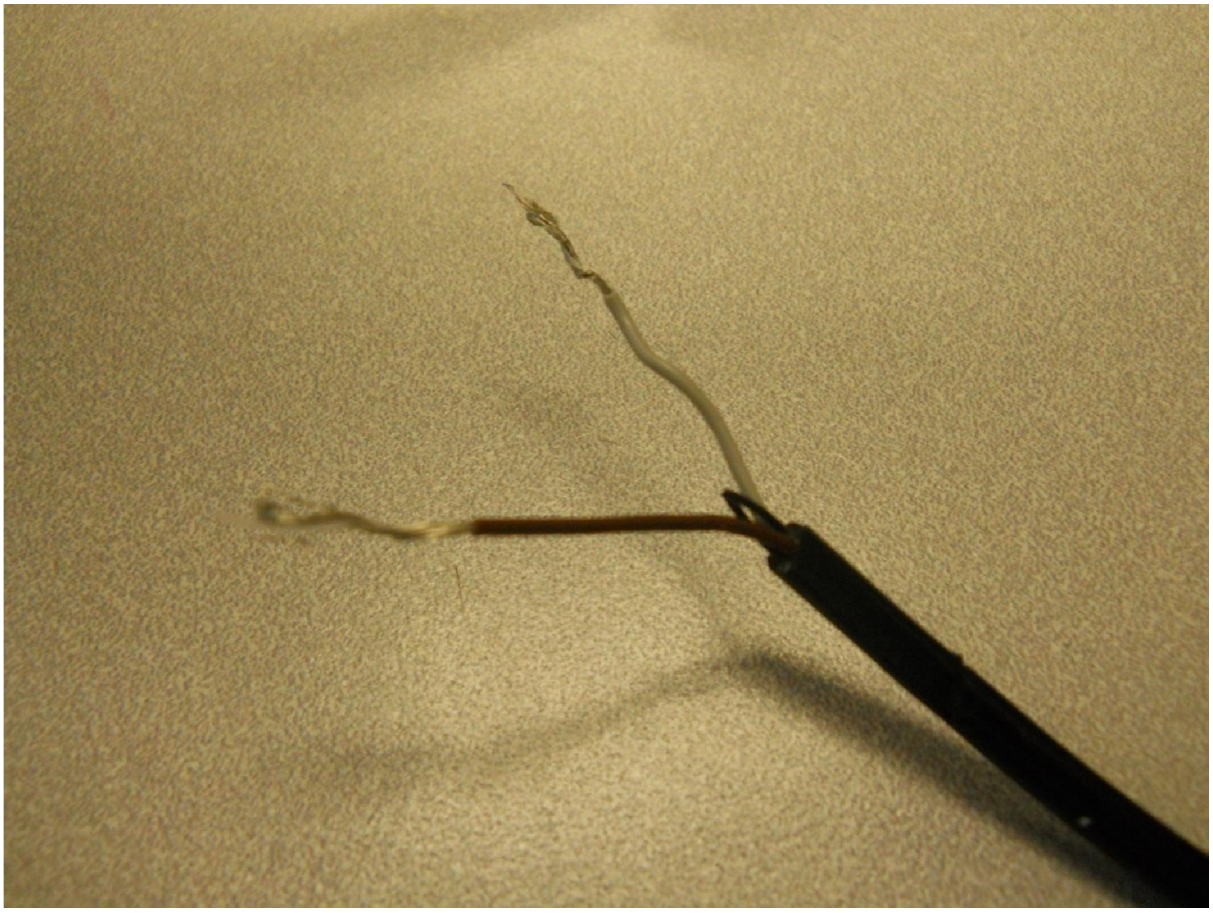

pi@raspberrypi: ~/maestro-linux
pi@raspberrypi:~/maestro-linux $ ls -l
total 324
-rw-r--r-- 1 pi pi   55 Jan 16 2015 99-pololu.rules
-rw-r--r-- 1 pi pi 19968 Jan 16 2015 Bytecode.dll
-rw-r--r-- 1 pi pi 29696 Jan 16 2015 FirmwareUpgrade.dll
-rwxr-xr-x 1 pi pi 183296 Jan 16 2015 MaestroControlCenter
-rw-r--r-- 1 pi pi   1483 Jan 16 2015 README.txt
-rw-r--r-- 1 pi pi 11264 Jan 16 2015 Sequencer.dll
-rw-r--r-- 1 pi pi 12800 Jan 16 2015 UsbWrapper.dll
-rwxr-xr-x 1 pi pi 15872 Jan 16 2015 UscCmd
-rw-r--r-- 1 pi pi 38400 Jan 16 2015 Usc.dll
pi@raspberrypi:~/maestro-linux $

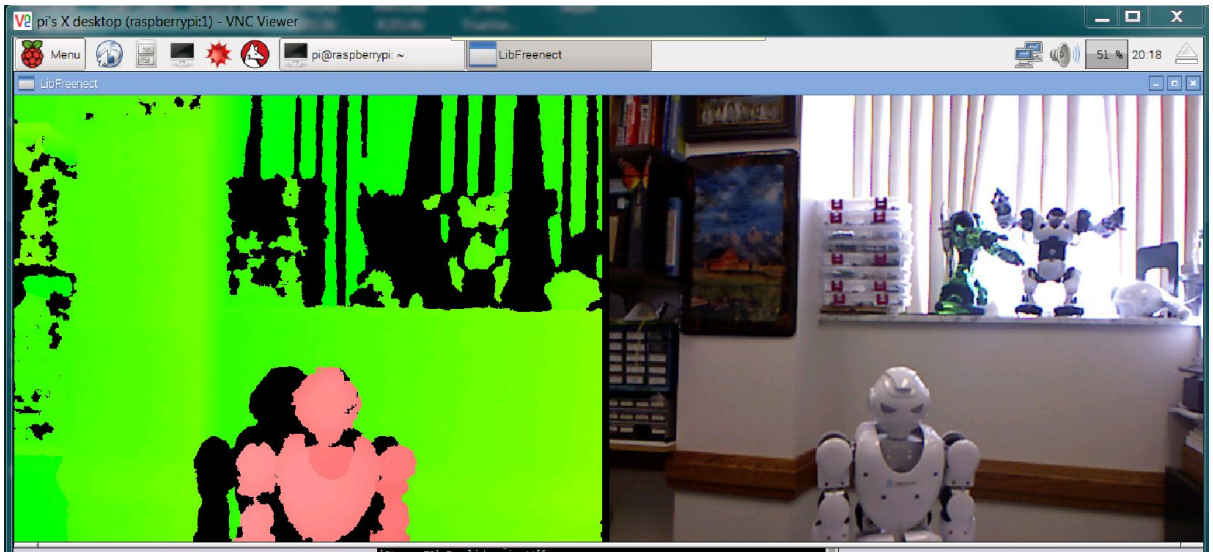

pi@raspberrypi: ~/maestro-linux
pi@raspberrypi:~/maestro-linux $ ./UscCmd --list
1 Maestro USB servo controller device found:
#00076884
pi@raspberrypi:~/maestro-linux $

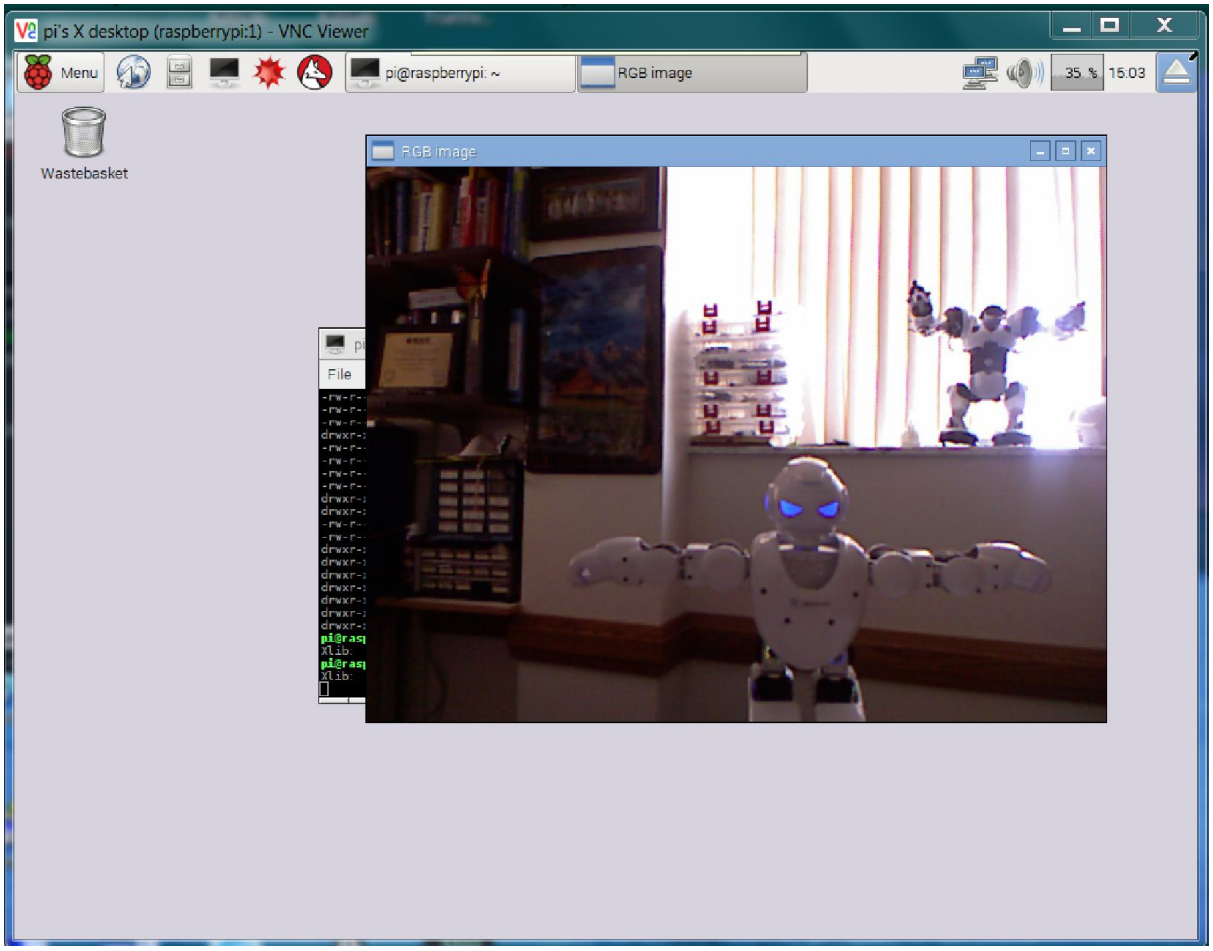

pi@raspberrypi: ~/maestro-linux
pi@raspberrypi:~/maestro-linux $ ./UscCmd
UscCmd, Version=1.5.3.0, Culture=neutral, PublicKeyToken=null
Select one of the following actions:
--list list available devices
--configure FILE load configuration file into device
--getconf FILE read device settings and write 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 $

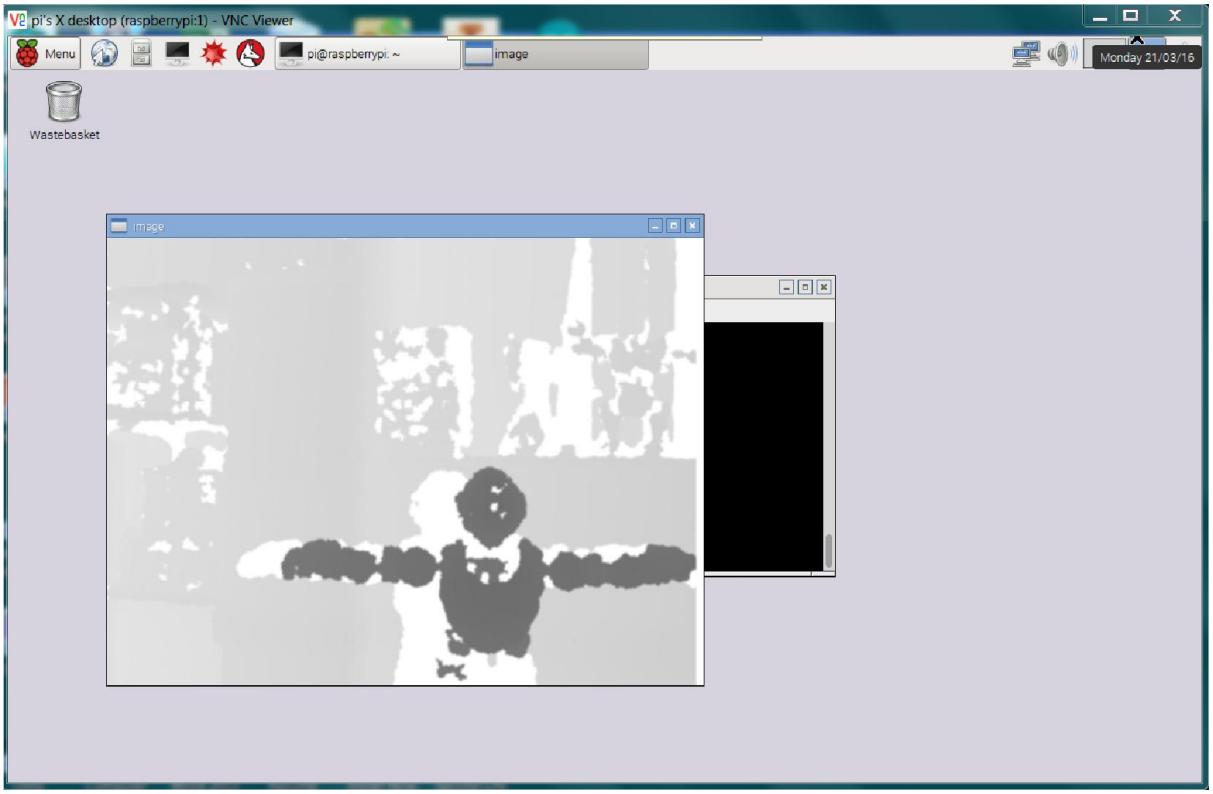

pi@raspberrypi: ~/maestro-linux
pi@raspberrypi:~/maestro-linux $ python walle.py
Servo: 0
Angle: 95
Servo: 0
Angle: 110
Servo: 0
Angle: 80



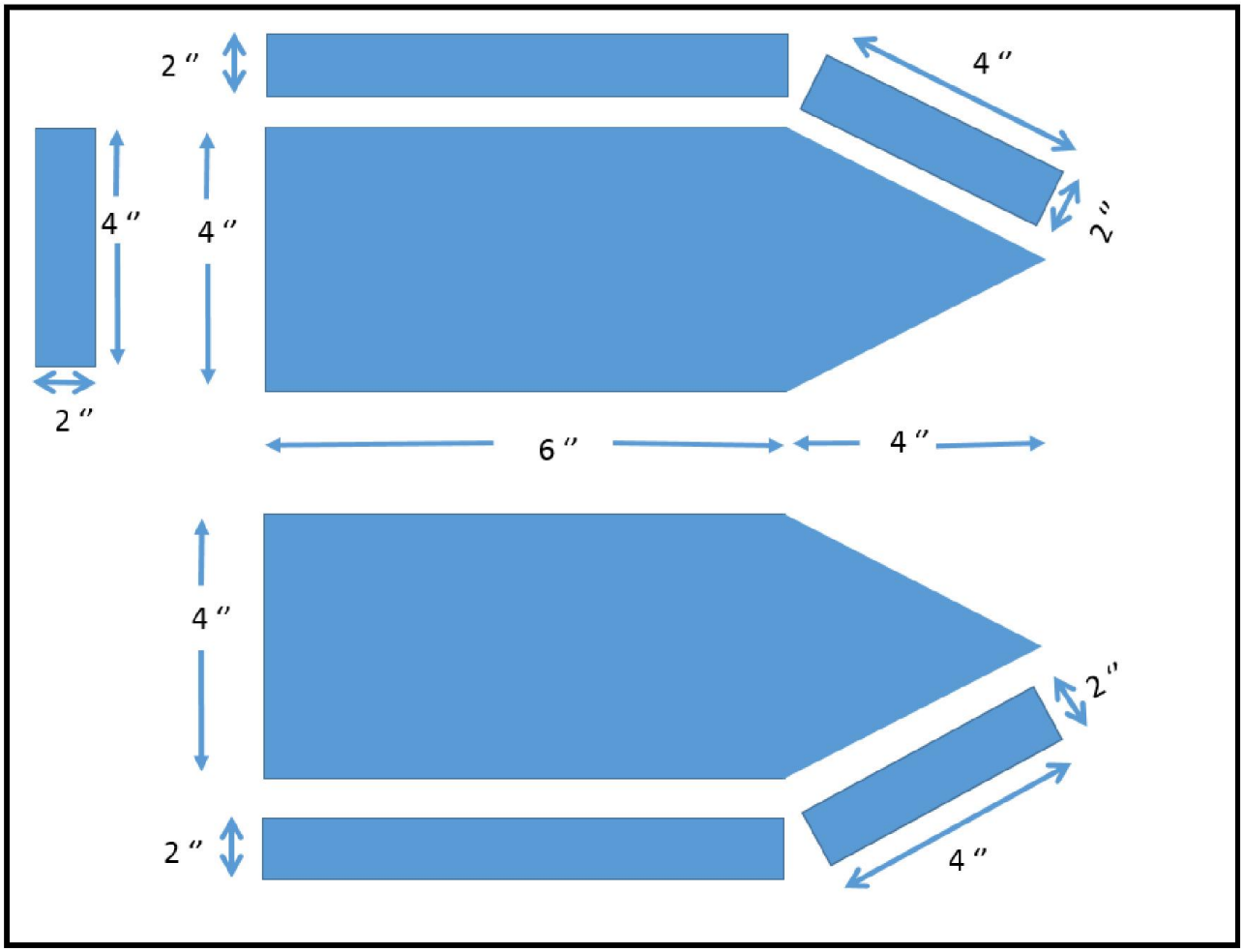


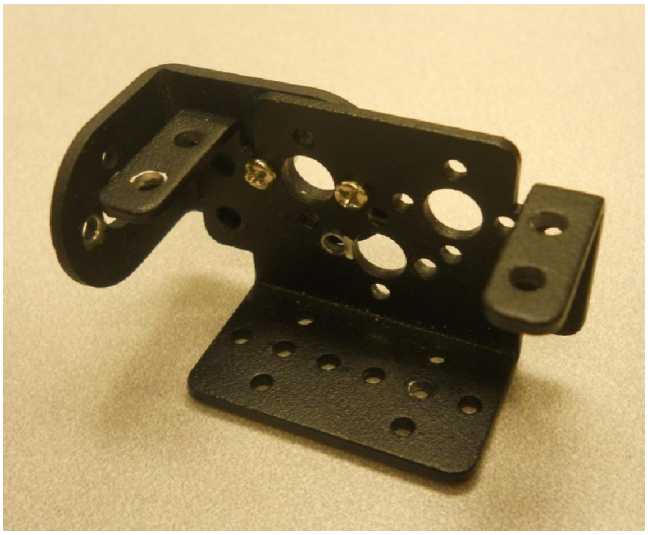

pi's X desktop (raspberrypi:1) - VNC Viewer
Menu
pi@raspberrypi: ~
LibFreenect
20:18
LibFreenect


pi's X desktop (raspberrypi:1) - VNC Viewer
Menu
pi@raspberrypi: ~
RGB image
35 %
15:03
Wastebasket
RGB image
File

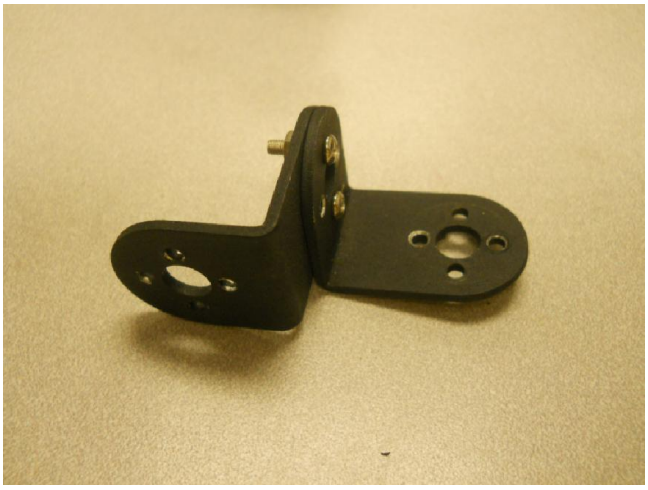

pi's X desktop (raspberrypi:1) - VNC Viewer
Menu
pi@raspberrypi: ~
image
Monday 21/03/16
Wastebasket
image

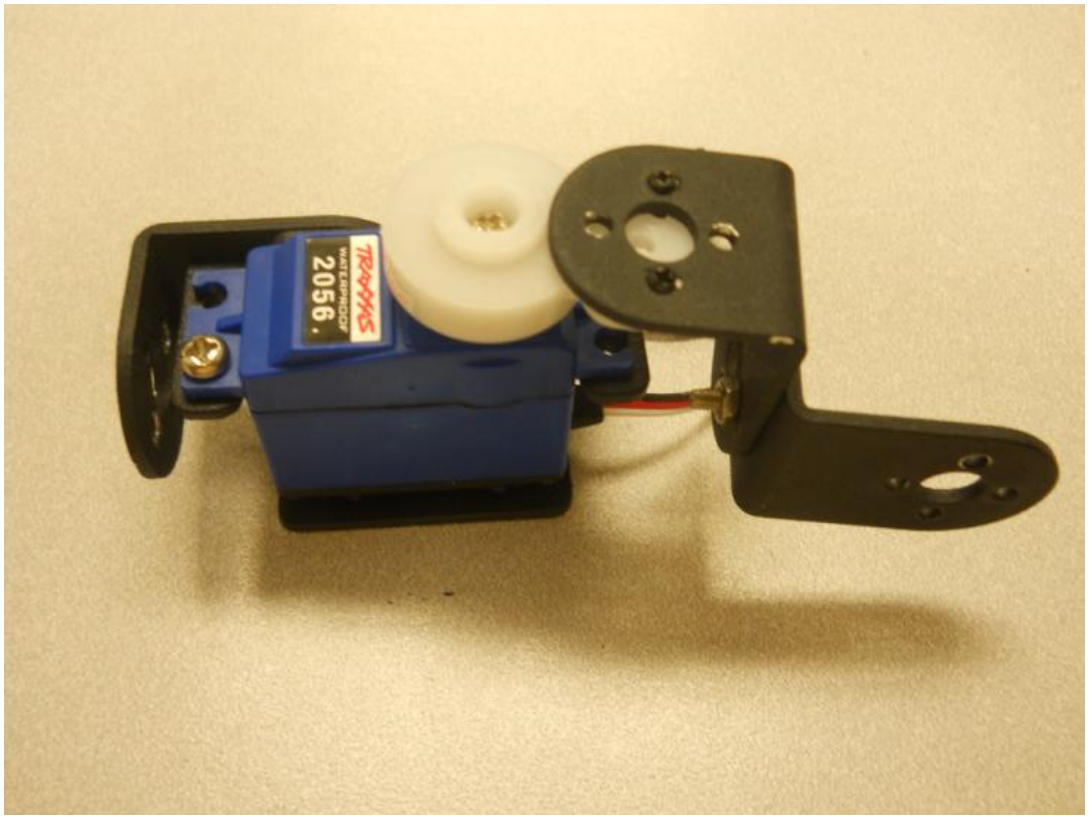
Chapter 4: Building a Robotic Fish

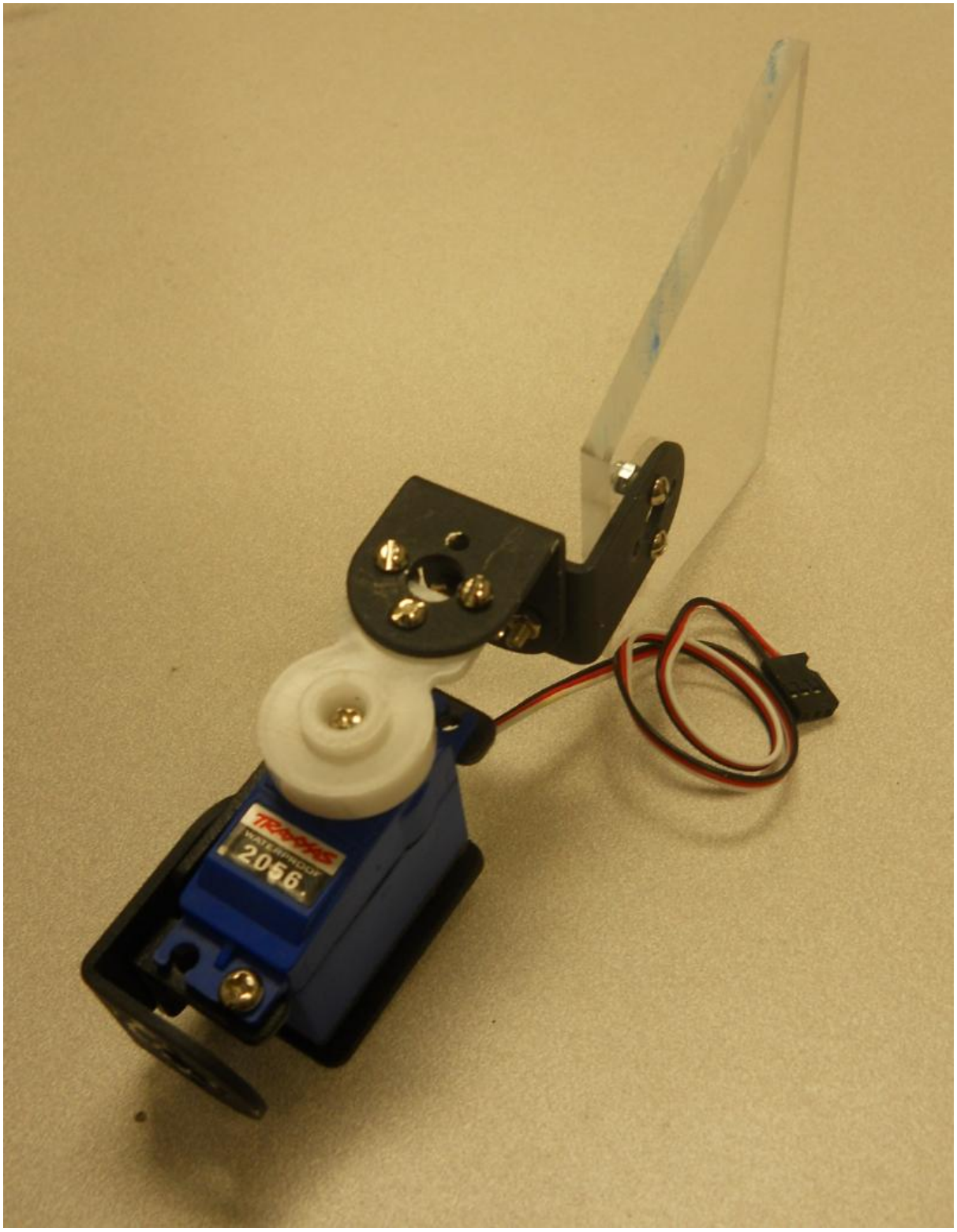


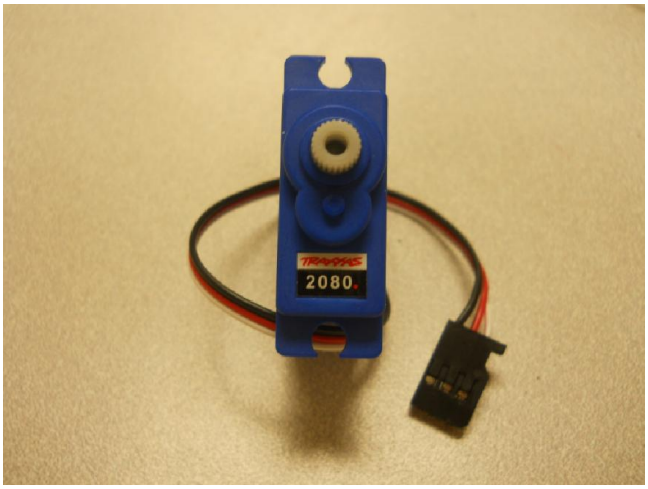


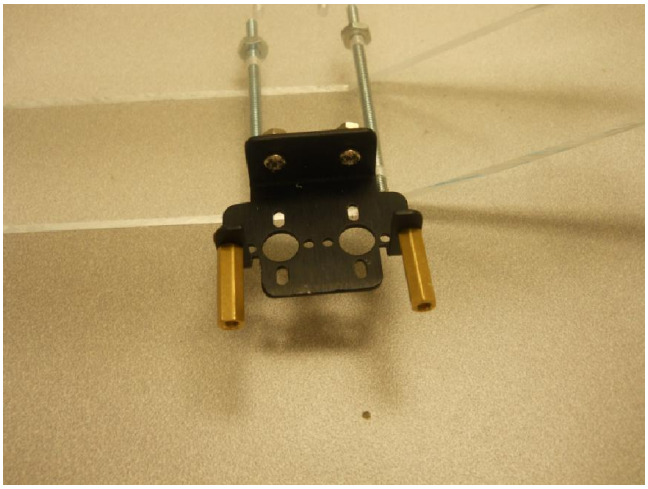

2056

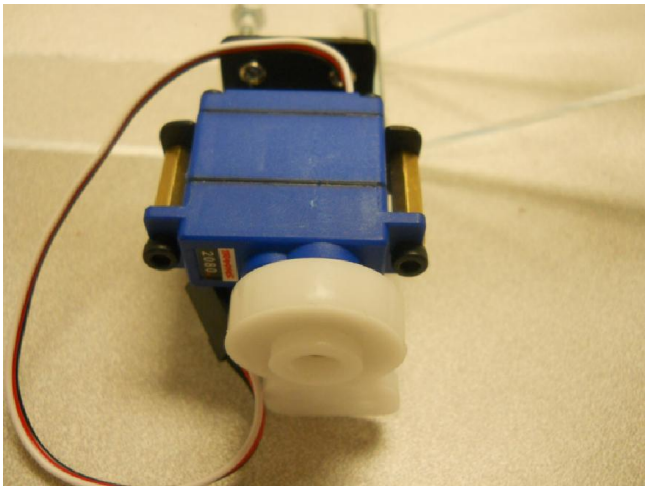


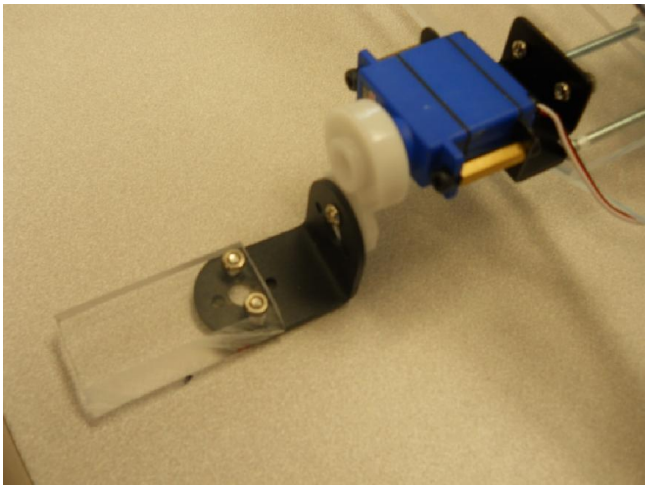

TRAXXAS
WATERPROOF
2056.

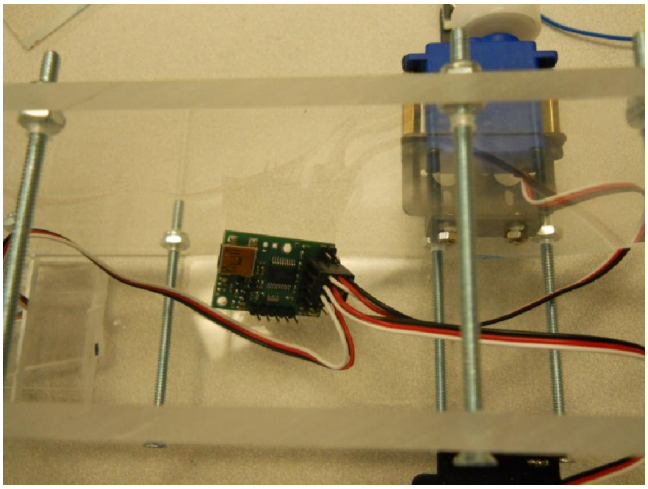

TRAXXAS
2056

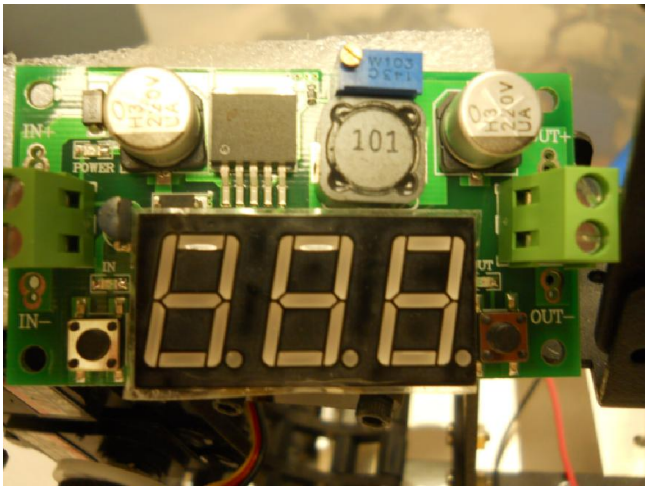

TRAXXAS
2080.

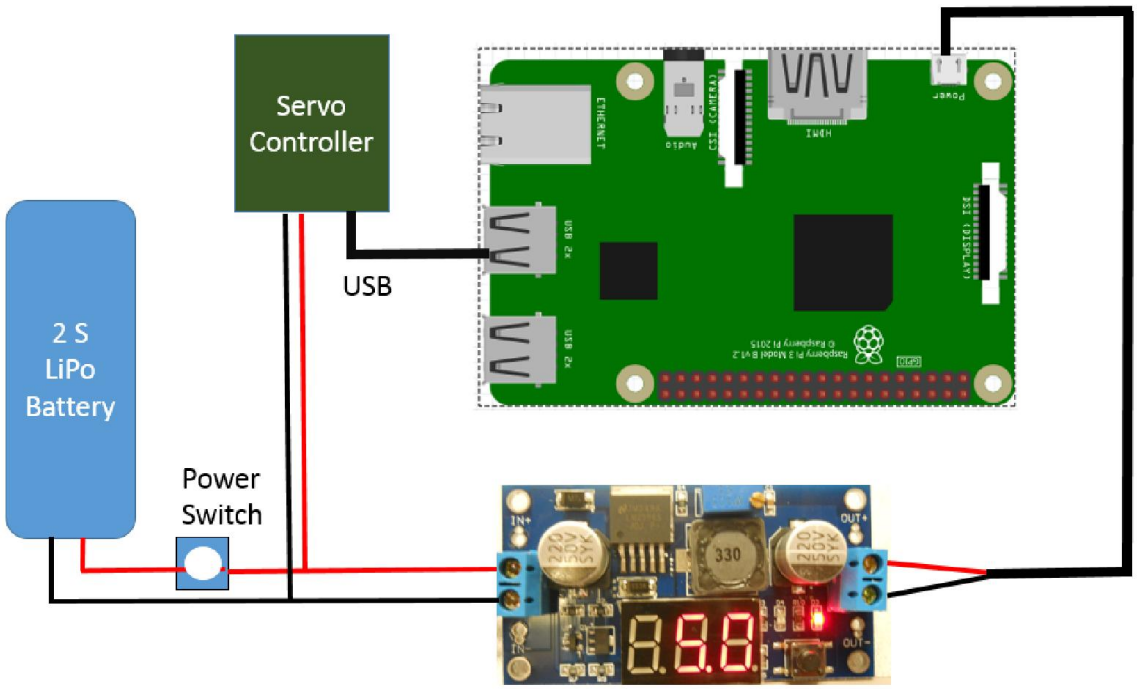


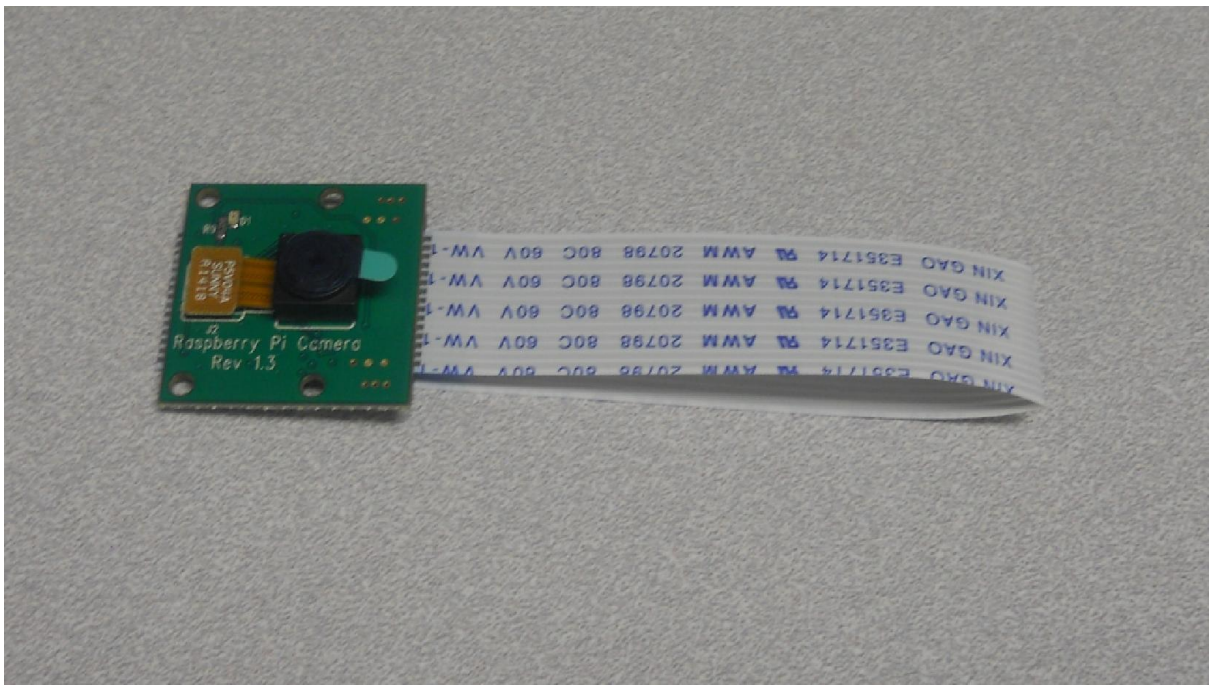


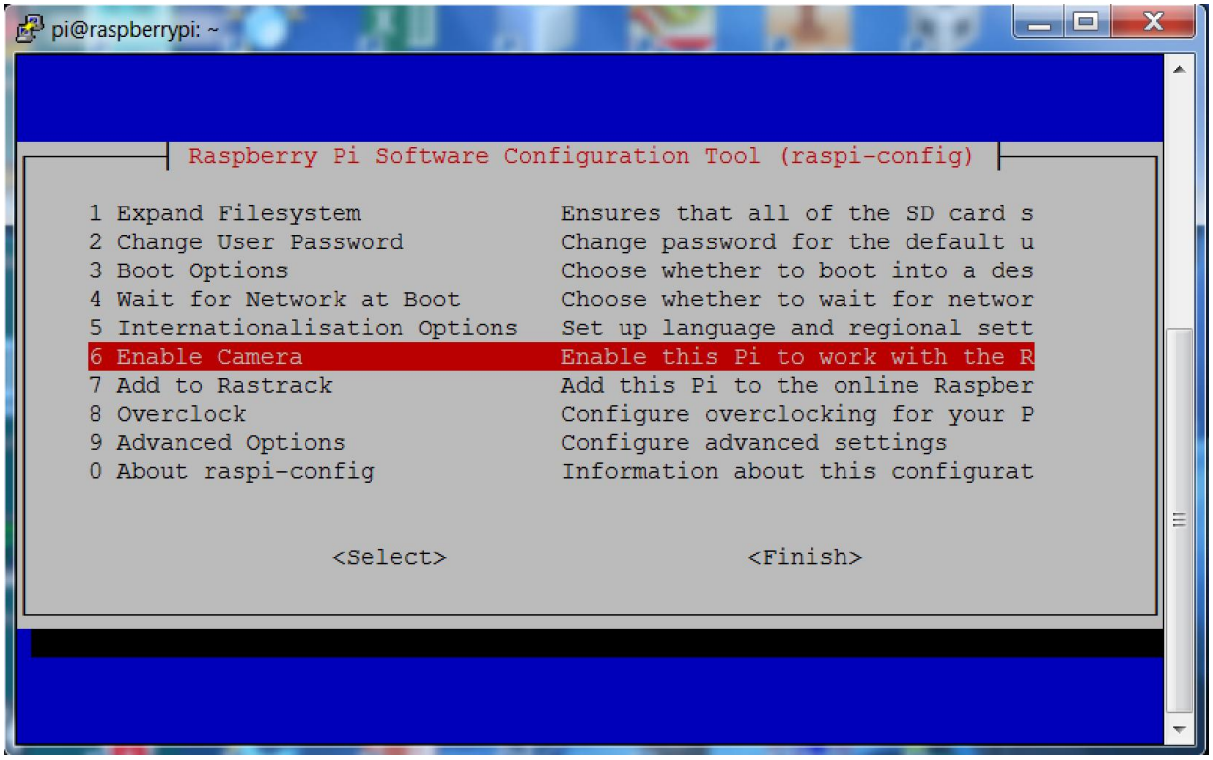


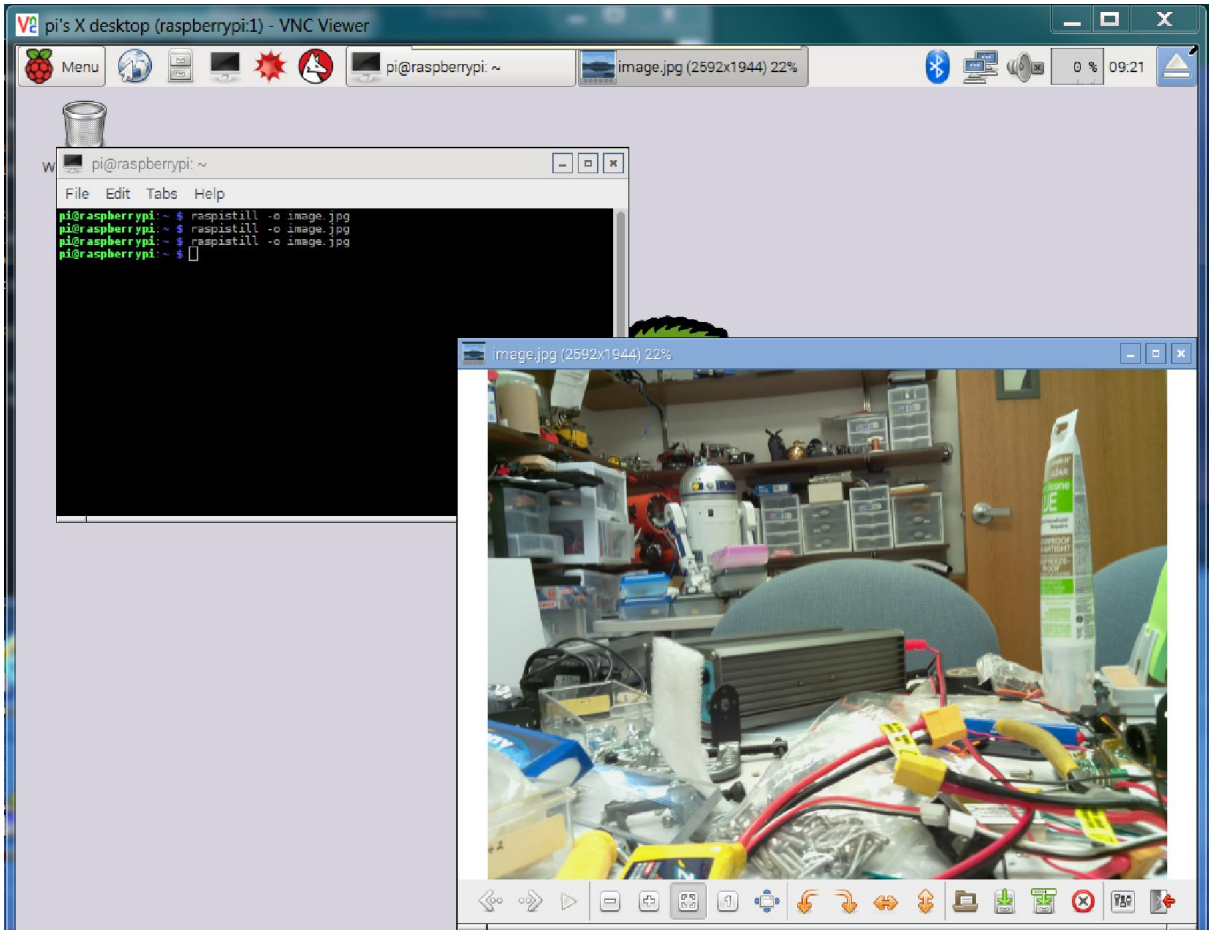


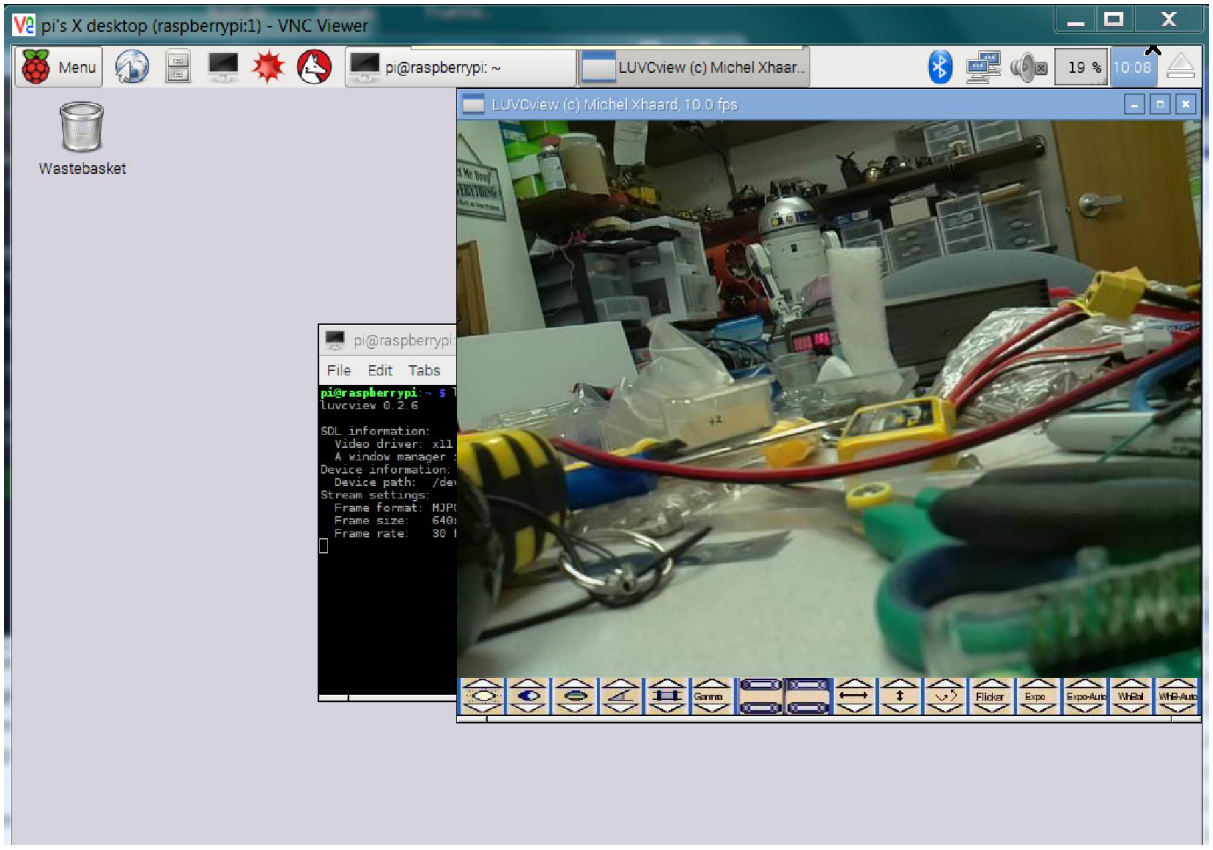

IN+
POWER
IN-
101
OUT+
OUT-

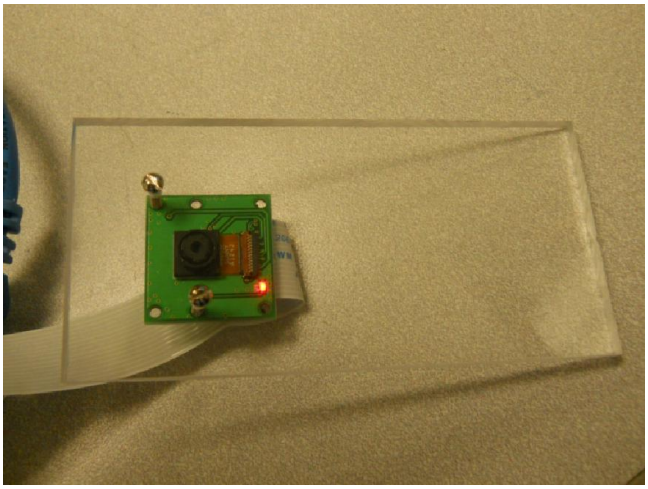

Servo
Controller
2 S
LiPo
Battery
USB
Power
Switch
IN+
IN-
OUT+
OUT-
330

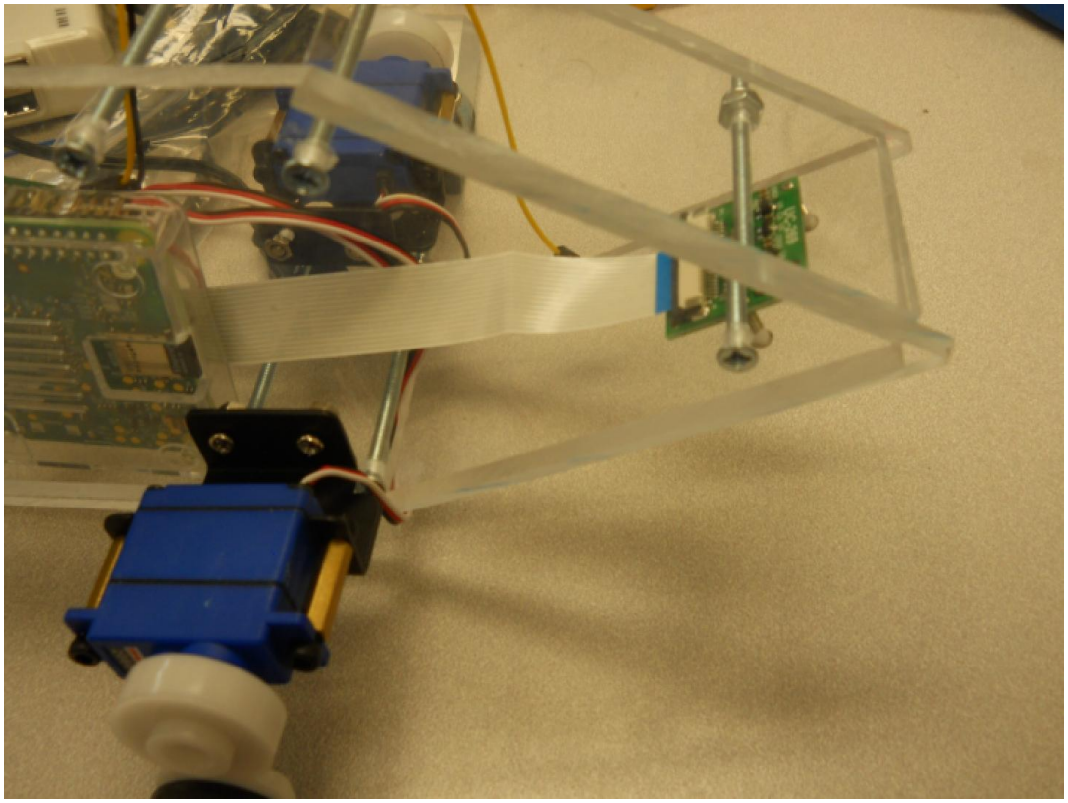

Raspberry Pi Camera
Rev 1.3

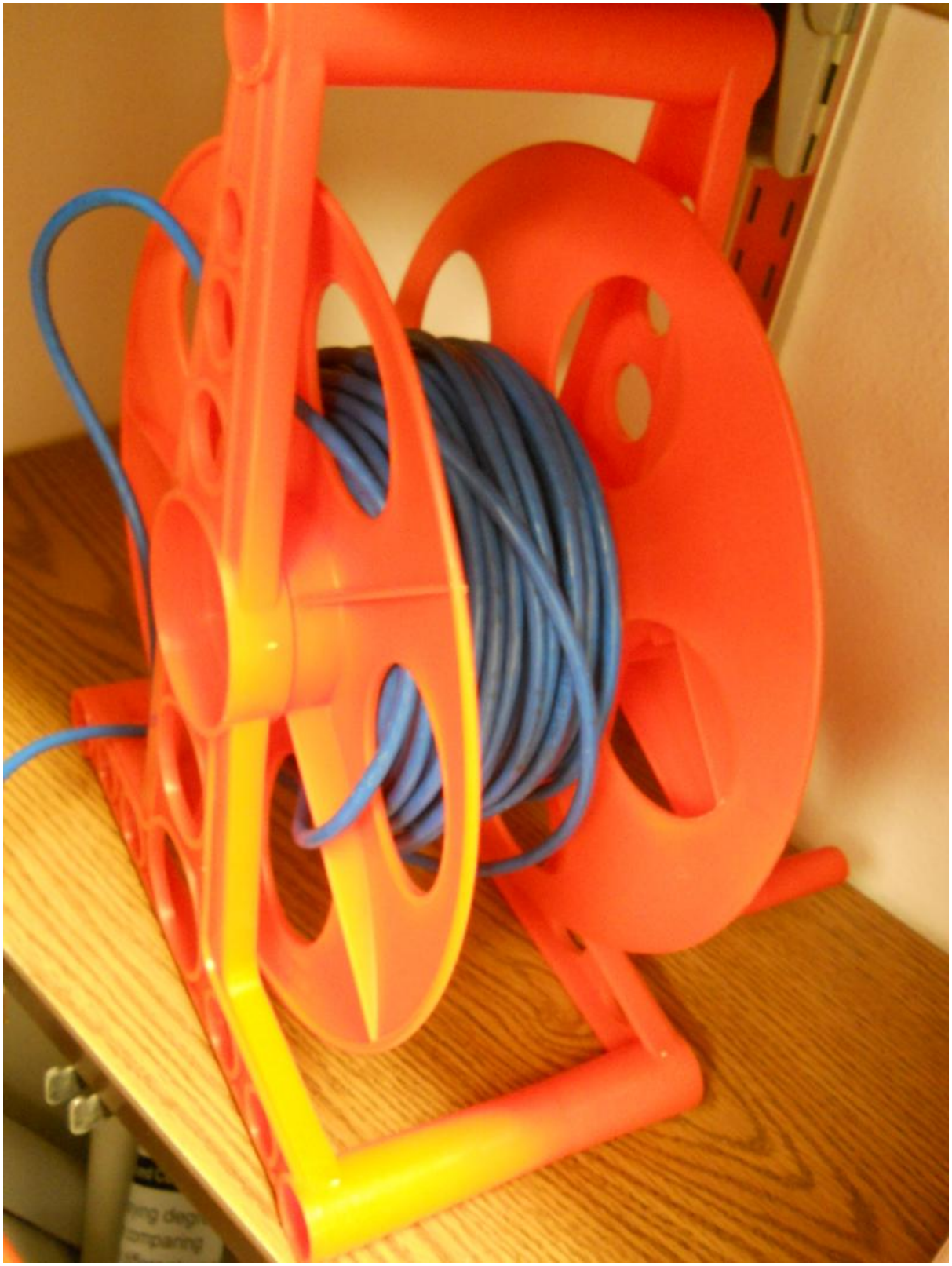

pi@raspberrypi: ~
Raspberry Pi Software Configuration Tool (raspi-config)
1 Expand Filesystem Ensures that all of the SD card s
2 Change User Password Change password for the default u
3 Boot Options Choose whether to boot into a des
4 Wait for Network at Boot Choose whether to wait for networ
5 Internationalisation 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>

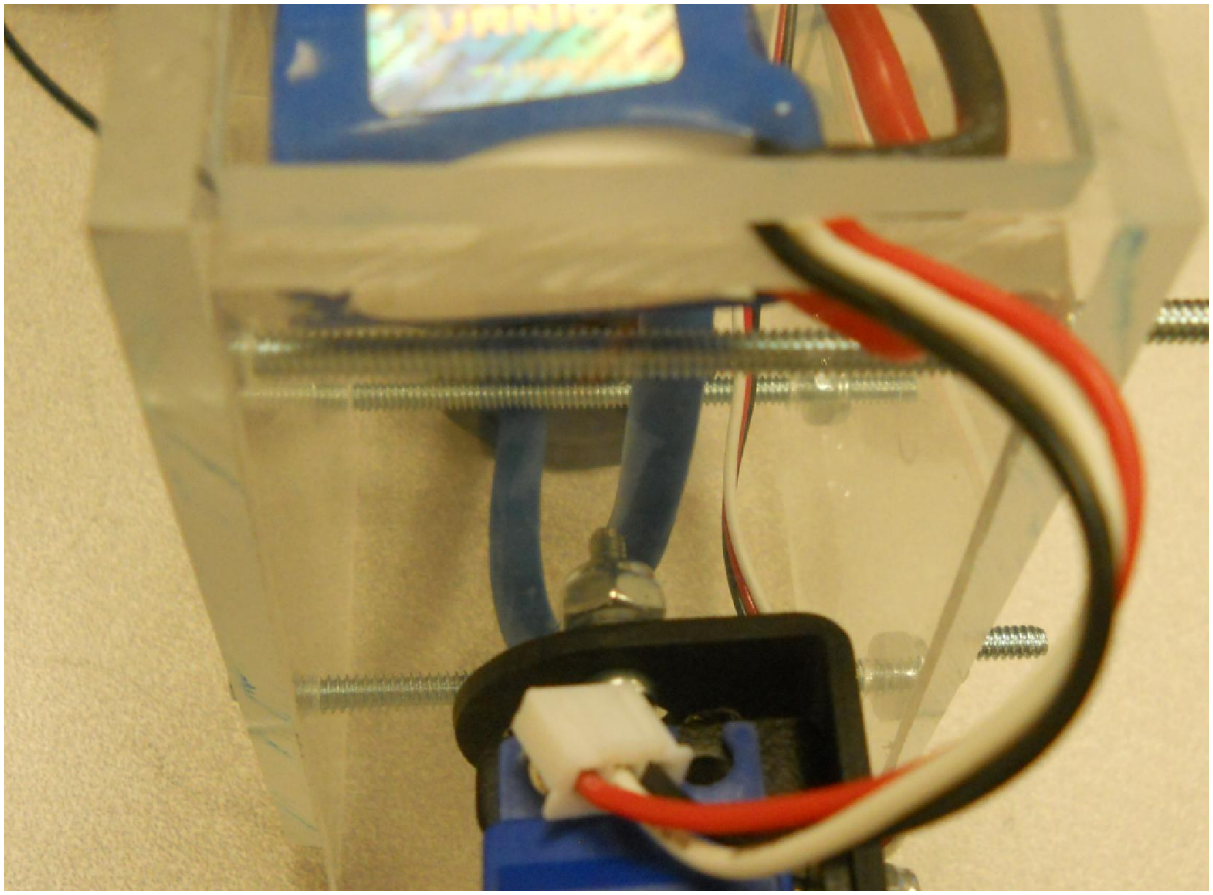

pi's X desktop (raspberrypi:1) - VNC Viewer
Menu
pi@raspberrypi: ~
image.jpg (2592x1944) 22%
09:21
File Edit Tabs Help
pi@raspberrypi:~ $ raspistill -o image.jpg
pi@raspberrypi:~ $ raspistill -o image.jpg
pi@raspberrypi:~ $ raspistill -o image.jpg
pi@raspberrypi:~ $
image.jpg (2592x1944) 22%

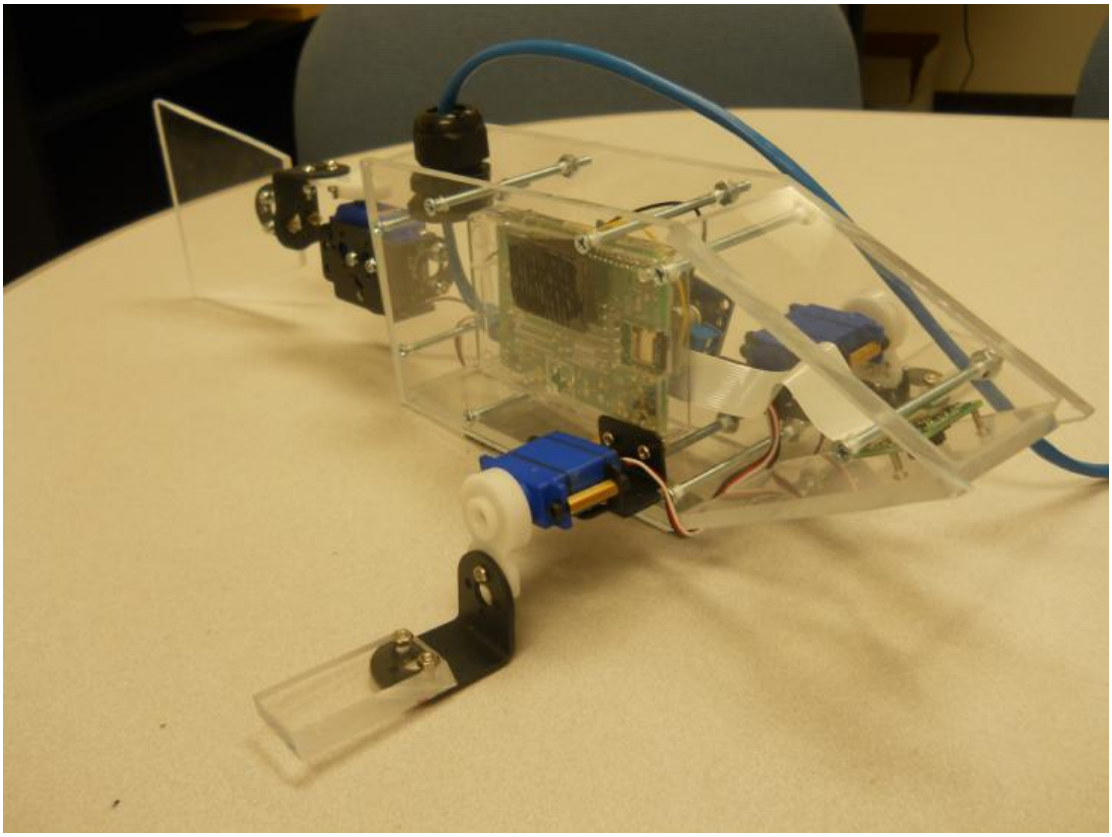

pi's X desktop (raspberrypi:1) - VNC Viewer
Menu
pi@raspberrypi: ~
LUVCview (c) Michel Xhaar...
19 %
10:08
Wastebasket
LUVCview (c) Michel Xhaard, 10.0 fps
File Edit Tabs
luvcview 0.2.6
SDL information:
Video driver: x11
Device information:
Stream settings:
Frame format:
Frame size:
Frame rate:
Gamma
Flicker
Expo
Expo-Auto
WhtBal
WhtBal-Auto



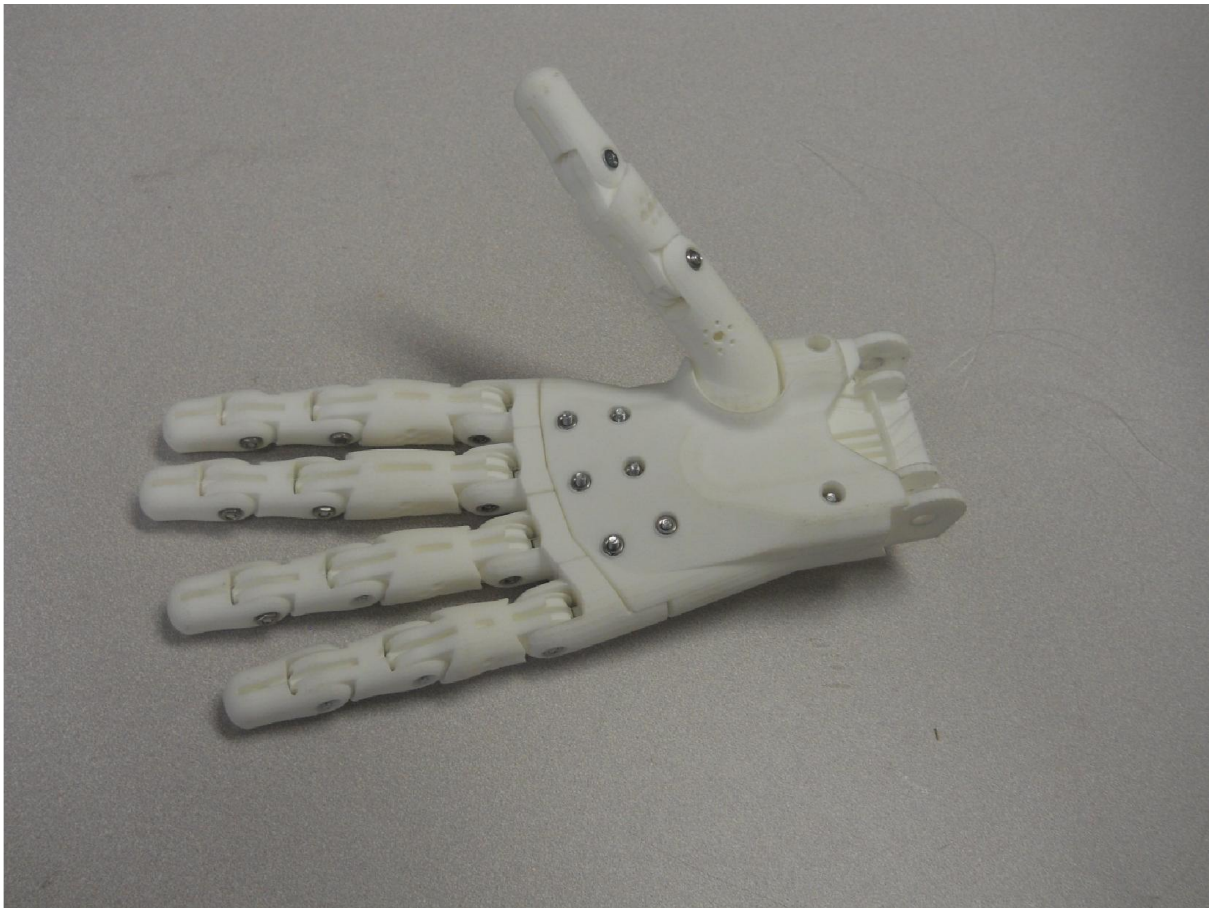


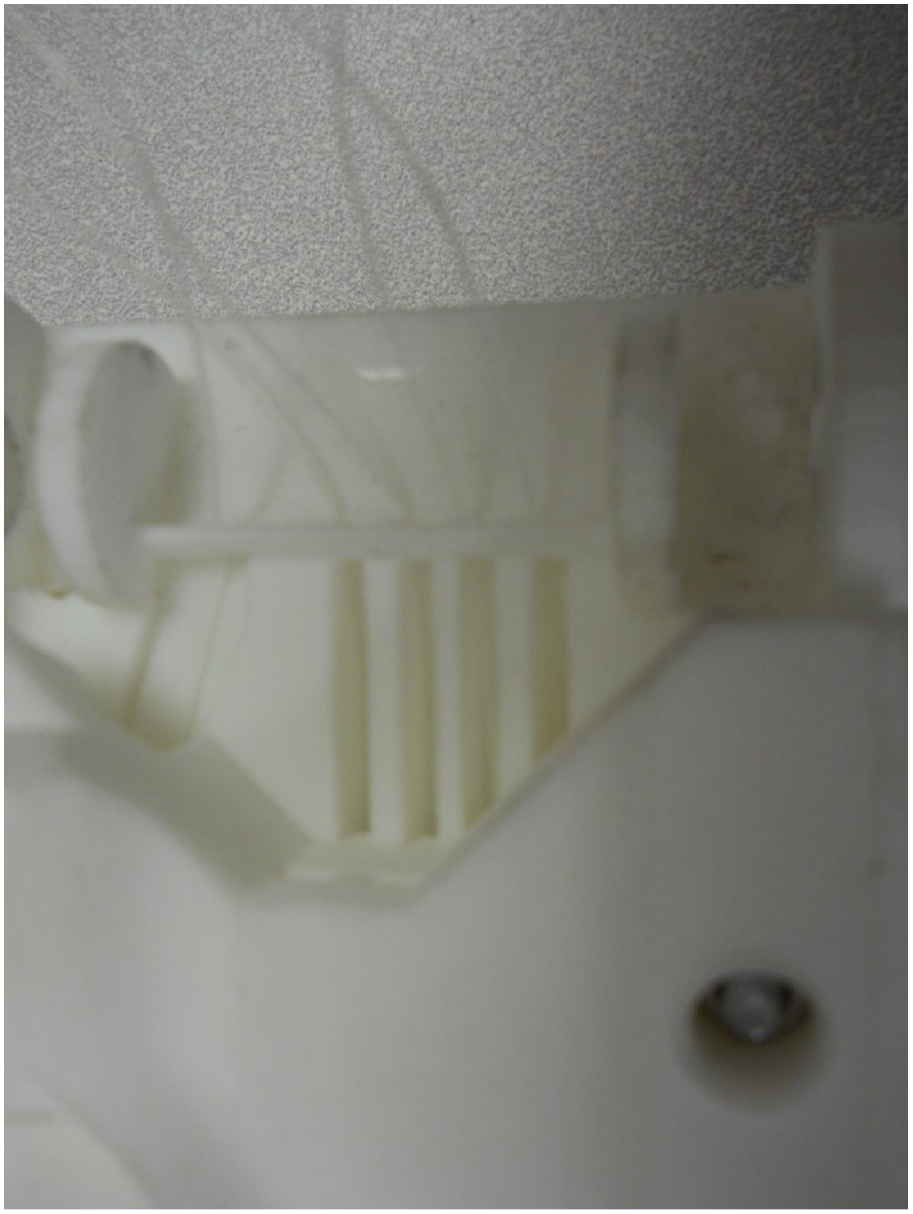




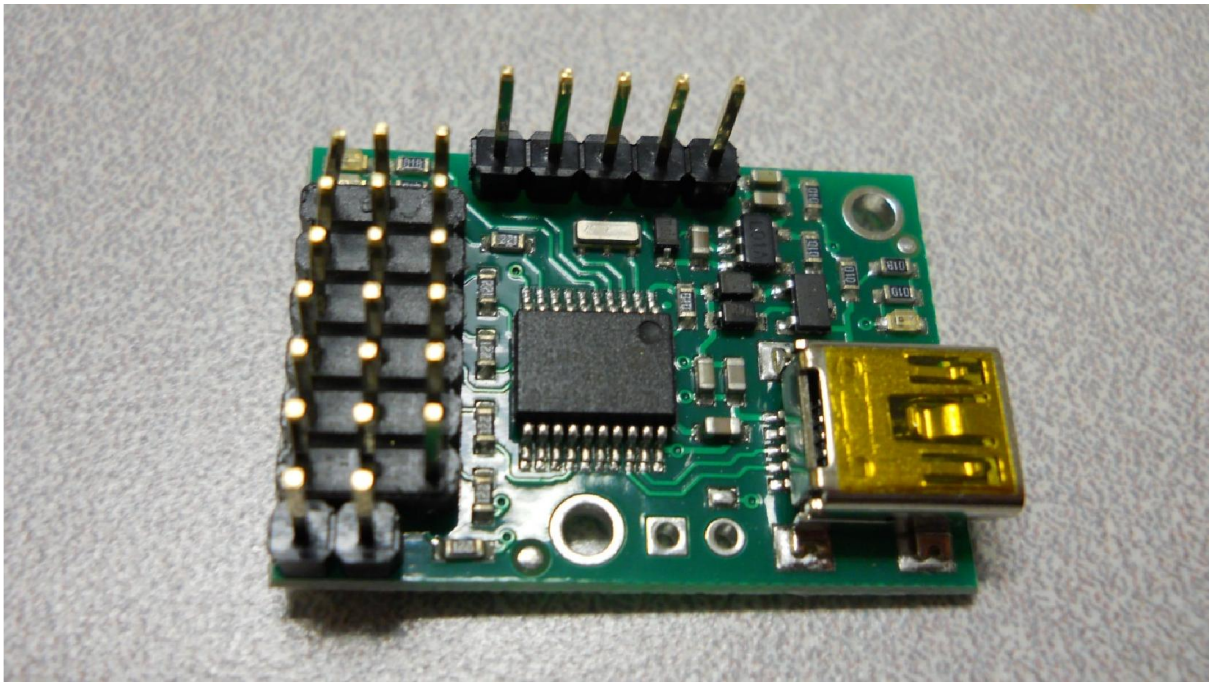


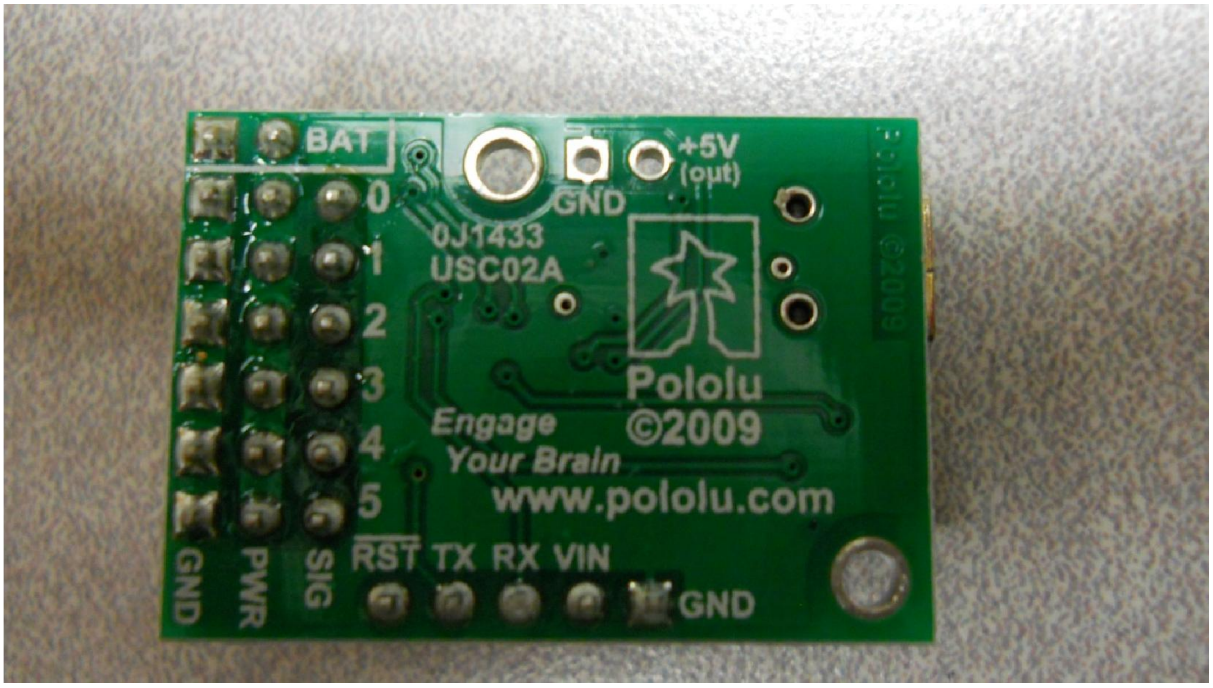
Chapter 5: Creating a Robotic Hand with the Raspberry Pi

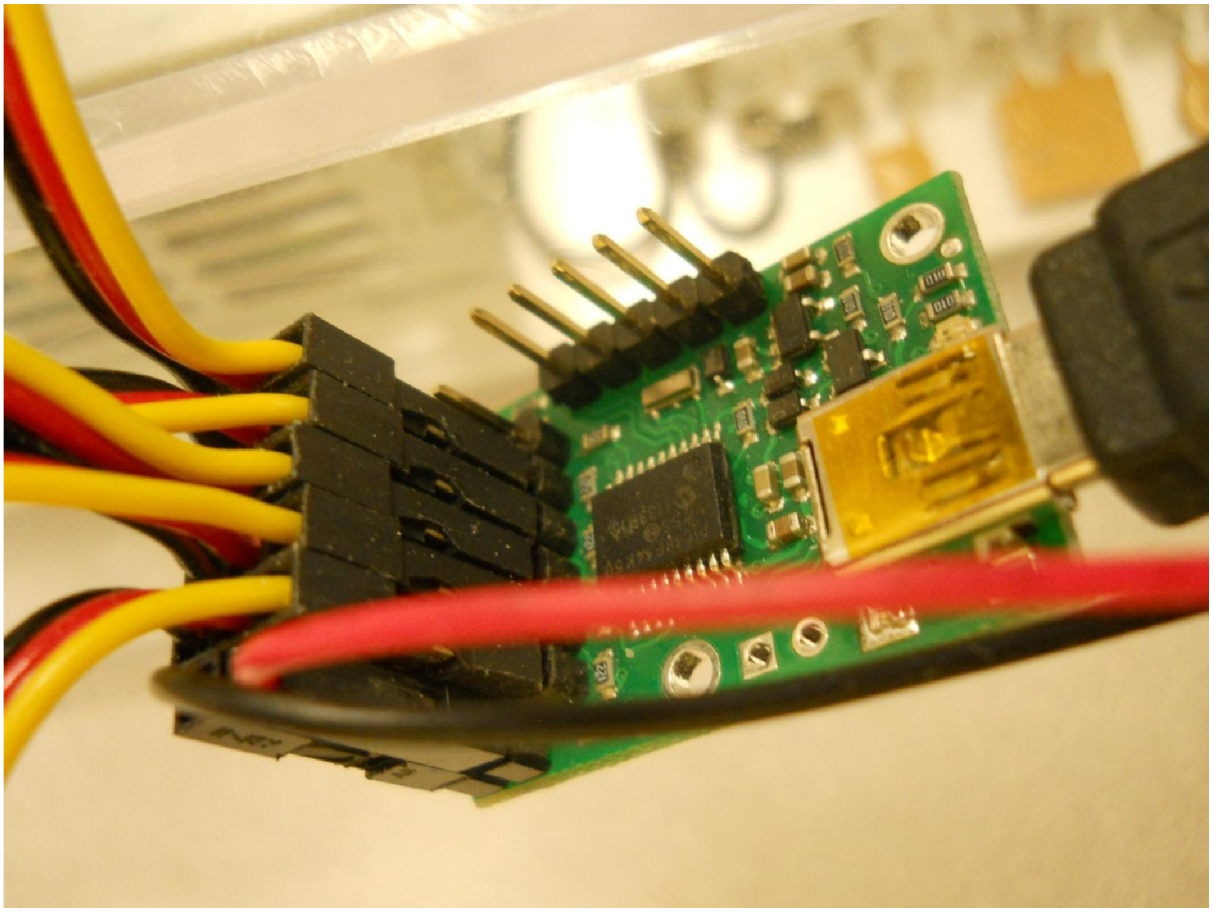


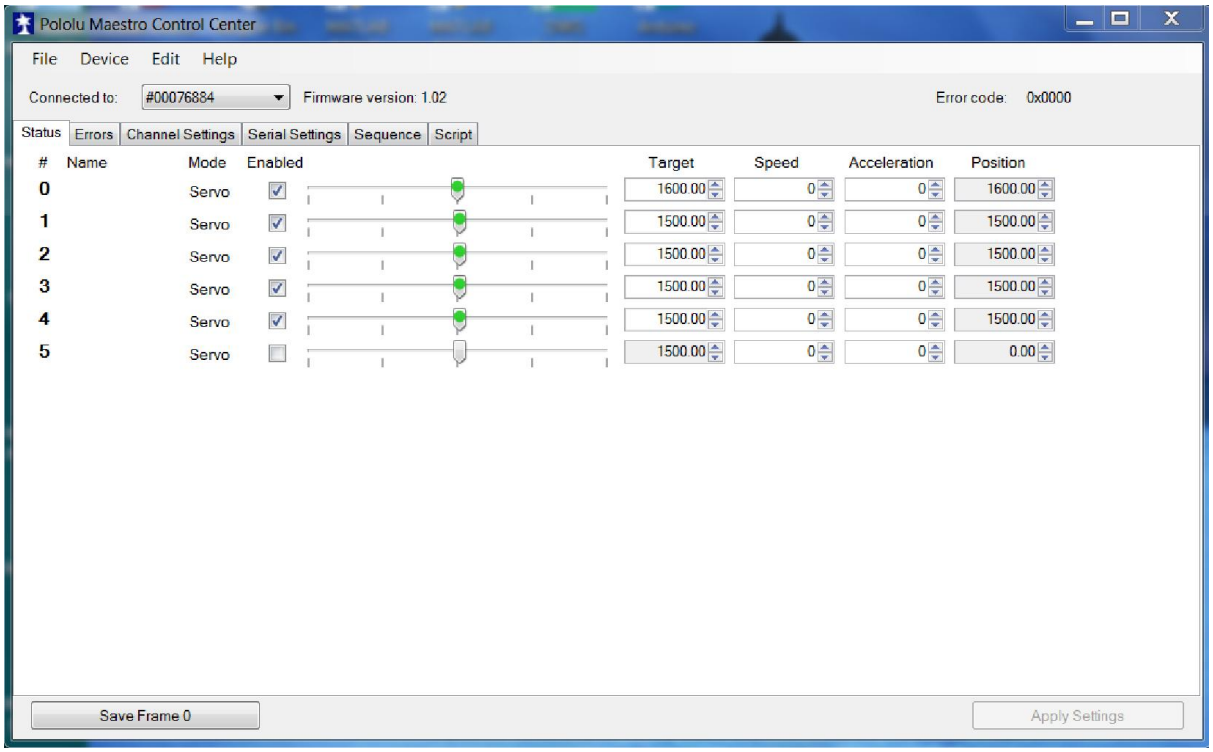


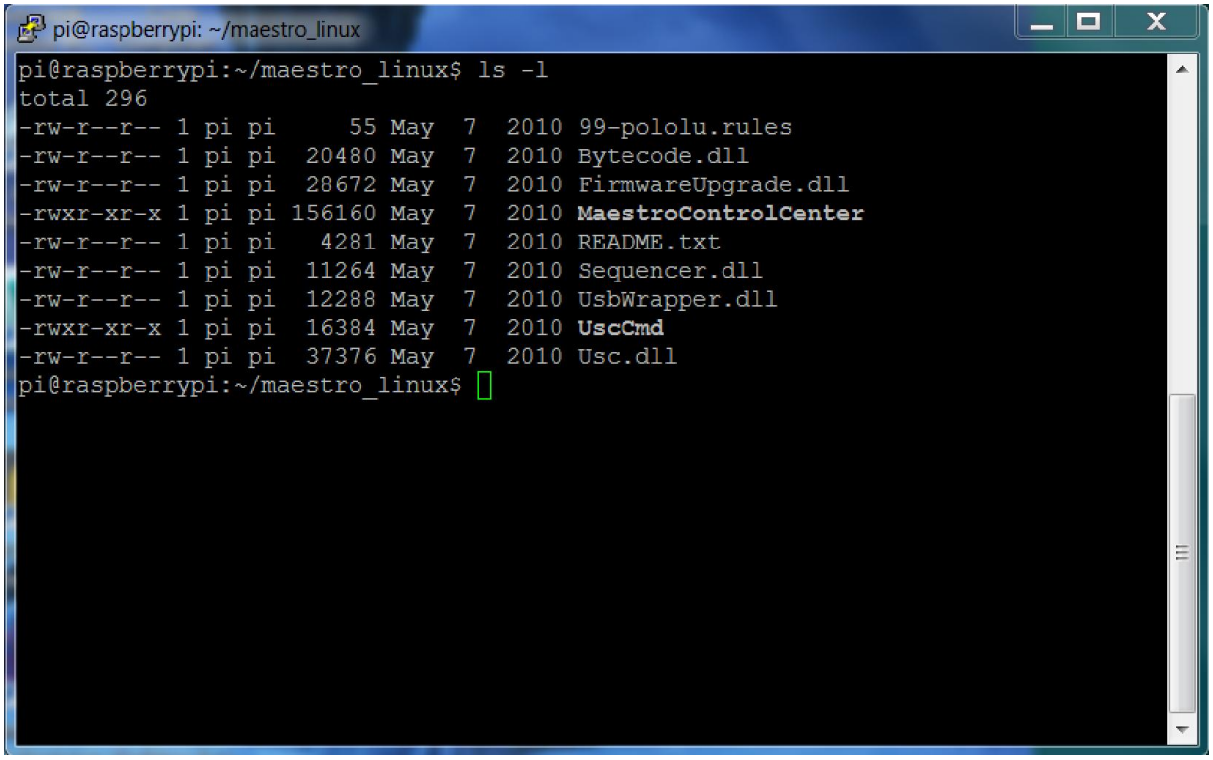

HS-422
HS-422
HS-422
HS-422

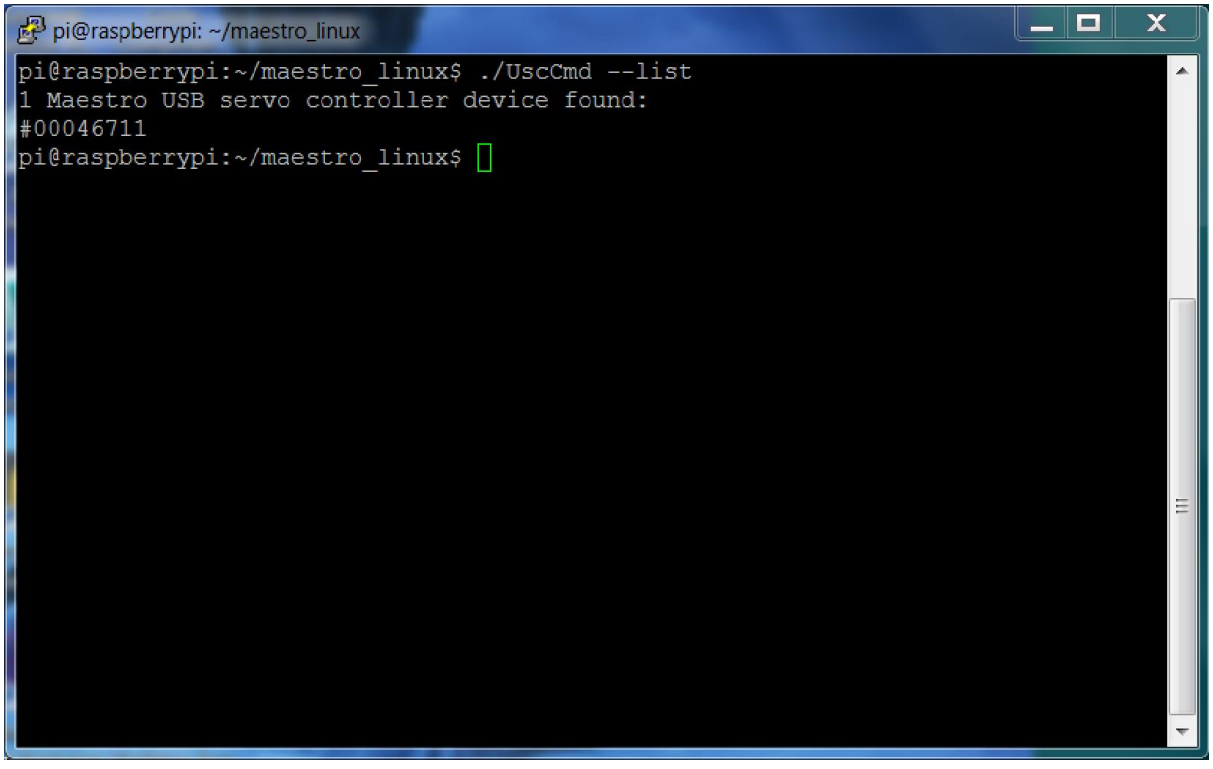


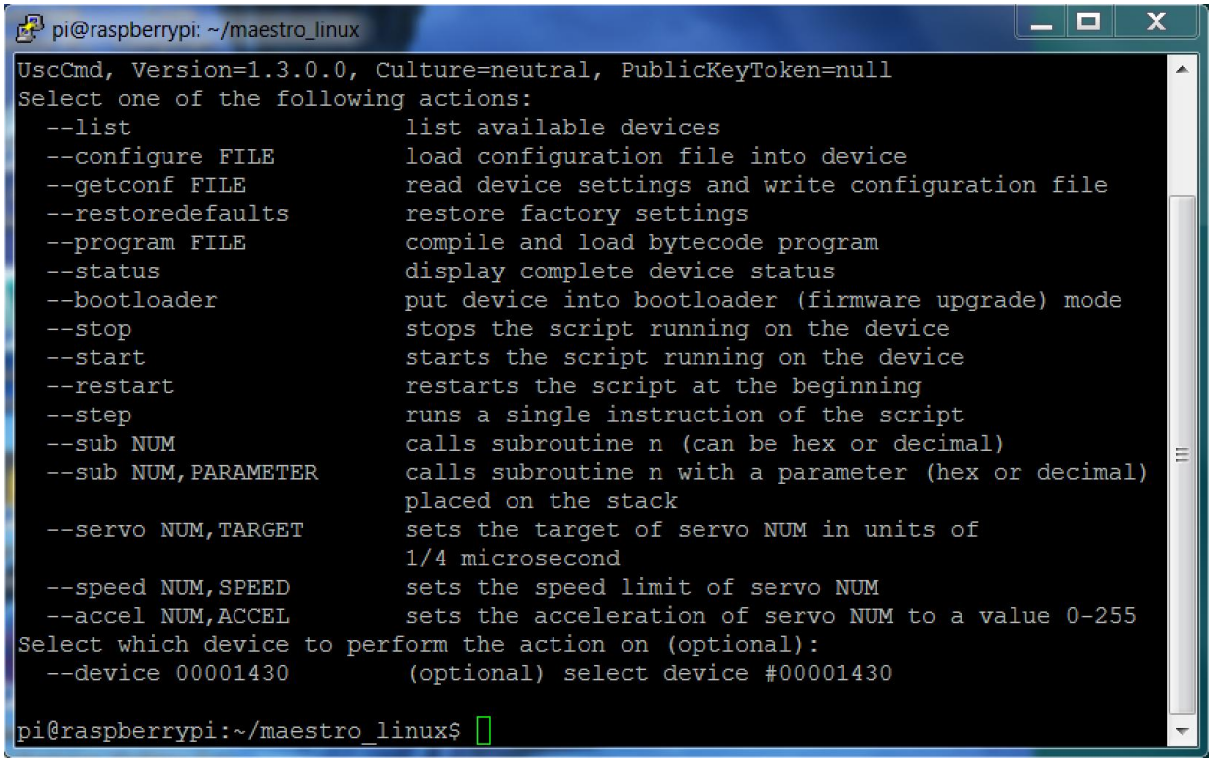

BAT
+5V
(out)
GND
0
1
2
3
4
5
0J1433
USC02A
Pololu
©2009
Engage
Your Brain
www.pololu.com
GND
PWR
SIG
RST TX RX VIN
GND

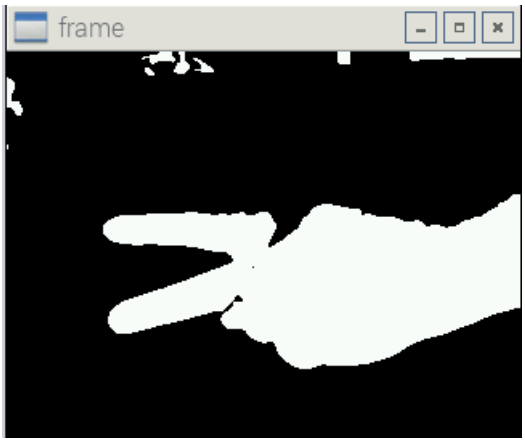


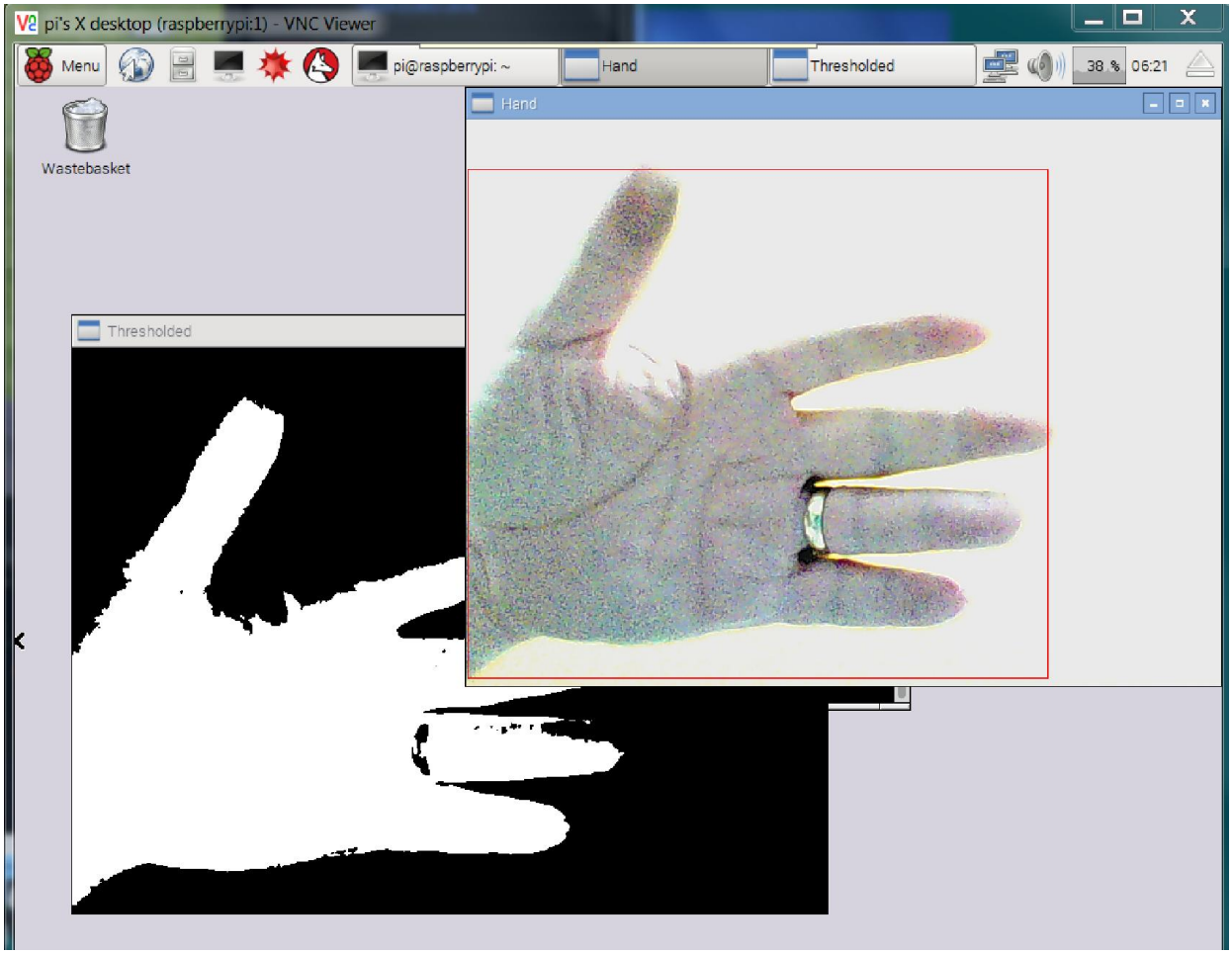

Pololu Maestro Control Center
File
Device
Edit
Help
Connected to:
#00076884
Firmware version: 1.02
Error code:
0x0000
Status
Errors
Channel Settings
Serial Settings
Sequence
Script
Name Mode Enabled Target Speed Acceleration Position
0 Servo 1600.00 0 0 1600.00
1 Servo 1500.00 0 0 1500.00
2 Servo 1500.00 0 0 1500.00
3 Servo 1500.00 0 0 1500.00
4 Servo 1500.00 0 0 1500.00
5 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$

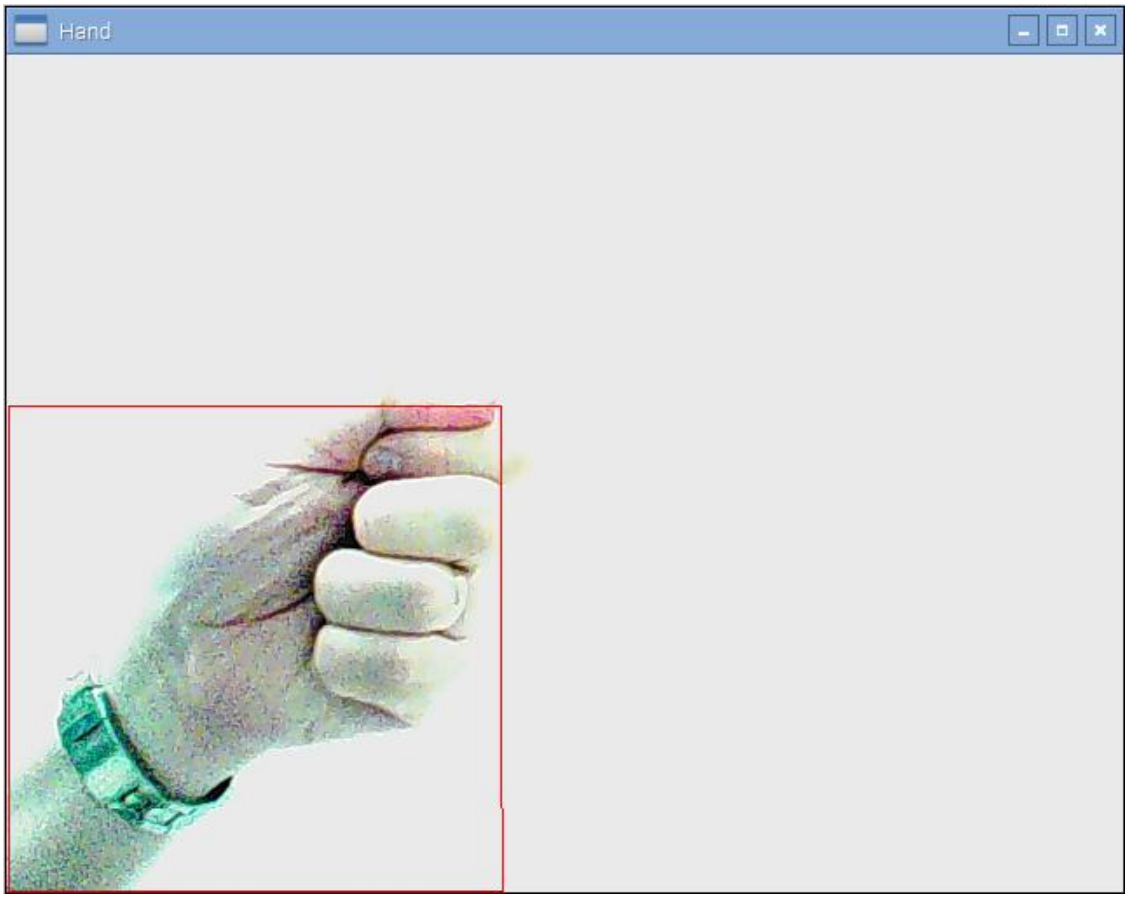

pi@raspberrypi: ~/maestro_linux
pi@raspberrypi:~/maestro_linux$ ./UscCmd --list
1 Maestro USB servo controller device found:
#00046711
pi@raspberrypi:~/maestro_linux$


pi@raspberrypi: ~/maestro_linux
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$

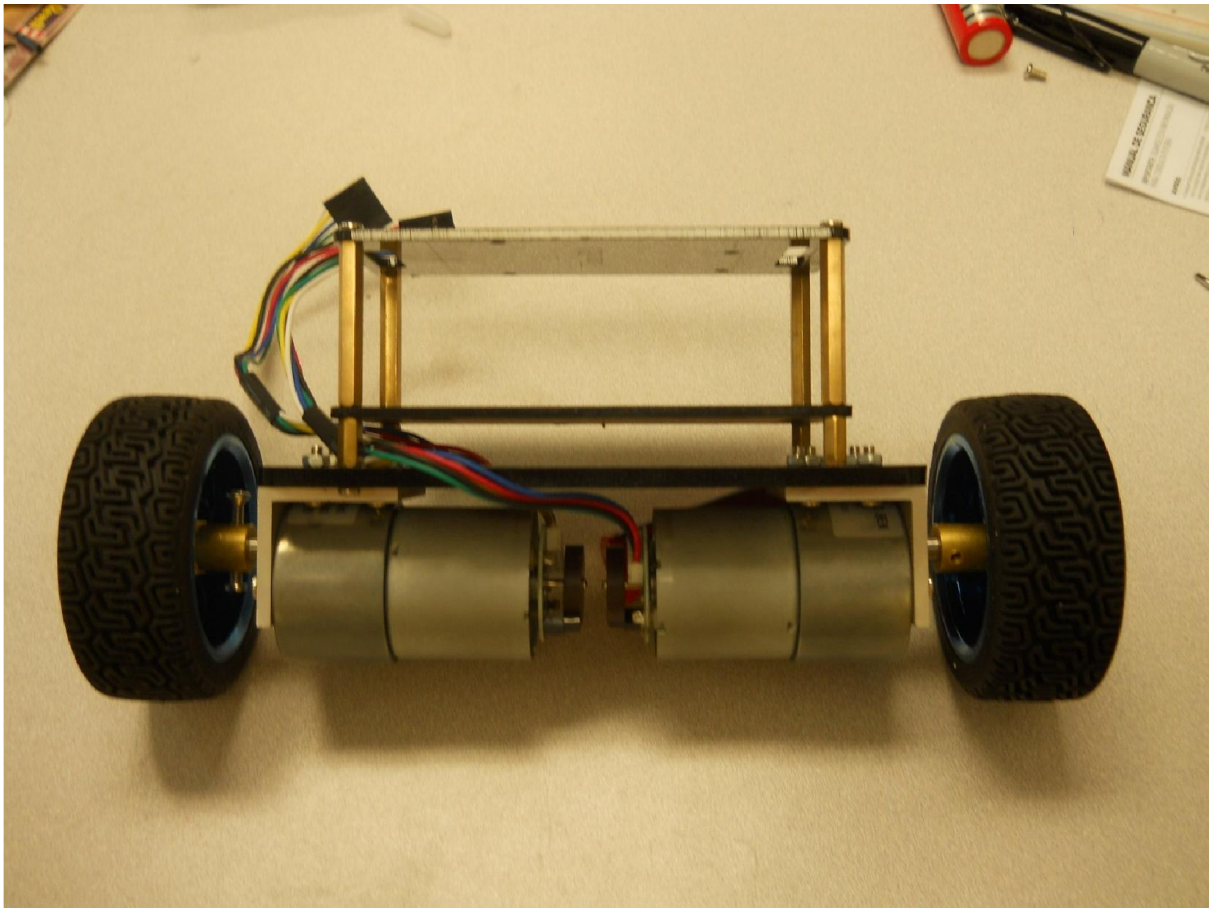

frame

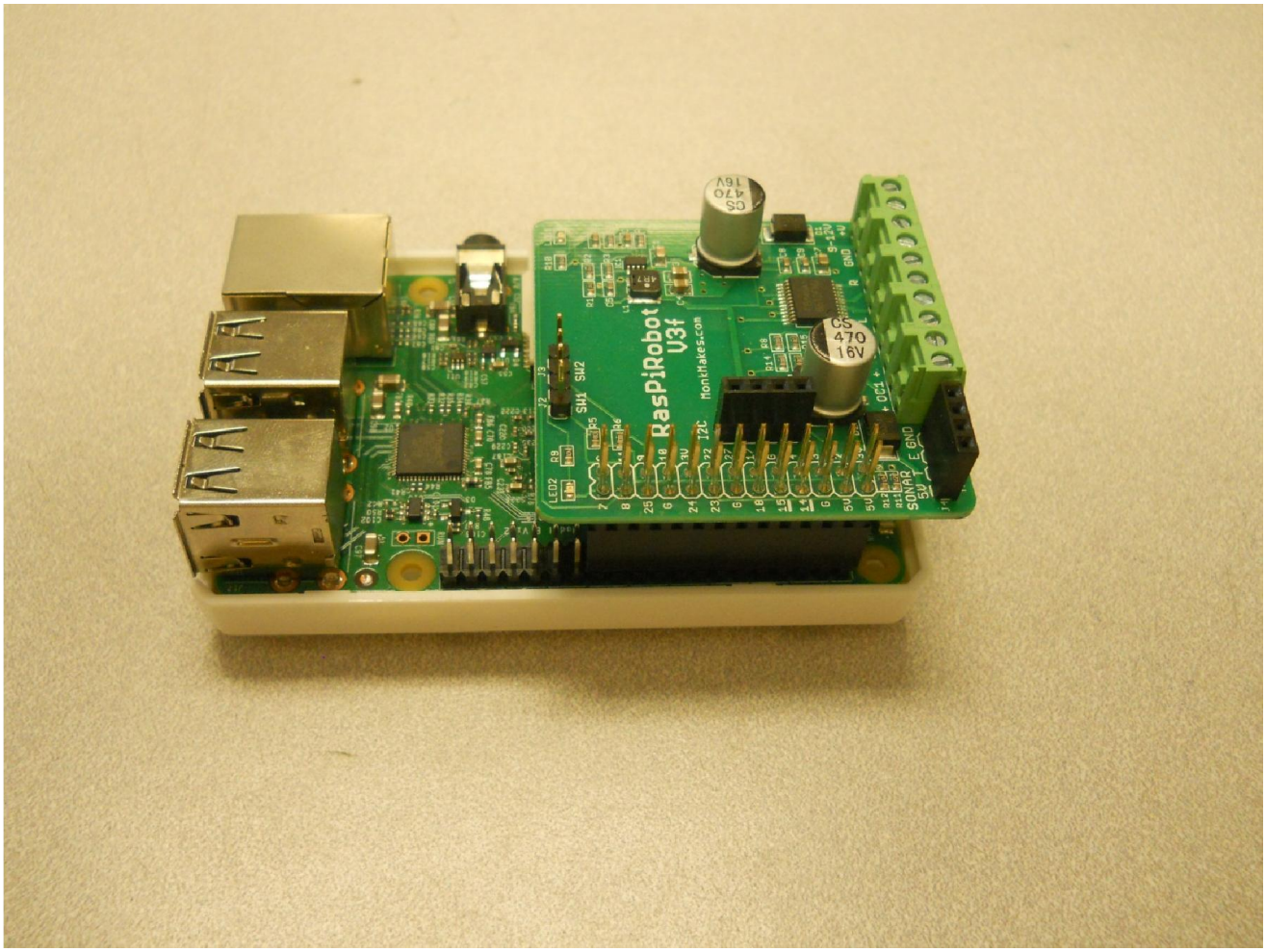

pi's X desktop (raspberrypi:1) - VNC Viewer
Menu
pi@raspberrypi: ~
Hand
Thresholded
38 %
06:21
Wastebasket
Hand
Thresholded

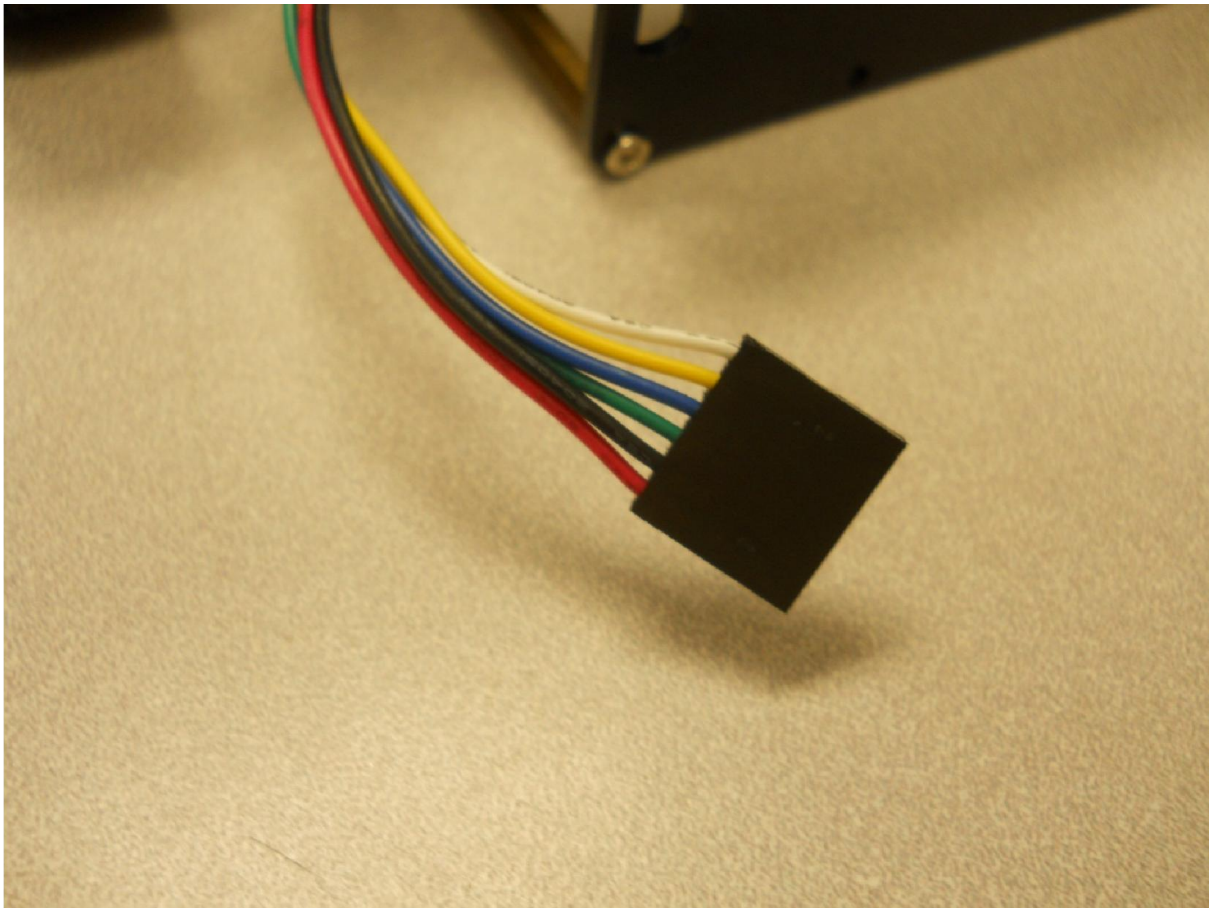

Hand

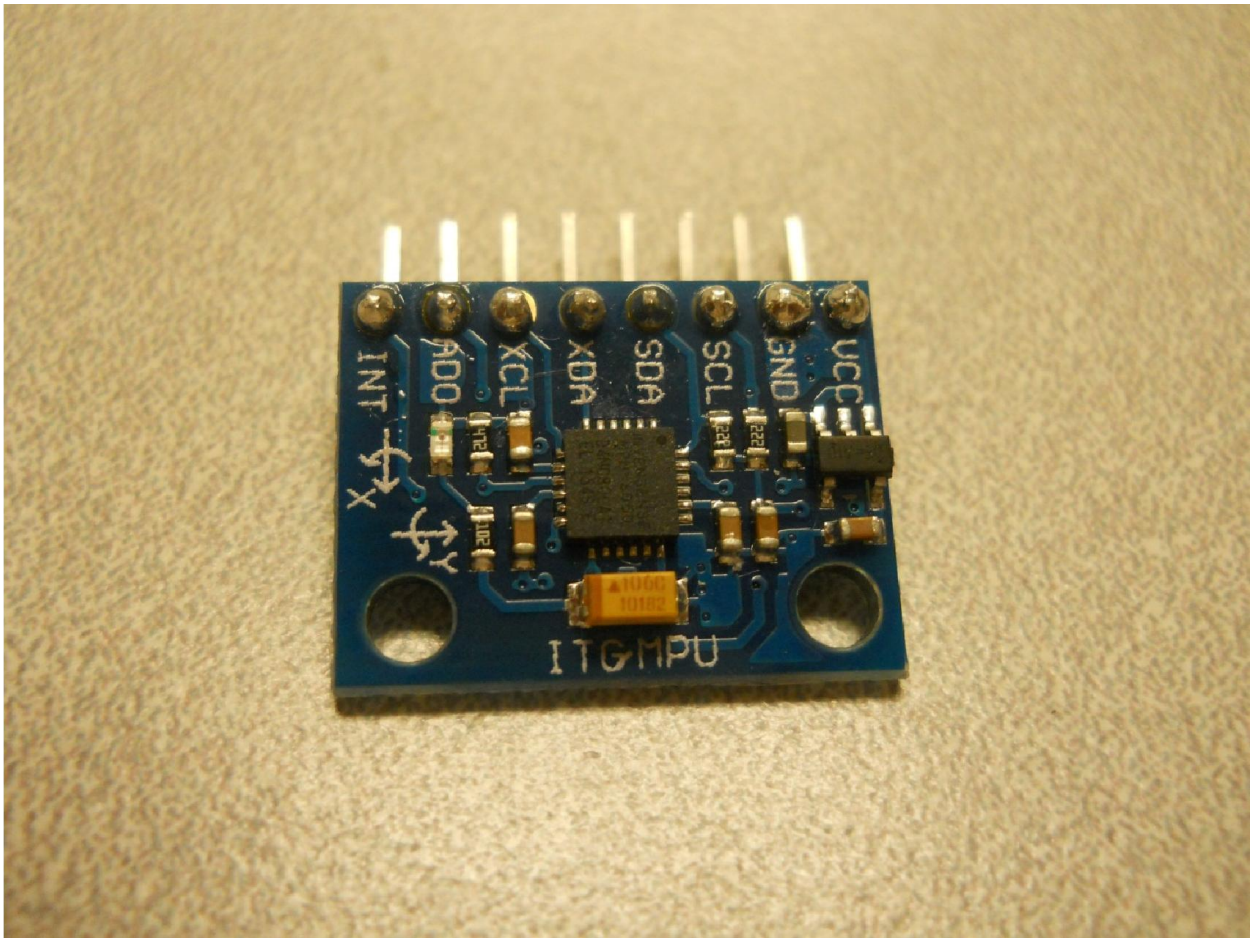

Hand

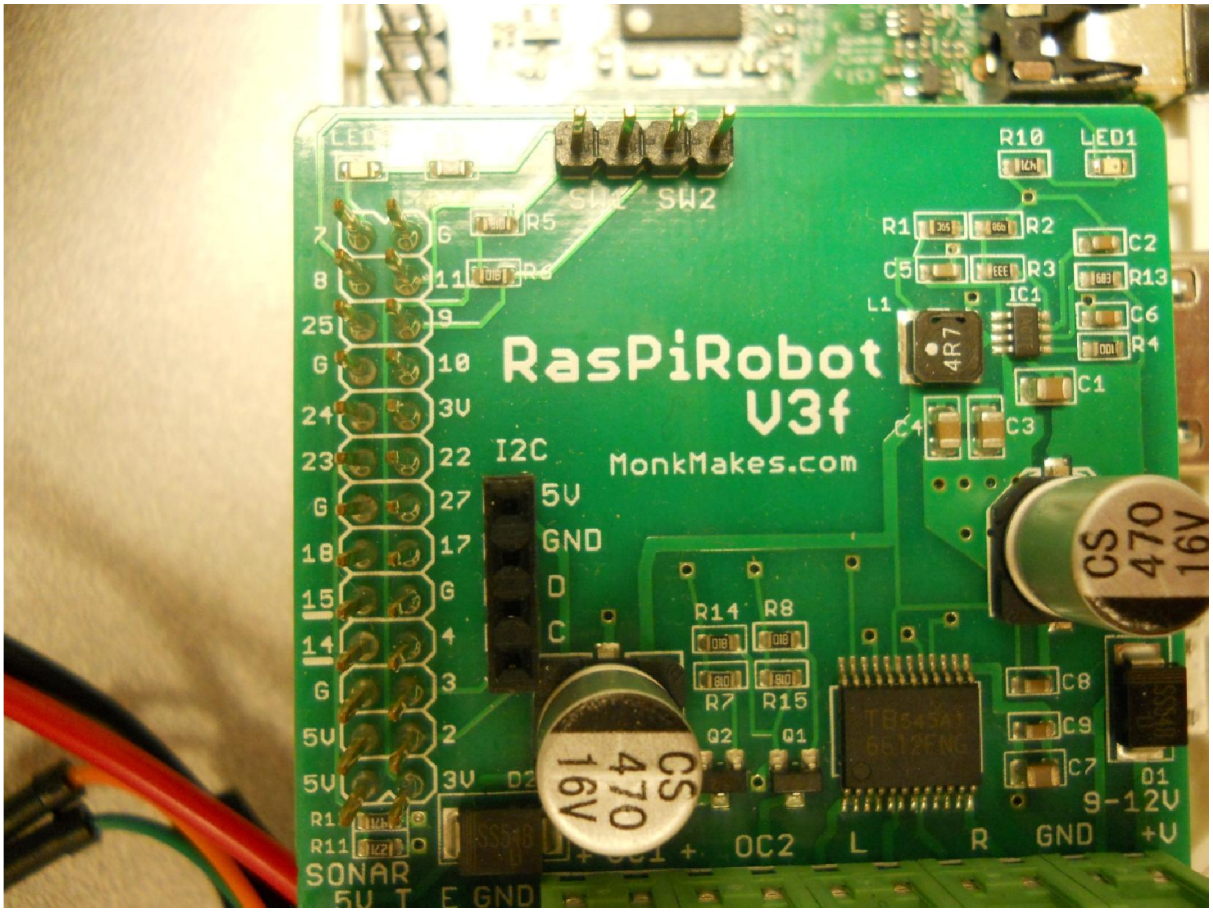
Chapter 6: A Self-Balancing Robot

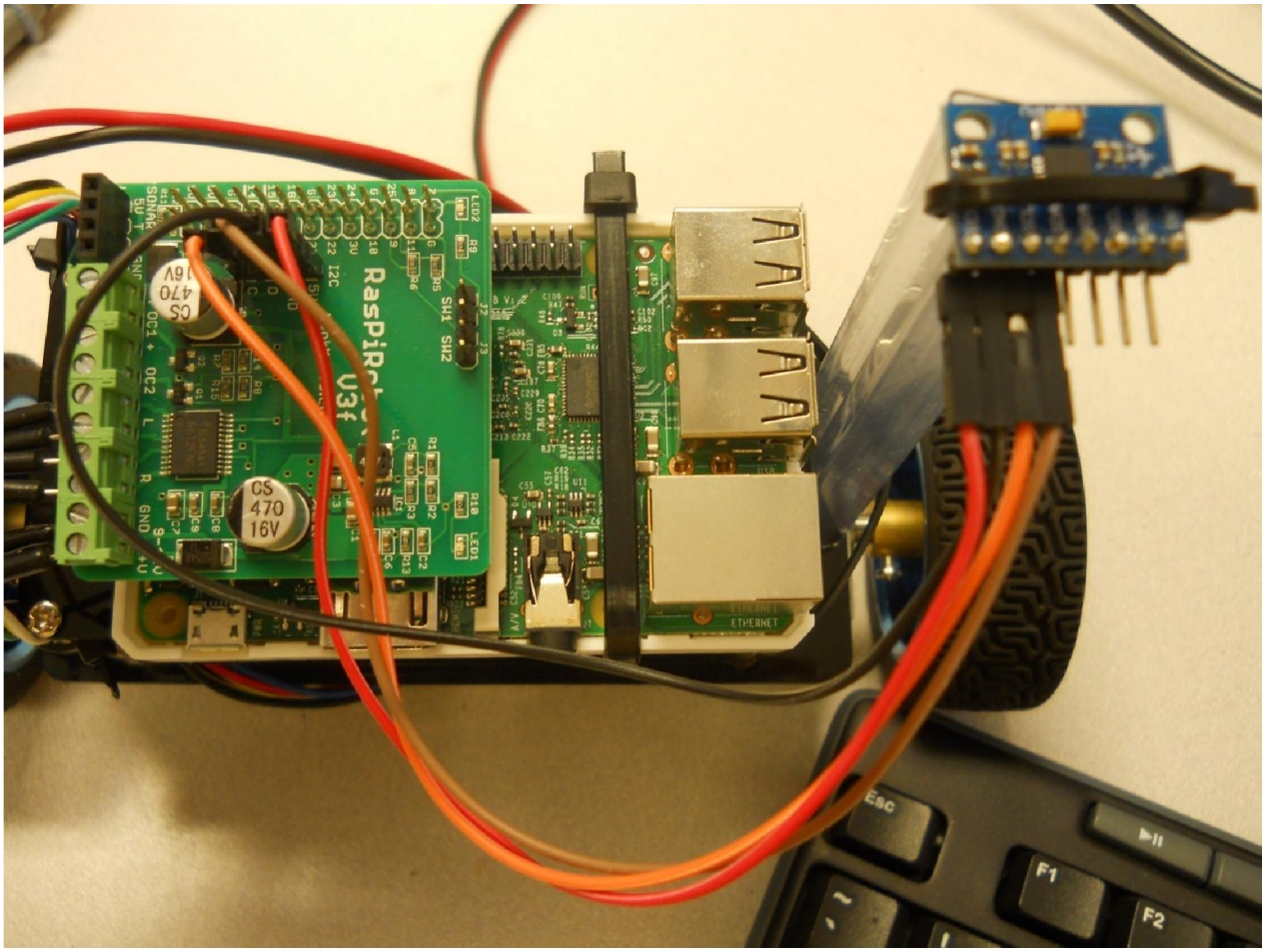


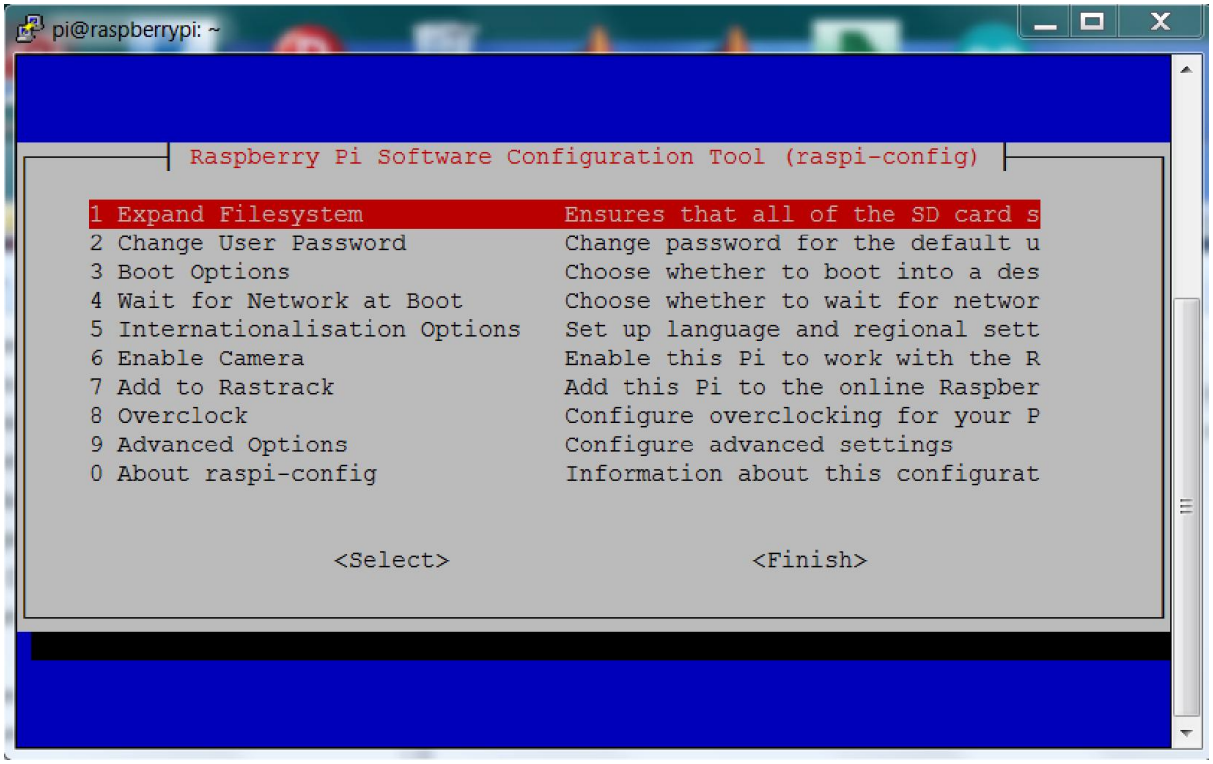

RasPiRobot
V3+
MonthAkes.com
CS
470
16V

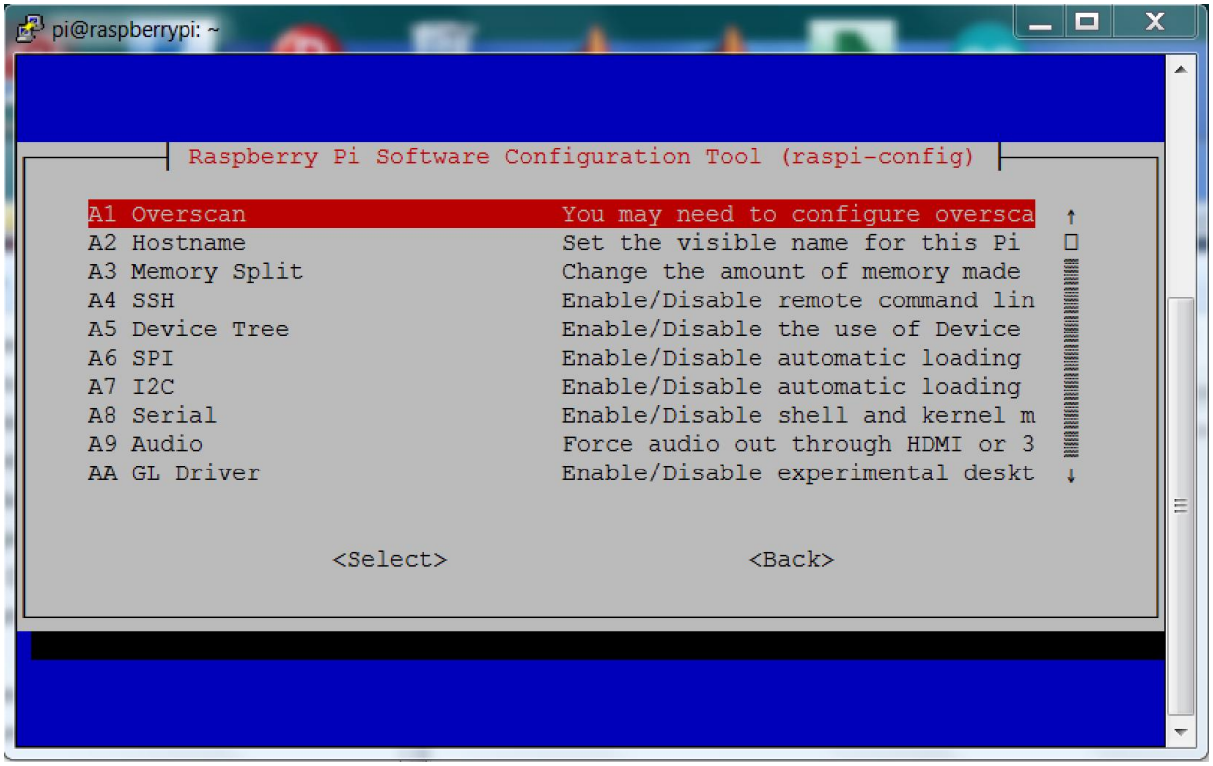


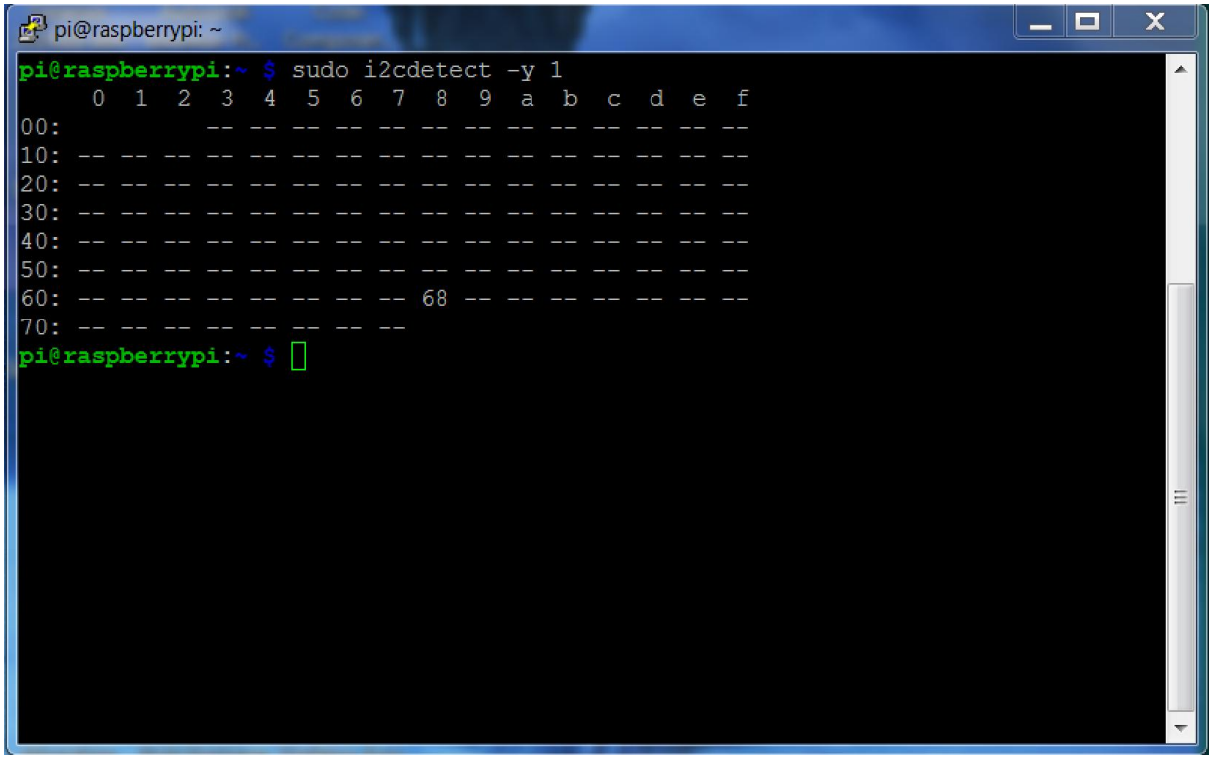

INT
ADO
XCL
XDA
SDA
SCL
GND
VCC
X
Y
ITGMPU

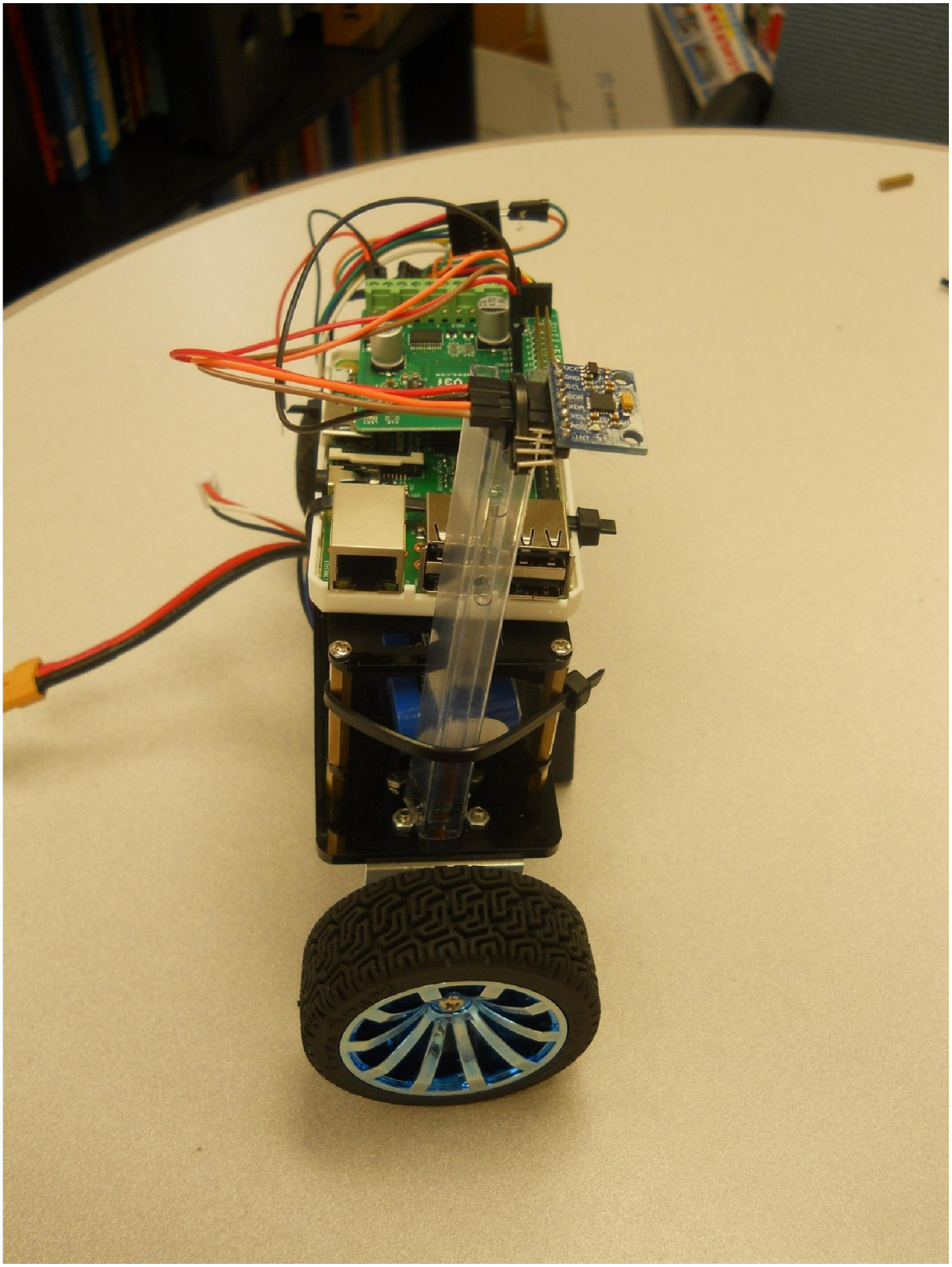

RasPiRobot
V3f
MonkMakes.com
I2C
5V
GND
D
C
SONAR
5V T E GND
OC2
L
R
GND
+V
9-12V
SW2
LED1
R10
IC1
C1
C2
C3
C4
C5
C6
R1
R2
R3
R4
R13
R14
R8
R7
R15
Q1
Q2
C8
C9
C7
D1
470
16V

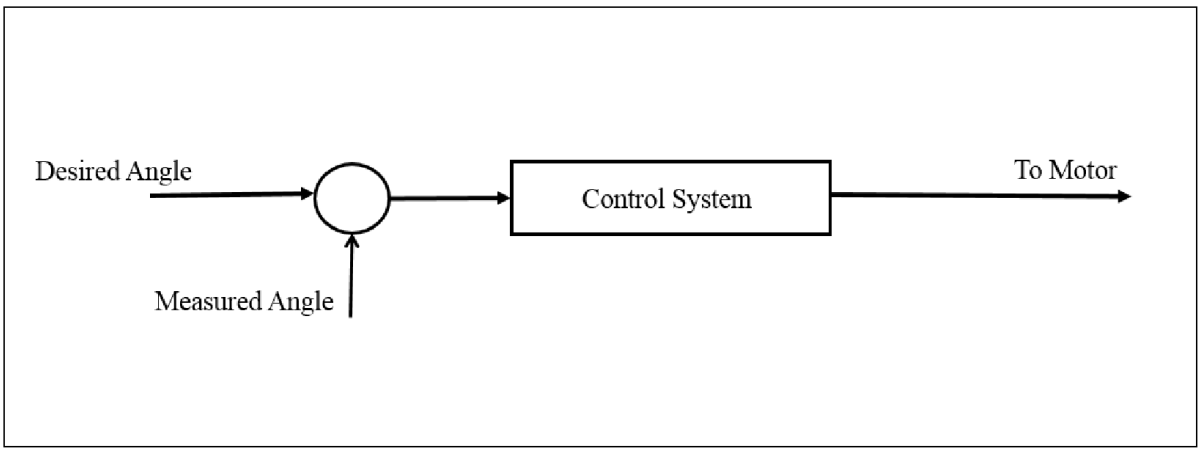

SH1 SH2
ETHERNET
Esc
F1
F2

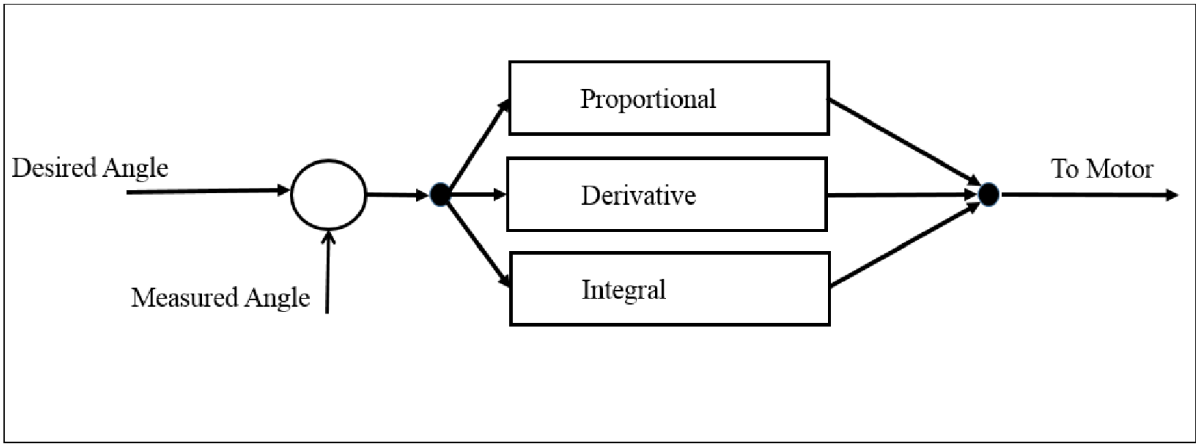

pi@raspberrypi: ~
Raspberry Pi Software Configuration Tool (raspi-config)
1 Expand Filesystem Ensures that all of the SD card s
2 Change User Password Change password for the default u
3 Boot Options Choose whether to boot into a des
4 Wait for Network at Boot Choose whether to wait for networ
5 Internationalisation 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
AA GL Driver Enable/Disable experimental deskt
<Select>
<Back>

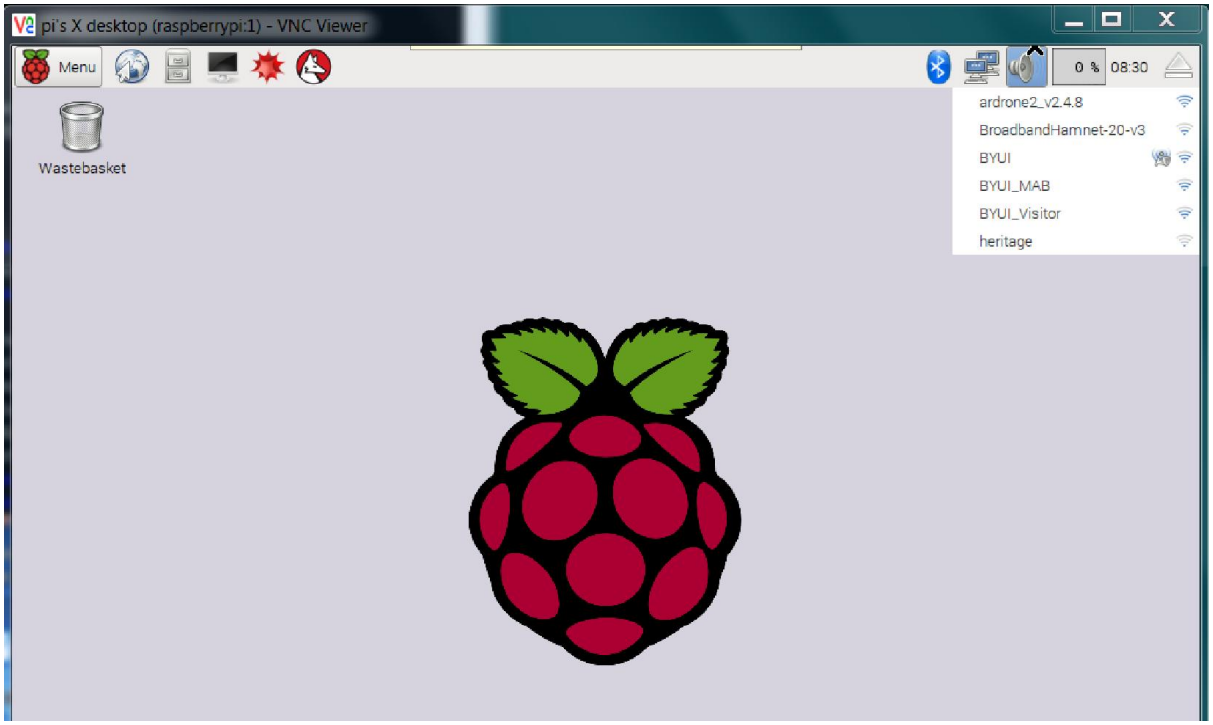

pi@raspberrypi: ~
pi@raspberrypi:~ $ sudo i2cdetect -y 1
0 1 2 3 4 5 6 7 8 9 a b c d e f
00: -- -- -- -- -- -- -- -- -- -- -- -- --
10: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
20: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
30: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
40: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
50: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
60: -- -- -- -- -- -- -- -- 68 -- -- -- -- -- -- --
70: -- -- -- -- -- -- -- --
pi@raspberrypi:~ $

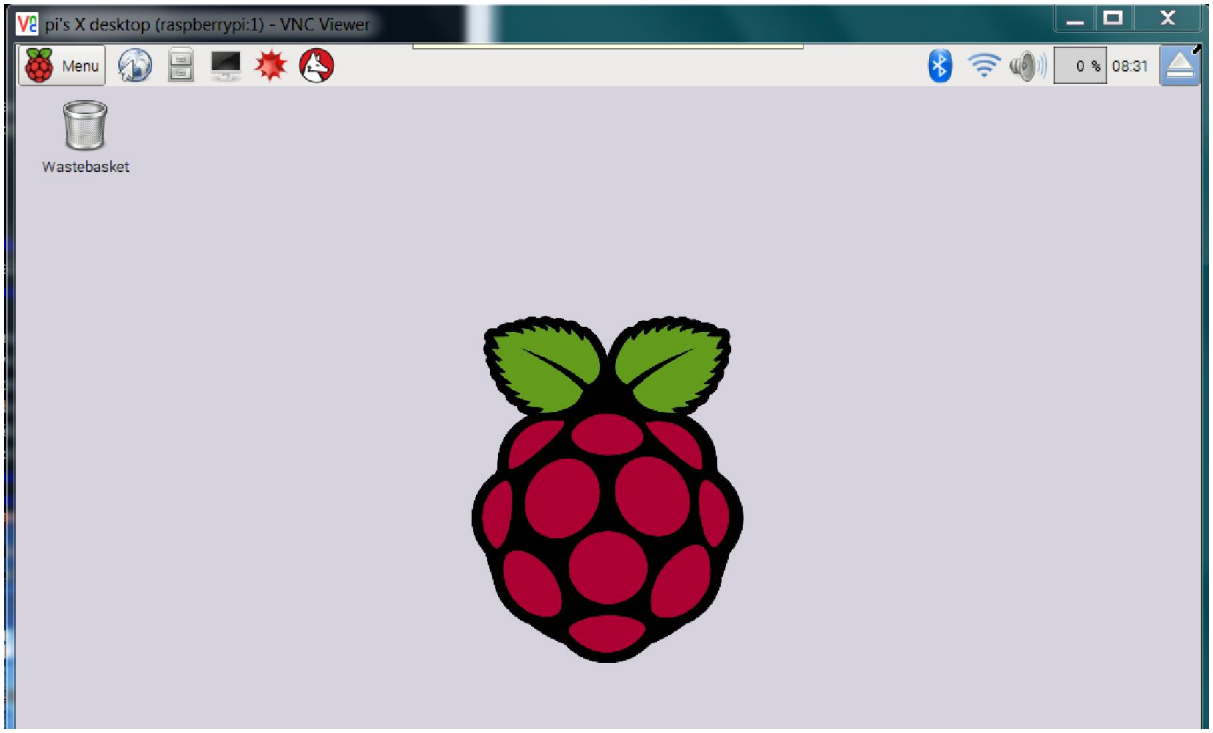



Desired Angle
Control System
To Motor
Measured Angle

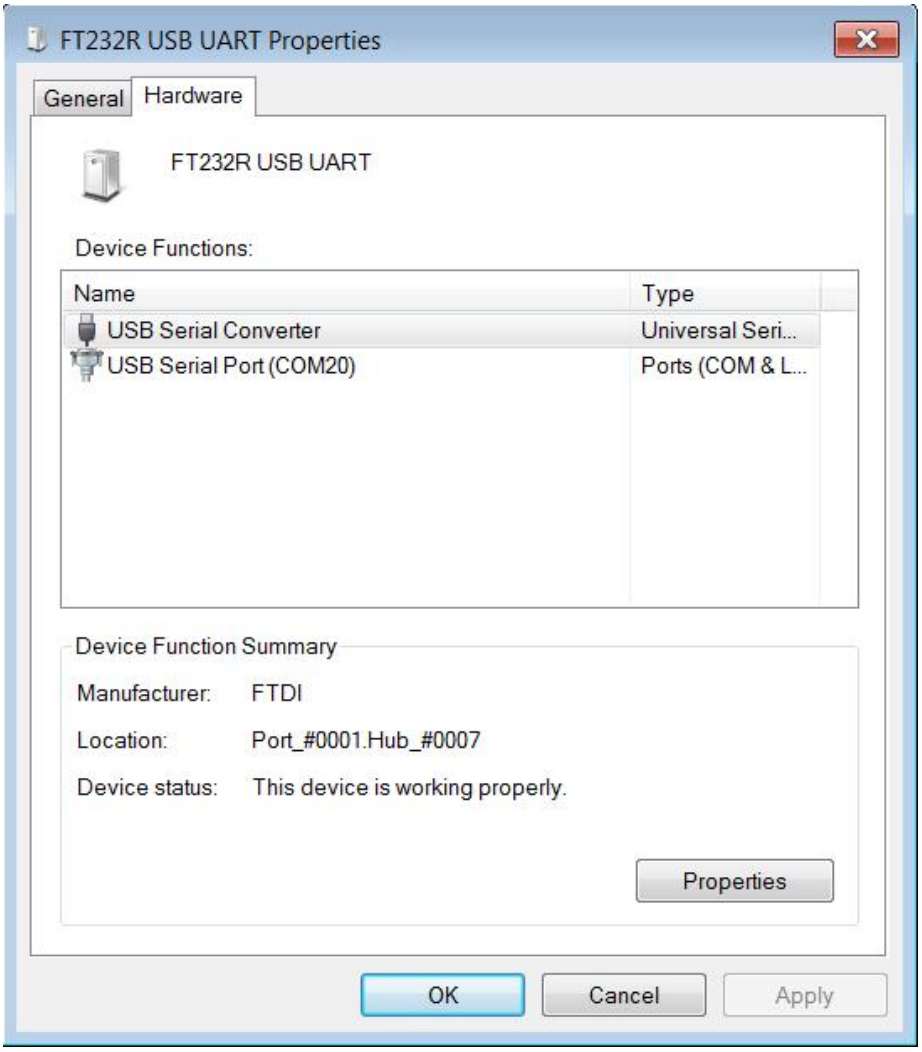

Proportional
Desired Angle
Derivative
To Motor
Integral
Measured Angle

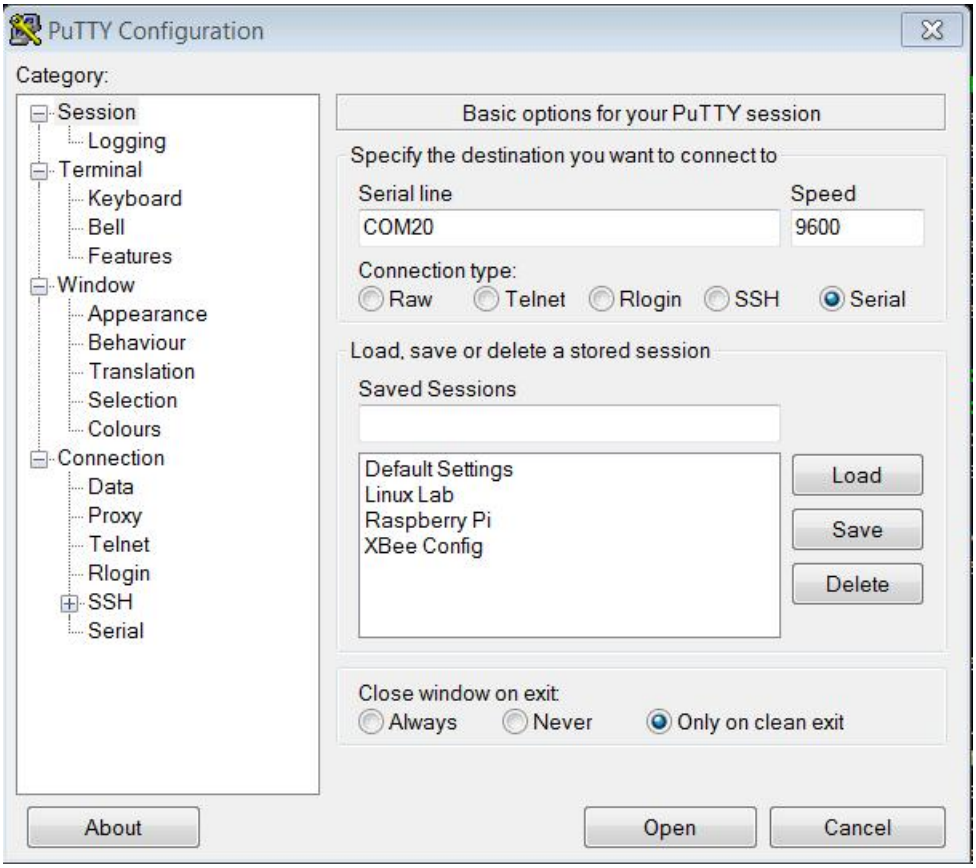
Chapter 7: Adding the Raspberry Pi to a Quadcopter

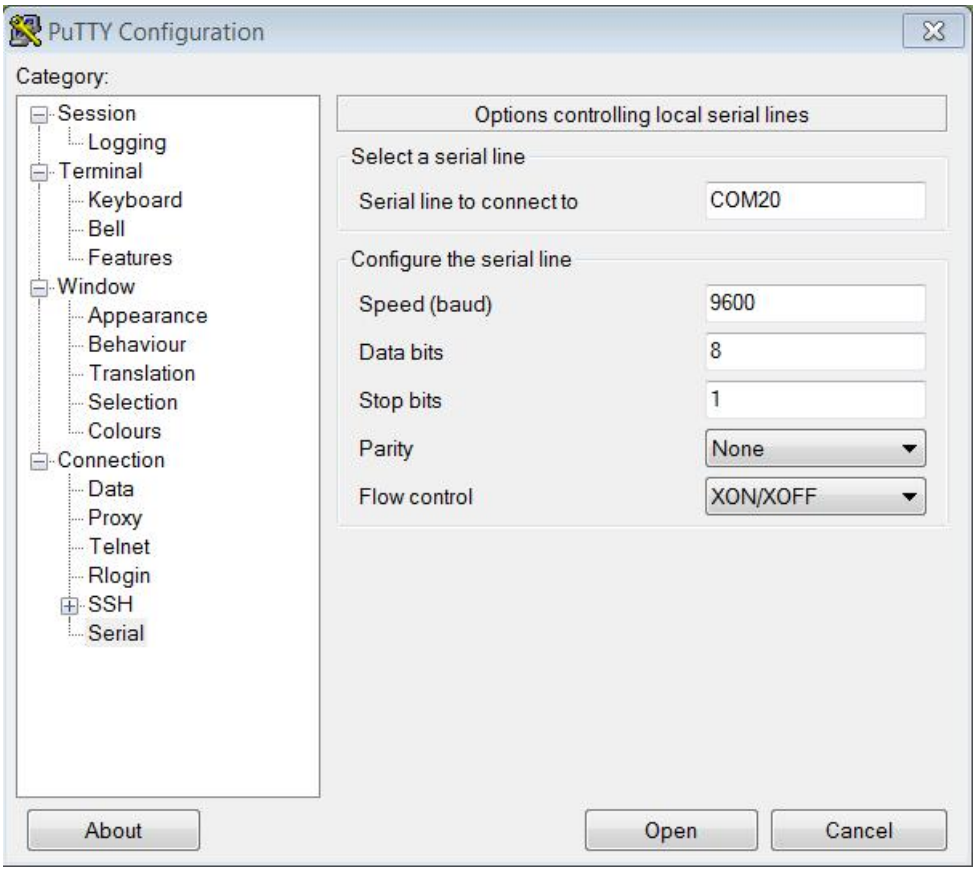

pi's X desktop (raspberrypi:1) - VNC Viewer
Menu
0 %
08:30
Wastebasket
ardrone2_v2.4.8
BroadbandHamnet-20-v3
BYUI
BYUI_MAB
BYUI_Visitor
heritage

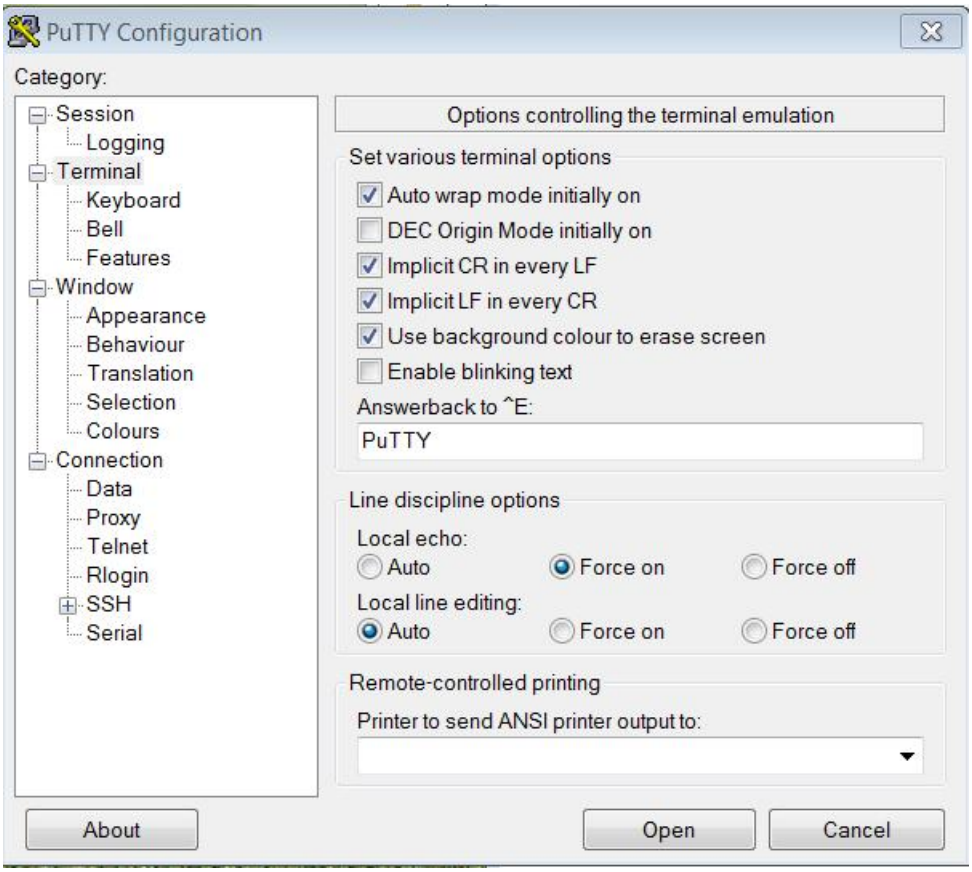

pi's X desktop (raspberrypi:1) - VNC Viewer
Menu
0 %
08:31
Wastebasket

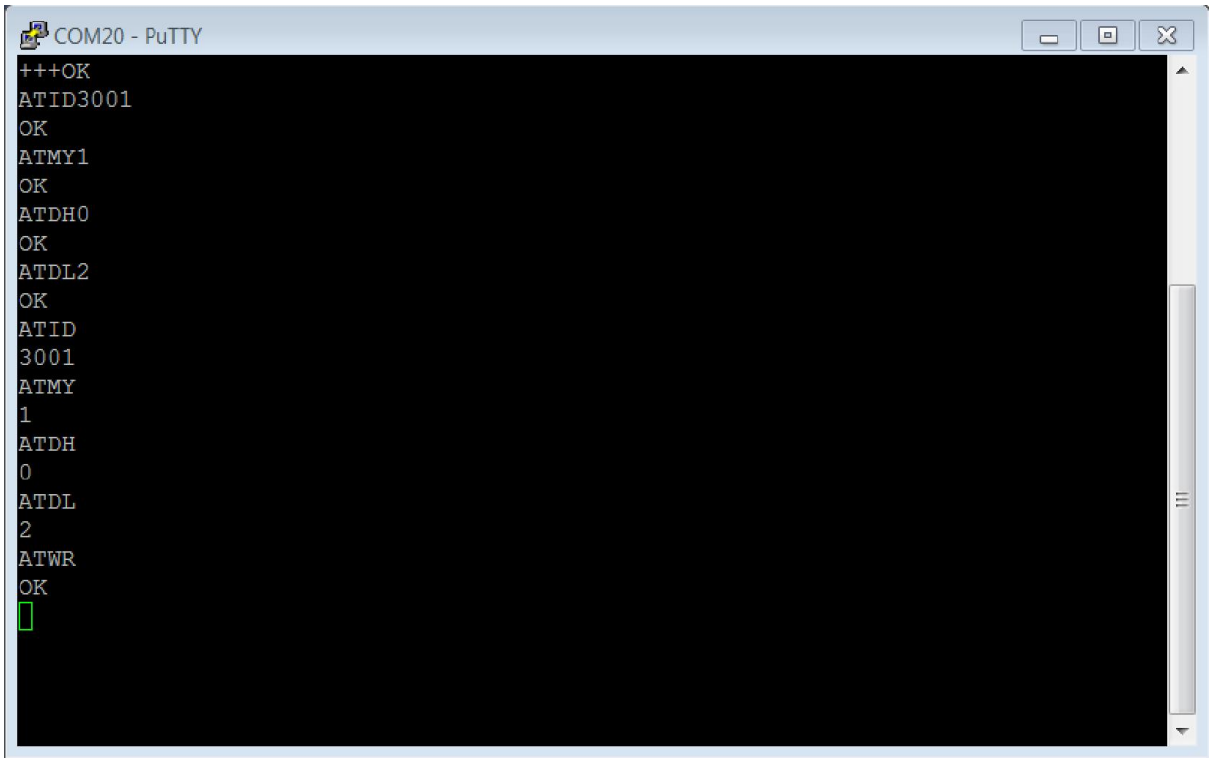

Unspecified (1)
FT232R USB
UART
10 items

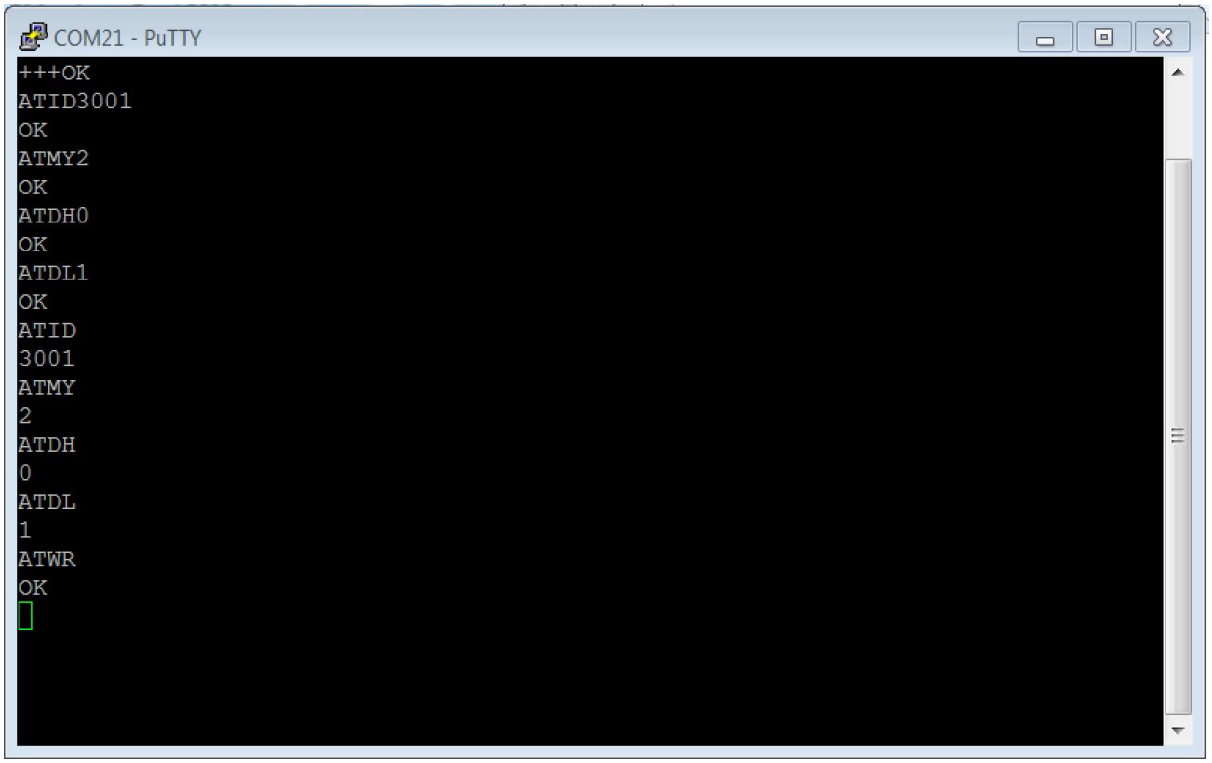

FT232R USB UART Properties
General
Hardware
FT232R USB UART
Device Functions:
Name
Type
USB Serial Converter
Universal Seri...
USB Serial Port (COM20)
Ports (COM & L...
Device Function Summary
Manufacturer:
FTDI
Location:
Port_#0001.Hub_#0007
Device status:
This device is working properly.
Properties
OK
Cancel
Apply

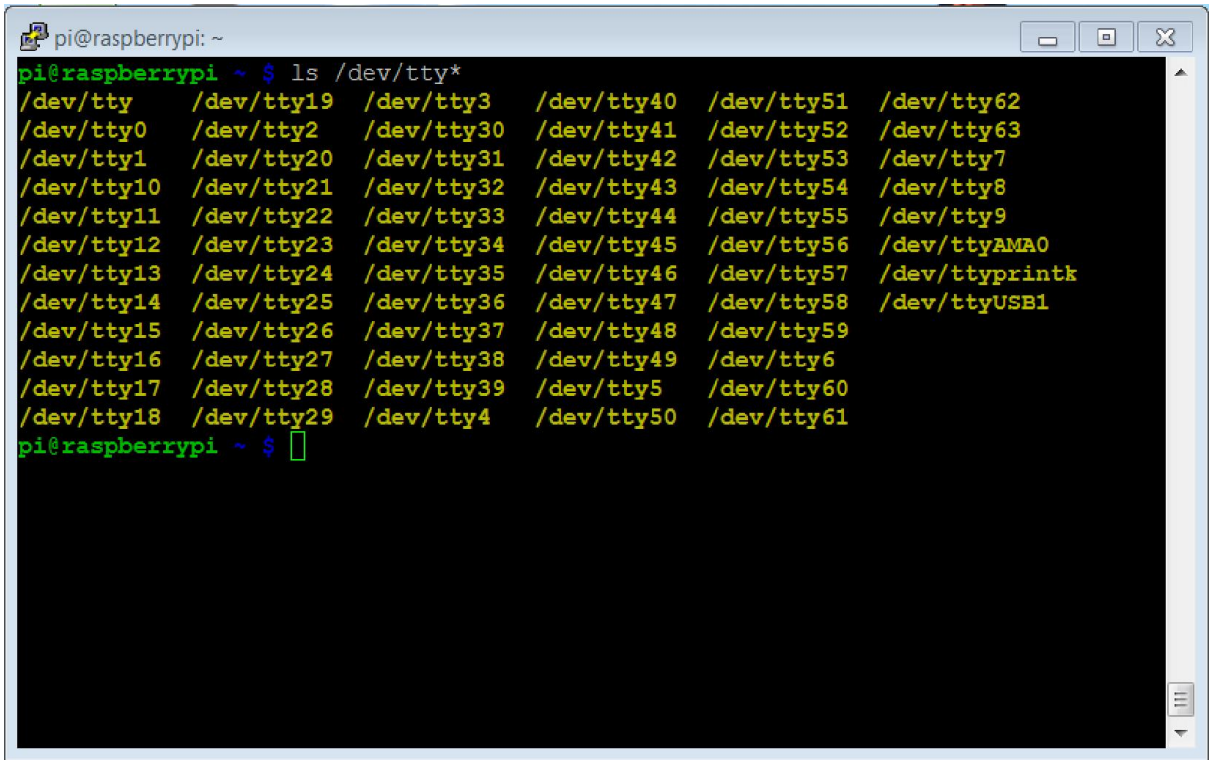

PuTTY Configuration
Category:
Session
Logging
Terminal
Keyboard
Bell
Features
Window
Appearance
Behaviour
Translation
Selection
Colours
Connection
Data
Proxy
Telnet
Rlogin
SSH
Serial
Basic options for your PuTTY session
Specify the destination you want to connect to
Serial line
Speed
COM20
9600
Connection type:
Raw
Telnet
Rlogin
SSH
Serial
Load, save or delete a stored session
Saved Sessions
Default Settings
Linux Lab
Raspberry Pi
XBee Config
Load
Save
Delete
Close window on exit:
Always
Never
Only on clean exit
About
Open
Cancel

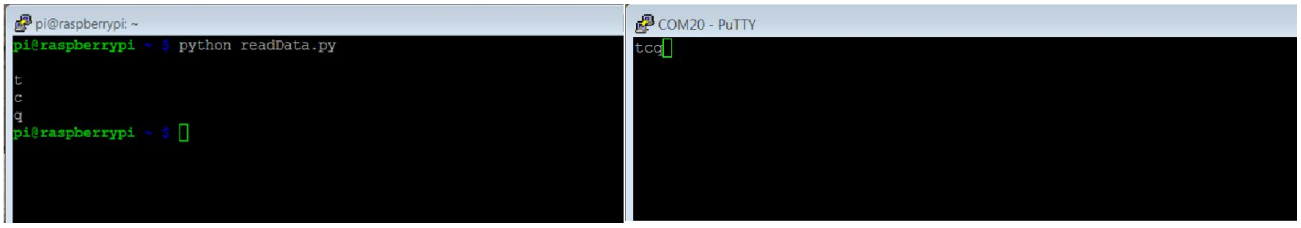

PuTTY Configuration
Category:
Session
Logging
Terminal
Keyboard
Bell
Features
Window
Appearance
Behaviour
Translation
Selection
Colours
Connection
Data
Proxy
Telnet
Rlogin
SSH
Serial
Options controlling local serial lines
Select a serial line
Serial line to connect to
COM20
Configure the serial line
Speed (baud)
9600
Data bits
8
Stop bits
1
Parity
None
Flow control
XON/XOFF
About
Open
Cancel

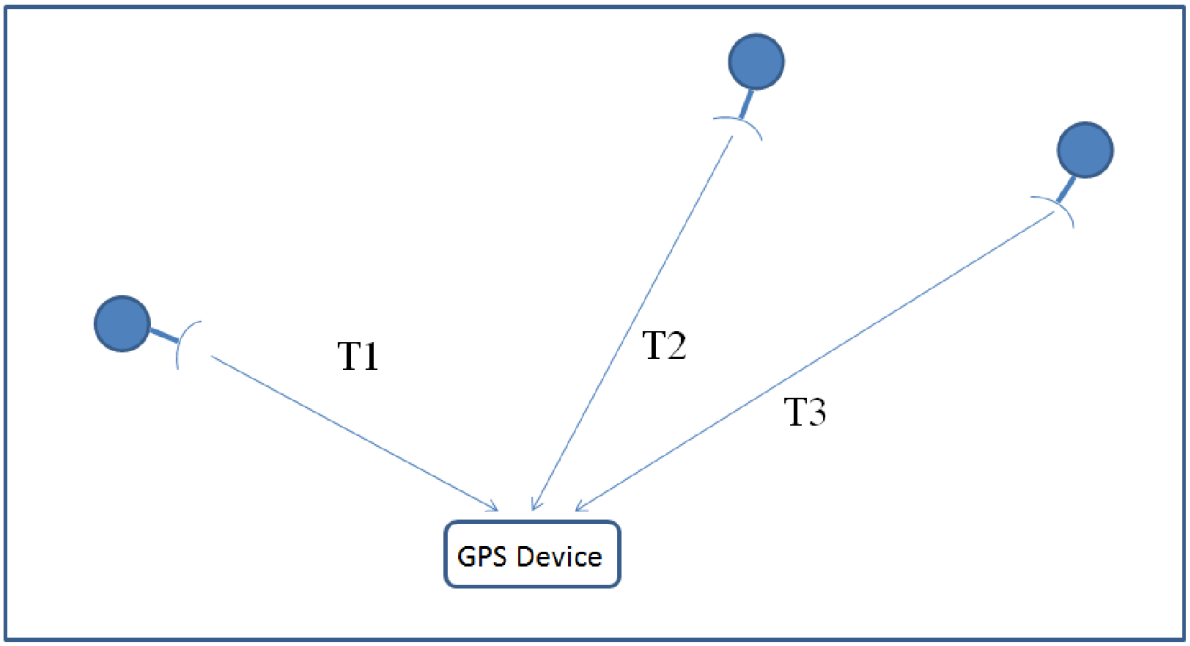

PuTTY Configuration
Category:
Session
Logging
Terminal
Keyboard
Bell
Features
Window
Appearance
Behaviour
Translation
Selection
Colours
Connection
Data
Proxy
Telnet
Rlogin
SSH
Serial
Options controlling the terminal emulation
Set various terminal options
Auto wrap mode initially on
DEC Origin Mode initially on
Implicit CR in every LF
Implicit LF in every CR
Use background colour to erase screen
Enable blinking text
Answerback to ^E:
PuTTY
Line discipline options
Local echo:
Auto
Force on
Force off
Local line editing:
Auto
Force on
Force off
Remote-controlled printing
Printer to send ANSI printer output to:
About
Open
Cancel

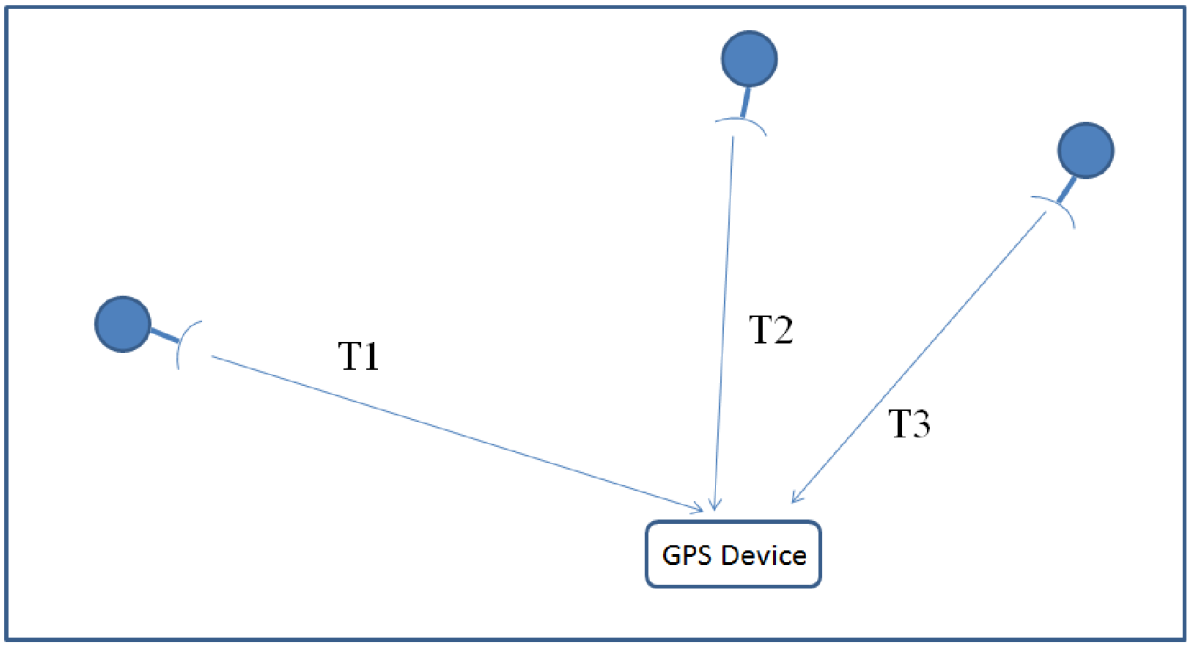

COM20 - PuTTY
+++OK
ATID3001
OK
ATMY1
OK
ATDH0
OK
ATDL2
OK
ATID
3001
ATMY
1
ATDH
0
ATDL
2
ATWR
OK

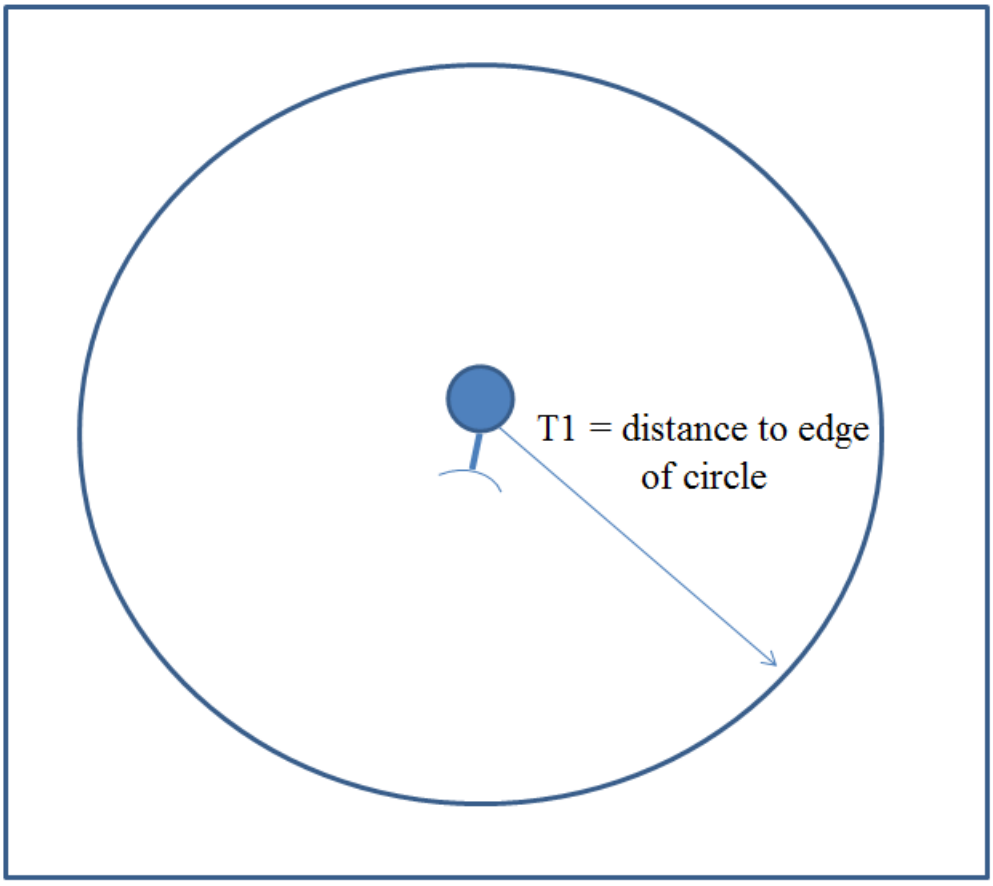

COM21 - PuTTY
+++OK
ATID3001
OK
ATMY2
OK
ATDH0
OK
ATDL1
OK
ATID
3001
ATMY
2
ATDH
0
ATDL
1
ATWR
OK

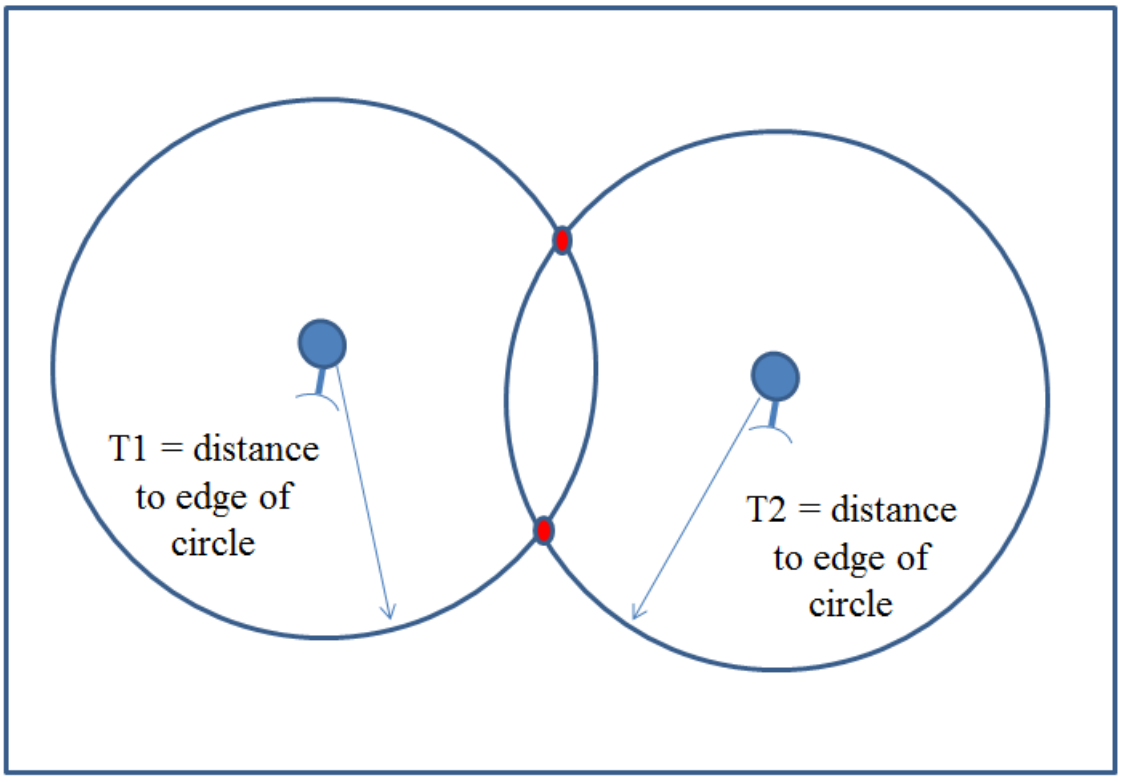

pi@raspberrypi: ~
pi@raspberrypi ~ $ ls /dev/tty*
/dev/tty /dev/tty19 /dev/tty3 /dev/tty40 /dev/tty51 /dev/tty62
/dev/tty0 /dev/tty2 /dev/tty30 /dev/tty41 /dev/tty52 /dev/tty63
/dev/tty1 /dev/tty20 /dev/tty31 /dev/tty42 /dev/tty53 /dev/tty7
/dev/tty10 /dev/tty21 /dev/tty32 /dev/tty43 /dev/tty54 /dev/tty8
/dev/tty11 /dev/tty22 /dev/tty33 /dev/tty44 /dev/tty55 /dev/tty9
/dev/tty12 /dev/tty23 /dev/tty34 /dev/tty45 /dev/tty56 /dev/ttyAMA0
/dev/tty13 /dev/tty24 /dev/tty35 /dev/tty46 /dev/tty57 /dev/ttyprintk
/dev/tty14 /dev/tty25 /dev/tty36 /dev/tty47 /dev/tty58 /dev/ttyUSB1
/dev/tty15 /dev/tty26 /dev/tty37 /dev/tty48 /dev/tty59
/dev/tty16 /dev/tty27 /dev/tty38 /dev/tty49 /dev/tty6
/dev/tty17 /dev/tty28 /dev/tty39 /dev/tty5 /dev/tty60
/dev/tty18 /dev/tty29 /dev/tty4 /dev/tty50 /dev/tty61
pi@raspberrypi ~ $

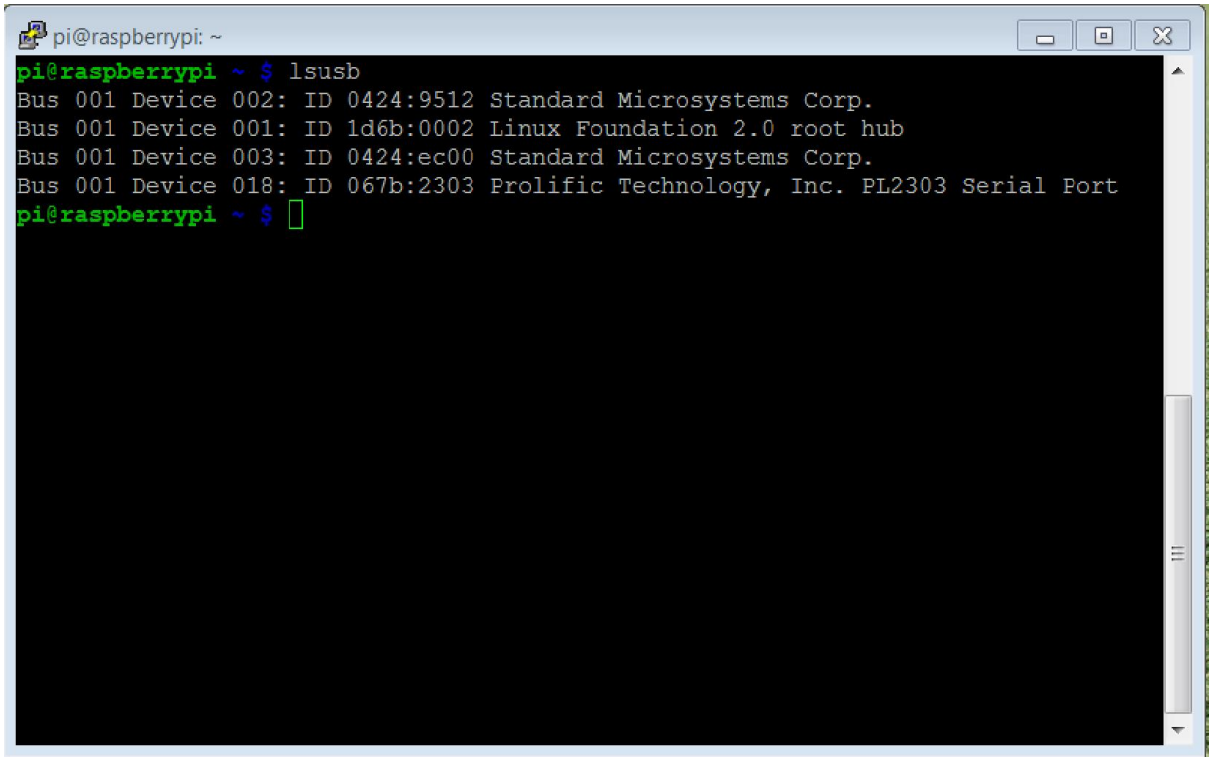

pi@raspberrypi: ~
pi@raspberrypi ~ $ python readData.py
t
c
g
pi@raspberrypi ~ $
COM20 - PuTTY
tcg

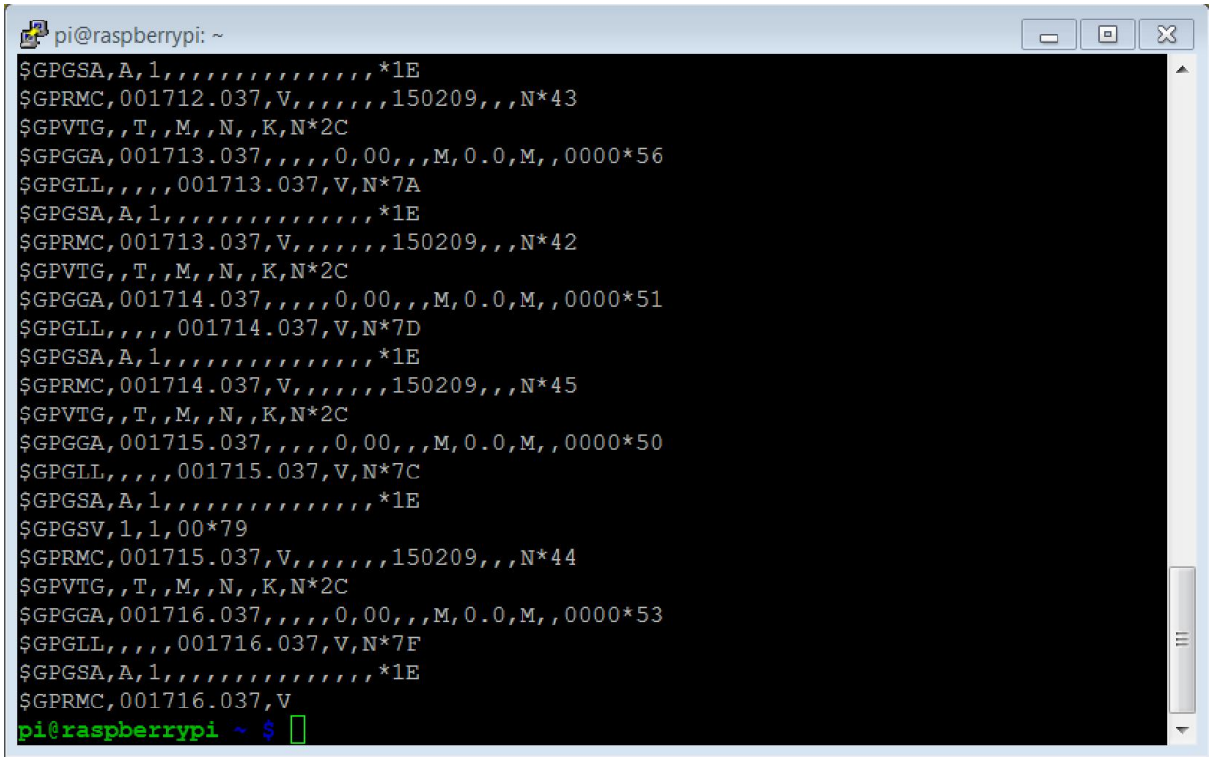

T1
T2
T3
GPS Device

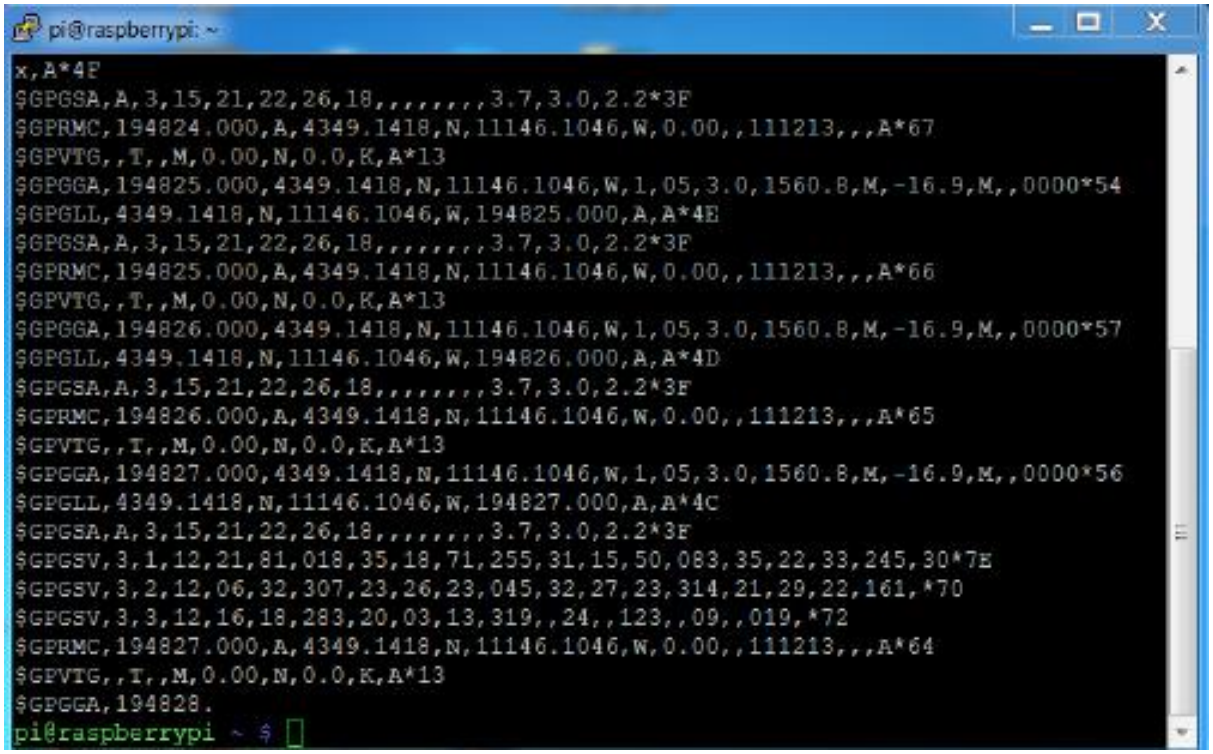

T1
T2
T3
GPS Device

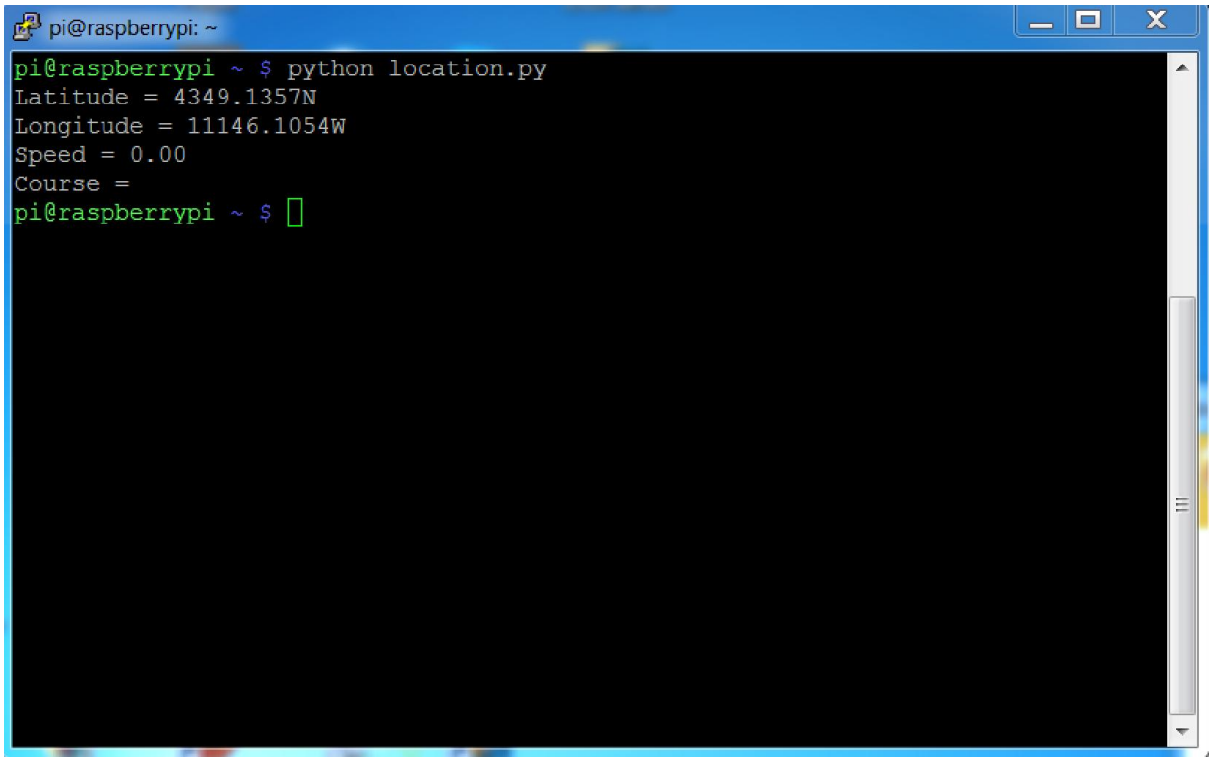

T1 = distance to edge of circle

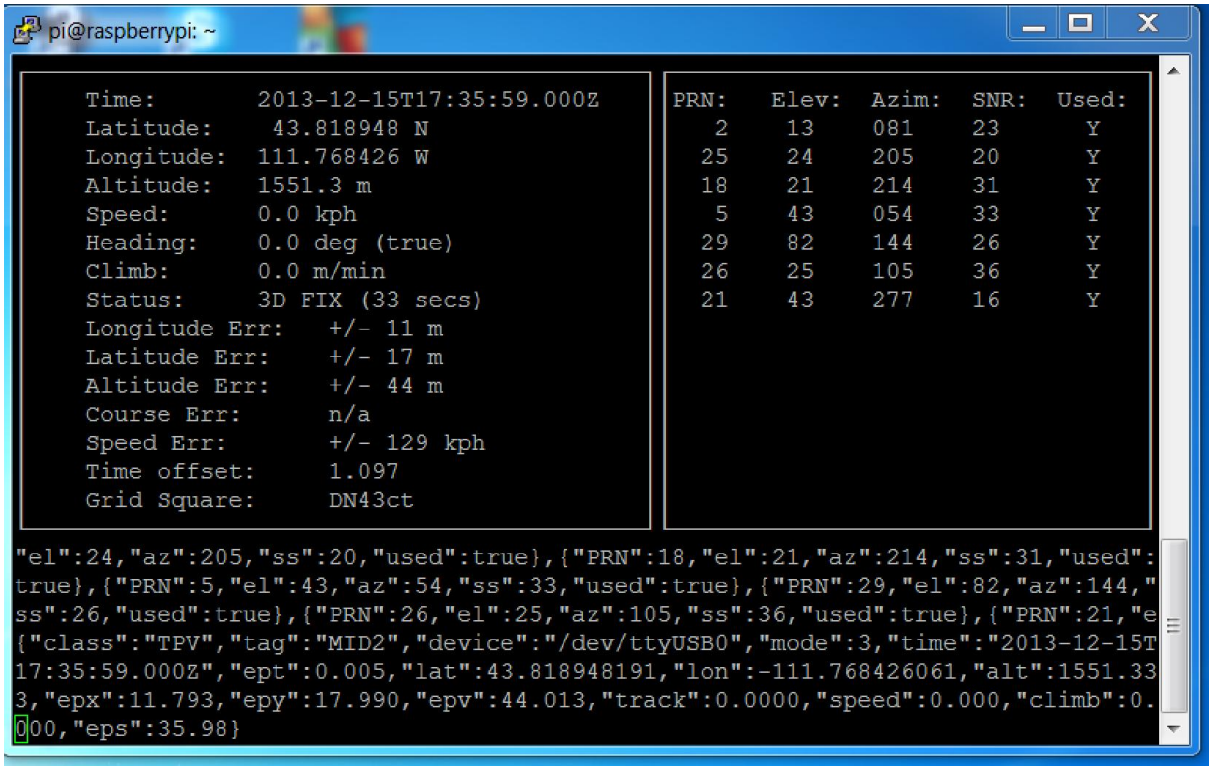

T1 = distance to edge of circle
T2 = distance to edge of circle

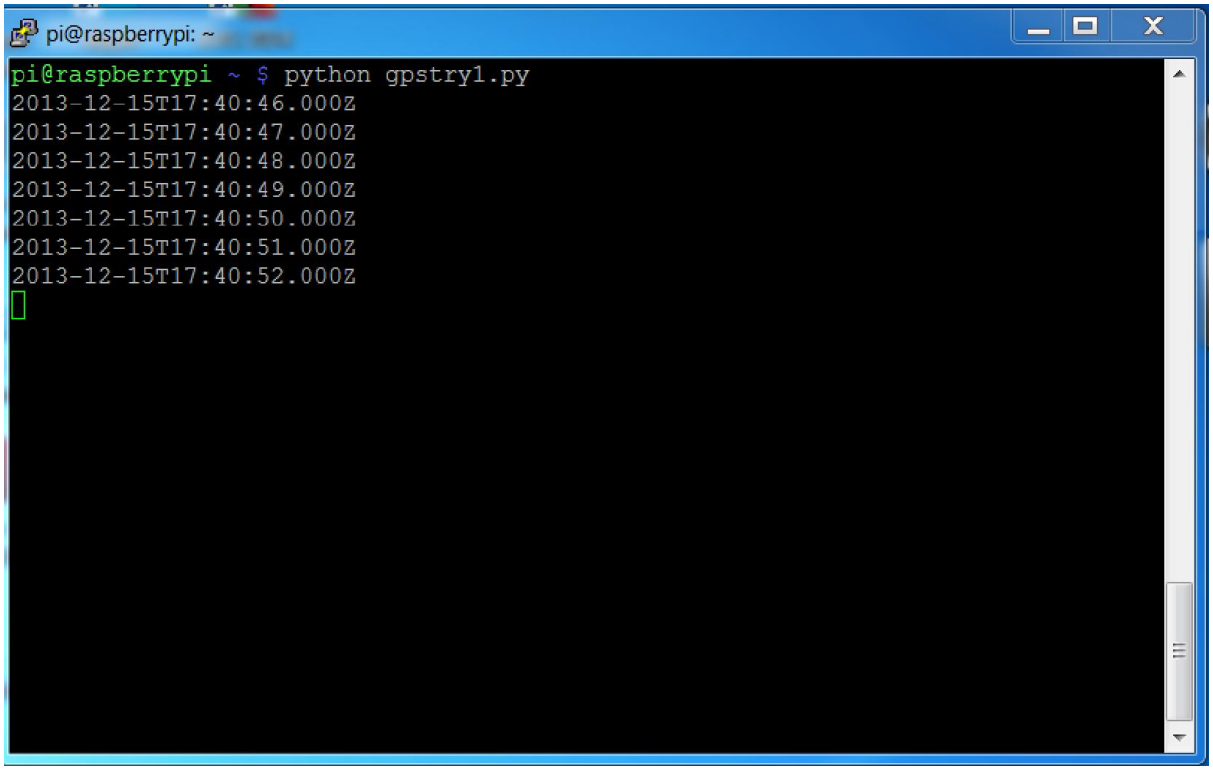

pi@raspberrypi: ~
pi@raspberrypi ~ $ lsusb
Bus 001 Device 002: ID 0424:9512 Standard Microsystems Corp.
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 001 Device 003: ID 0424:ec00 Standard Microsystems Corp.
Bus 001 Device 018: ID 067b:2303 Prolific Technology, Inc. PL2303 Serial Port
pi@raspberrypi ~ $


pi@raspberrypi: ~
$GPGSA,A,1,,,,,,,,,,,,,*1E
$GPRMC,001712.037,V,,,,,,,150209,,,N*43
$GPVTG,,T,,M,,N,,K,N*2C
$GPGGA,001713.037,,,,,0,00,,,M,0.0,M,,0000*56
$GPGLL,,,,,001713.037,V,N*7A
$GPGSA,A,1,,,,,,,,,,,,,*1E
$GPRMC,001713.037,V,,,,,,,150209,,,N*42
$GPVTG,,T,,M,,N,,K,N*2C
$GPGGA,001714.037,,,,,0,00,,,M,0.0,M,,0000*51
$GPGLL,,,,,001714.037,V,N*7D
$GPGSA,A,1,,,,,,,,,,,,,*1E
$GPRMC,001714.037,V,,,,,,,150209,,,N*45
$GPVTG,,T,,M,,N,,K,N*2C
$GPGGA,001715.037,,,,,0,00,,,M,0.0,M,,0000*50
$GPGLL,,,,,001715.037,V,N*7C
$GPGSA,A,1,,,,,,,,,,,,,*1E
$GPGSV,1,1,00*79
$GPRMC,001715.037,V,,,,,,,150209,,,N*44
$GPVTG,,T,,M,,N,,K,N*2C
$GPGGA,001716.037,,,,,0,00,,,M,0.0,M,,0000*53
$GPGLL,,,,,001716.037,V,N*7F
$GPGSA,A,1,,,,,,,,,,,,,*1E
$GPRMC,001716.037,V
pi@raspberrypi ~ $


pi@raspberrypi: ~
x,A*4F
$GPGSA,A,3,15,21,22,26,18,,,,,,,,3.7,3.0,2.2*3F
$GPRMC,194824.000,A,4349.1418,N,11146.1046,W,0.00,,111213,,,A*67
$GPVTG,,T,,M,0.00,N,0.0,K,A*13
$GPGGA,194825.000,4349.1418,N,11146.1046,W,1,05,3.0,1560.8,M,-16.9,M,,0000*54
$GPGLL,4349.1418,N,11146.1046,W,194825.000,A,A*4E
$GPGSA,A,3,15,21,22,26,18,,,,,,,,3.7,3.0,2.2*3F
$GPRMC,194825.000,A,4349.1418,N,11146.1046,W,0.00,,111213,,,A*66
$GPVTG,,T,,M,0.00,N,0.0,K,A*13
$GPGGA,194826.000,4349.1418,N,11146.1046,W,1,05,3.0,1560.8,M,-16.9,M,,0000*57
$GPGLL,4349.1418,N,11146.1046,W,194826.000,A,A*4D
$GPGSA,A,3,15,21,22,26,18,,,,,,,,3.7,3.0,2.2*3F
$GPRMC,194826.000,A,4349.1418,N,11146.1046,W,0.00,,111213,,,A*65
$GPVTG,,T,,M,0.00,N,0.0,K,A*13
$GPGGA,194827.000,4349.1418,N,11146.1046,W,1,05,3.0,1560.8,M,-16.9,M,,0000*56
$GPGLL,4349.1418,N,11146.1046,W,194827.000,A,A*4C
$GPGSA,A,3,15,21,22,26,18,,,,,,,,3.7,3.0,2.2*3F
$GPGSV,3,1,12,21,81,018,35,18,71,255,31,15,50,083,35,22,33,245,30*7E
$GPGSV,3,2,12,06,32,307,23,26,23,045,32,27,23,314,21,29,22,161,*70
$GPGSV,3,3,12,16,18,283,20,03,13,319,,24,,123,,09,,019,*72
$GPRMC,194827.000,A,4349.1418,N,11146.1046,W,0.00,,111213,,,A*64
$GPVTG,,T,,M,0.00,N,0.0,K,A*13
$GPGGA,194828.
pi@raspberrypi ~ $


pi@raspberrypi: ~
pi@raspberrypi ~ $ python location.py
Latitude = 4349.1357N
Longitude = 11146.1054W
Speed = 0.00
Course =
pi@raspberrypi ~ $


pi@raspberrypi: ~
Time: 2013-12-15T17:35:59.000Z
Latitude: 43.818948 N
Longitude: 111.768426 W
Altitude: 1551.3 m
Speed: 0.0 kph
Heading: 0.0 deg (true)
Climb: 0.0 m/min
Status: 3D FIX (33 secs)
Longitude Err: +/- 11 m
Latitude Err: +/- 17 m
Altitude Err: +/- 44 m
Course Err: n/a
Speed Err: +/- 129 kph
Time offset: 1.097
Grid Square: DN43ct
PRN: Elev: Azim: SNR: Used:
2 13 081 23 Y
25 24 205 20 Y
18 21 214 31 Y
5 43 054 33 Y
29 82 144 26 Y
26 25 105 36 Y
21 43 277 16 Y
"el":24,"az":205,"ss":20,"used":true},{"PRN":18,"el":21,"az":214,"ss":31,"used":
true},{"PRN":5,"el":43,"az":54,"ss":33,"used":true},{"PRN":29,"el":82,"az":144,"
ss":26,"used":true},{"PRN":26,"el":25,"az":105,"ss":36,"used":true},{"PRN":21,"e
{"class":"TPV","tag":"MID2","device":"/dev/ttyUSB0","mode":3,"time":"2013-12-15T
17:35:59.000Z","ept":0.005,"lat":43.818948191,"lon":-111.768426061,"alt":1551.33
3,"epx":11.793,"epy":17.990,"epv":44.013,"track":0.0000,"speed":0.000,"climb":0.
000,"eps":35.98}


pi@raspberrypi: ~
pi@raspberrypi ~ $ python gpstry1.py
2013-12-15T17:40:46.000Z
2013-12-15T17:40:47.000Z
2013-12-15T17:40:48.000Z
2013-12-15T17:40:49.000Z
2013-12-15T17:40:50.000Z
2013-12-15T17:40:51.000Z
2013-12-15T17:40:52.000Z