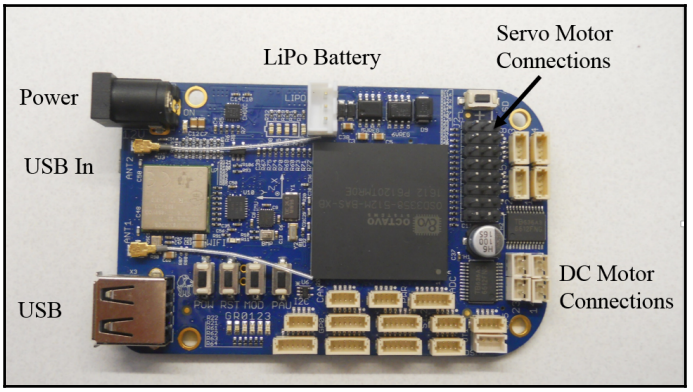
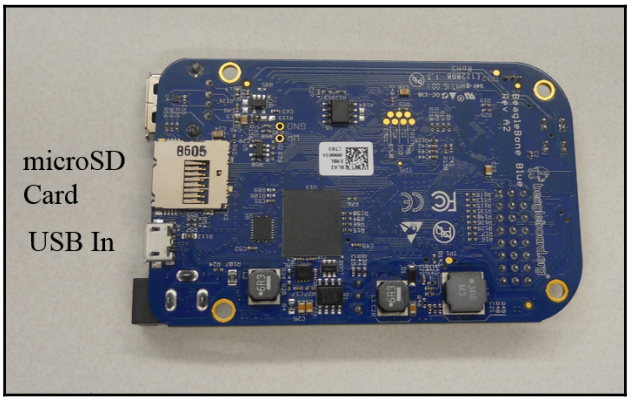
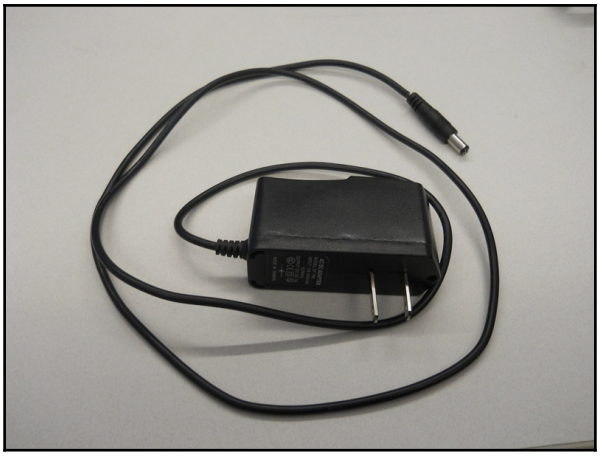
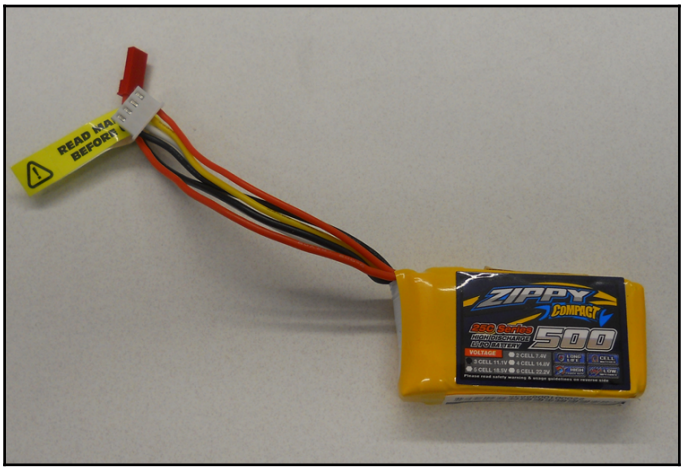
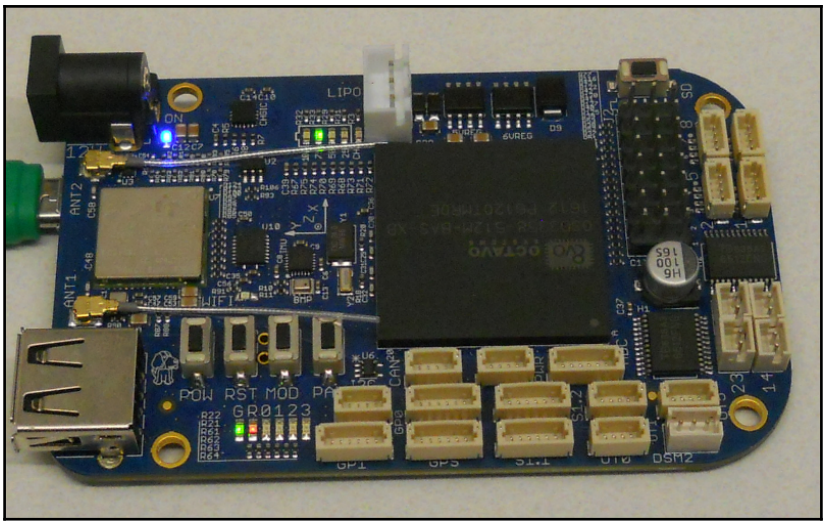
Chapter 1: Getting Started with the BeagleBone Blue



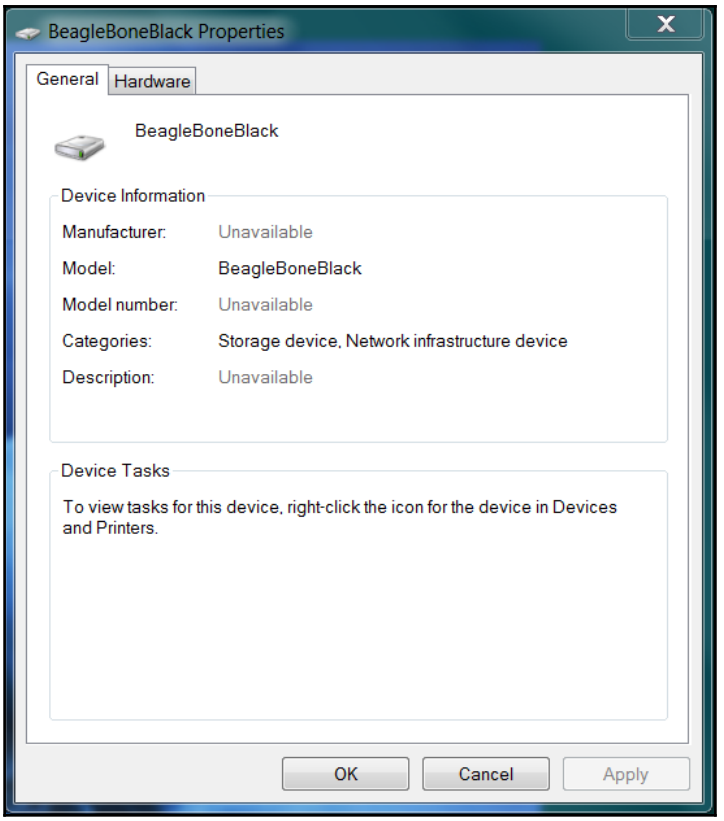


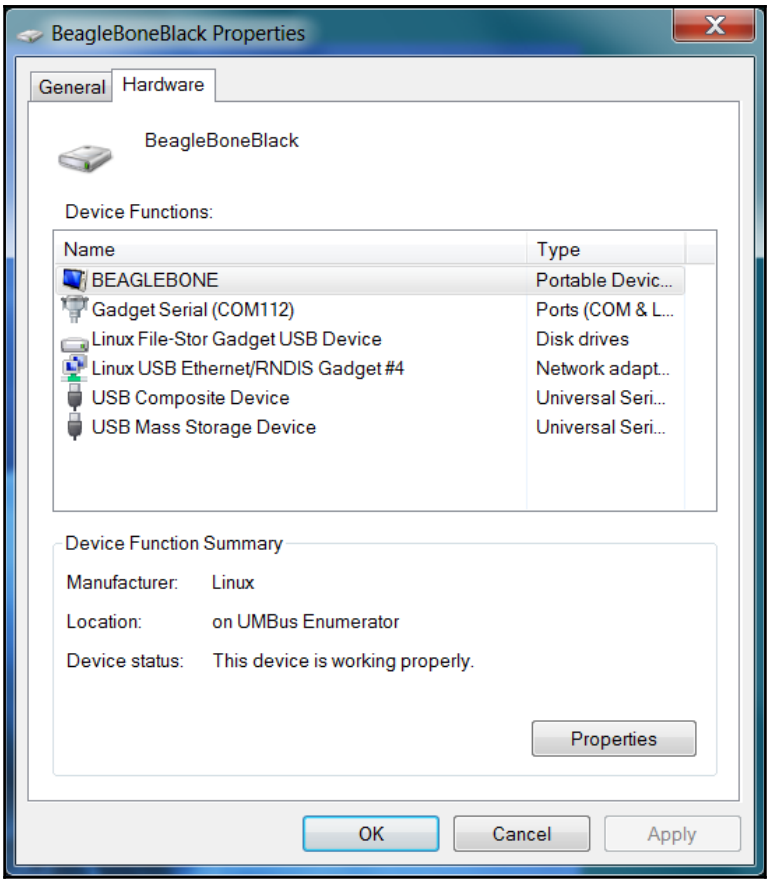


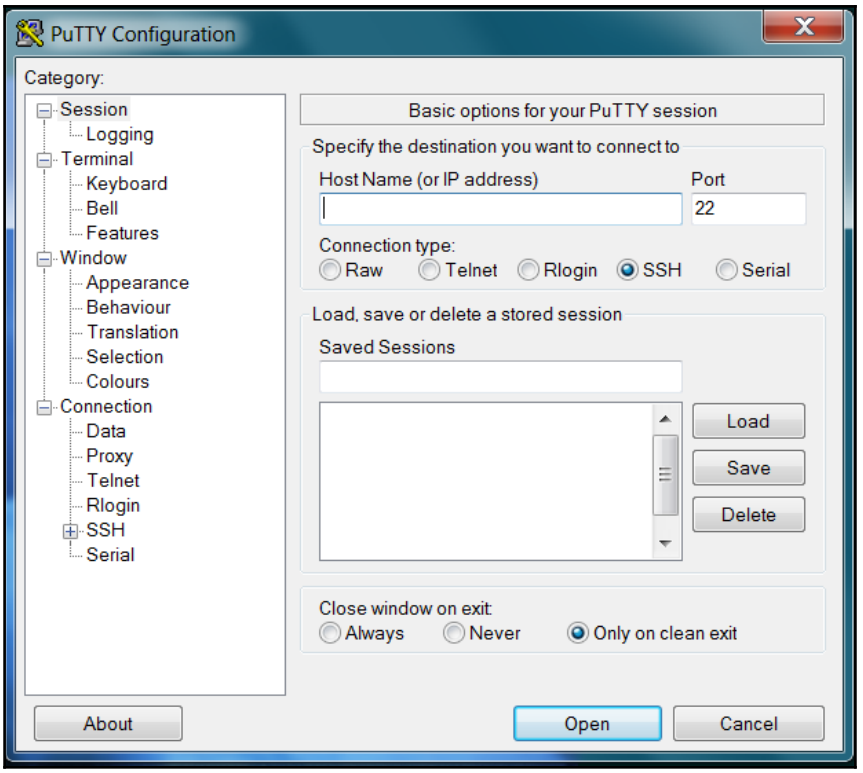

ZIPPY
COMPACT
500

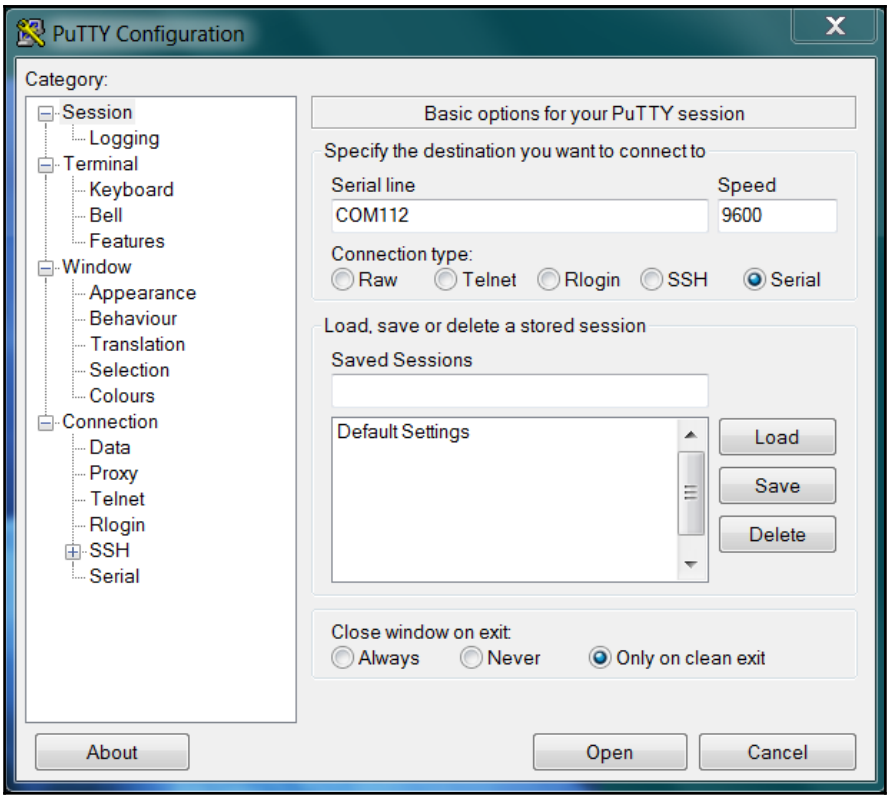

LIPO
ON
ANT2
ANT1
WIFI
POW RST MOD
GR0123
DSM2

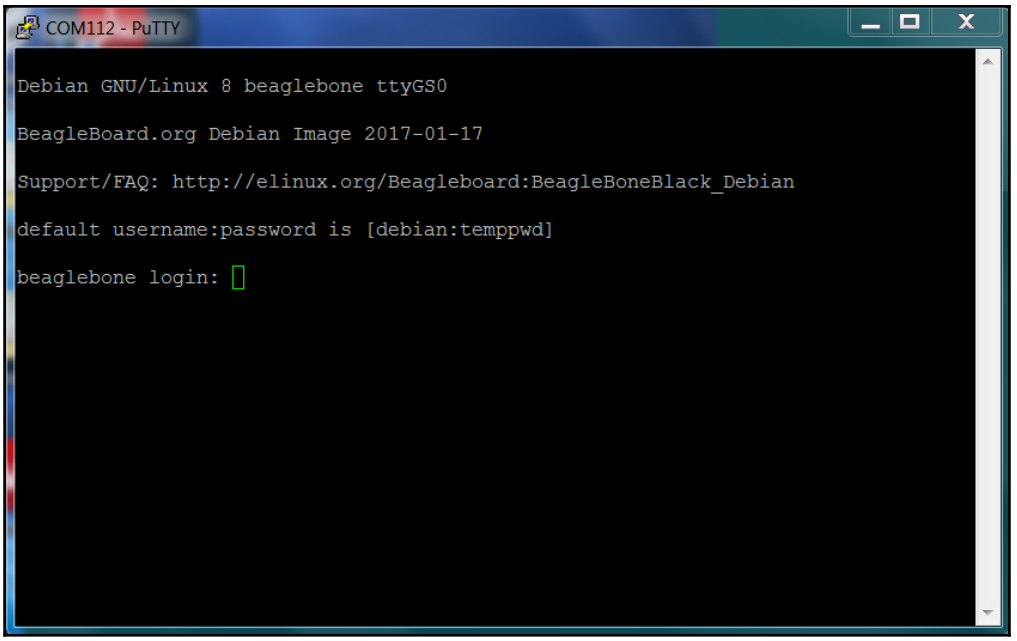

Devices (6)
BeagleBoneBlack

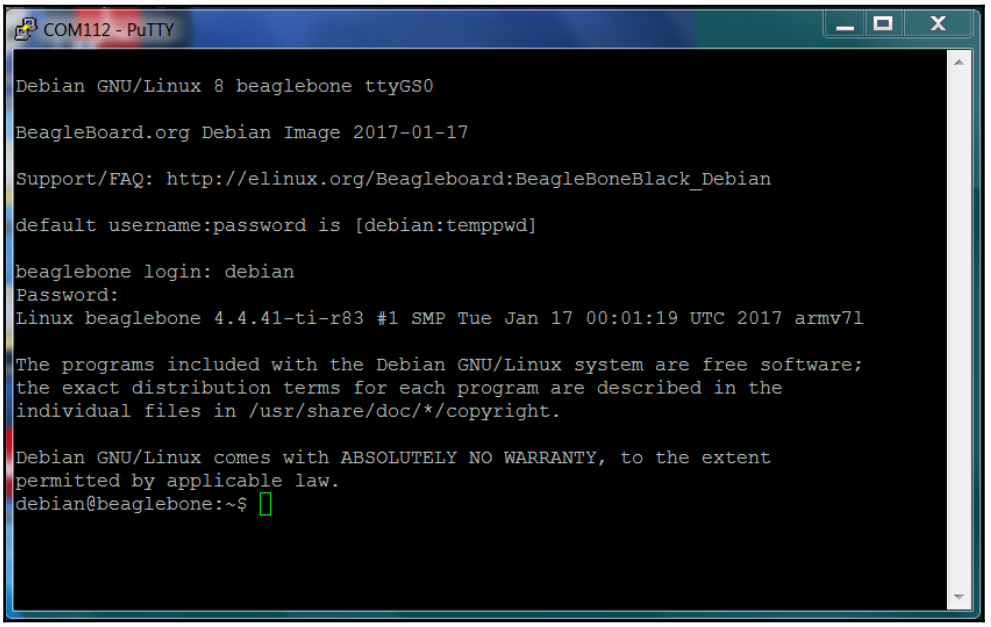

BeagleBoneBlack Properties
General
Hardware
BeagleBoneBlack
Device Information
Manufacturer:
Unavailable
Model:
BeagleBoneBlack
Model number:
Unavailable
Categories:
Storage device, Network infrastructure device
Description:
Unavailable
Device Tasks
To view tasks for this device, right-click the icon for the device in Devices and Printers.
OK
Cancel
Apply

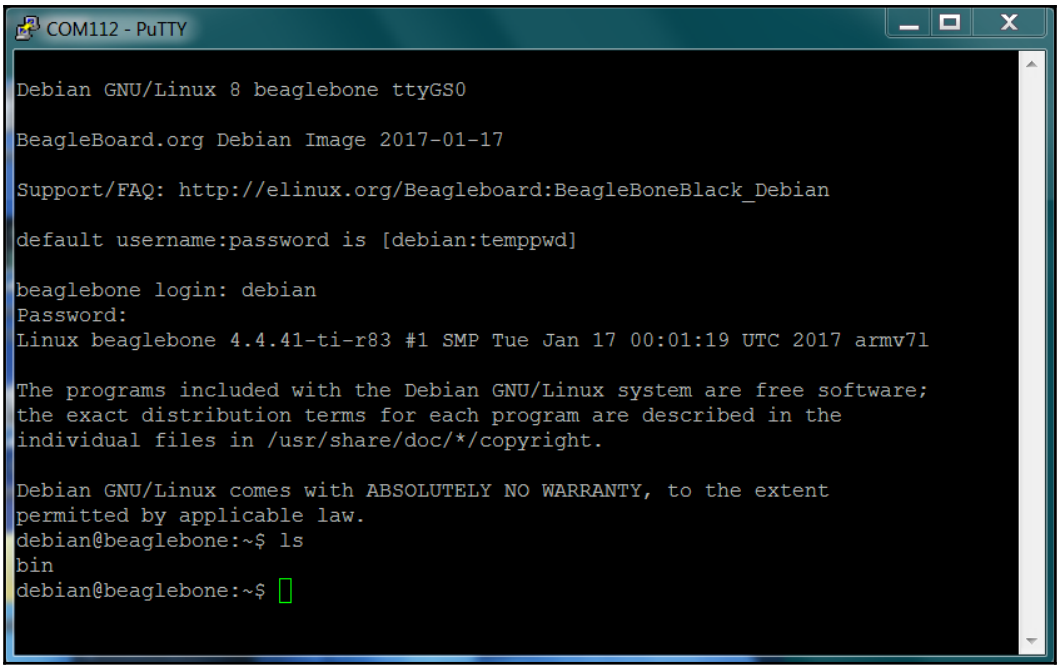

BeagleBoneBlack Properties
General
Hardware
BeagleBoneBlack
Device Functions:
Name
Type
BEAGLEBONE
Portable Devic...
Gadget Serial (COM112)
Ports (COM & L...
Linux File-Stor Gadget USB Device
Disk drives
Linux USB Ethernet/RNDIS Gadget #4
Network adapt...
USB Composite Device
Universal Seri...
USB Mass Storage Device
Universal Seri...
Device Function Summary
Manufacturer:
Linux
Location:
on UMBus Enumerator
Device status:
This device is working properly.
Properties
OK
Cancel
Apply

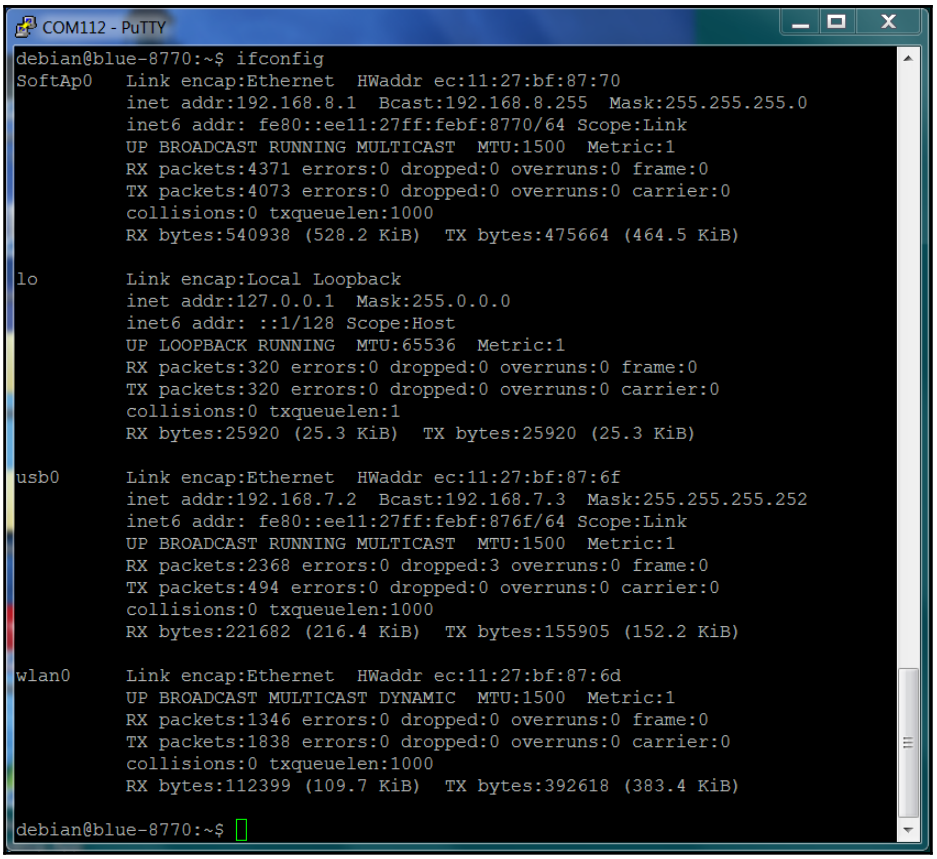

PuTTY Configuration
Category:
Session
Logging
Terminal
Keyboard
Bell
Features
Window
Appearance
Behaviour
Translation
Selection
Colours
Connection
Data
Proxy
Telnet
Rlogin
SSH
Serial
Basic options for your PuTTY session
Specify the destination you want to connect to
Host Name (or IP address)
Port
22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

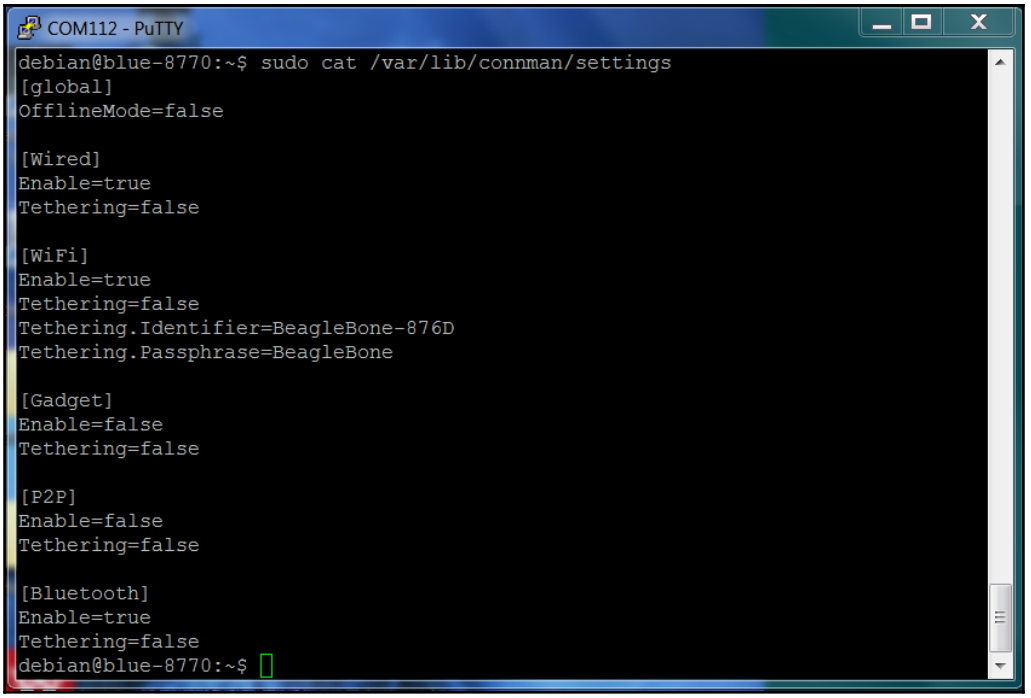

PuTTY Configuration
Category:
Session
Logging
Terminal
Keyboard
Bell
Features
Window
Appearance
Behaviour
Translation
Selection
Colours
Connection
Data
Proxy
Telnet
Rlogin
SSH
Serial
Basic options for your PuTTY session
Specify the destination you want to connect to
Serial line
Speed
COM112
9600
Connection 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

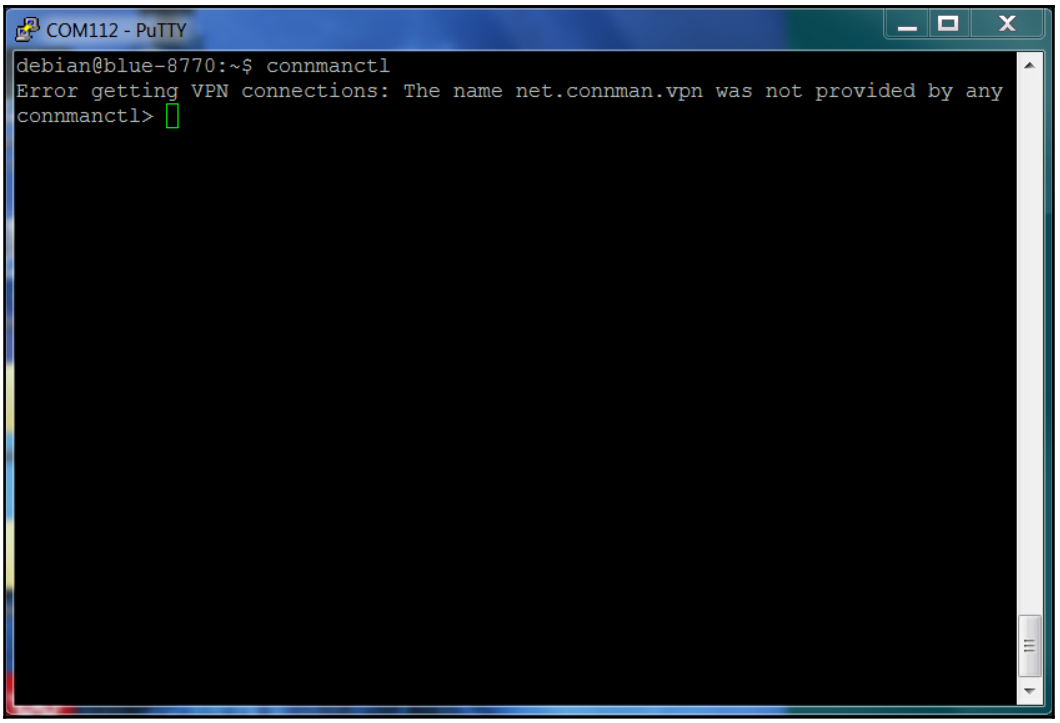

COM112 - PuTTY
Debian GNU/Linux 8 beaglebone ttyGS0
BeagleBoard.org Debian Image 2017-01-17
Support/FAQ: http://elinux.org/Beagleboard:BeagleBoneBlack_Debian
default username:password is [debian:temppwd]
beaglebone login:

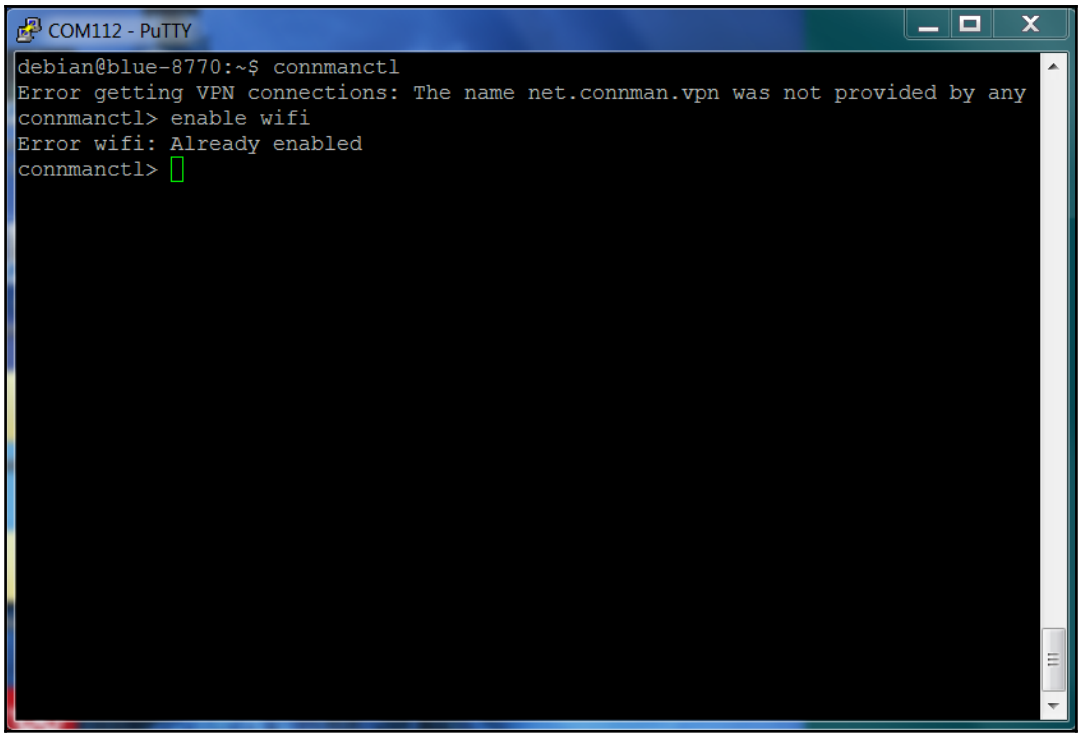

COM112 - PuTTY
Debian GNU/Linux 8 beaglebone ttyGS0
BeagleBoard.org Debian Image 2017-01-17
Support/FAQ: http://elinux.org/Beagleboard:BeagleBoneBlack_Debian
default username:password is [debian:temppwd]
beaglebone login: debian
Password:
Linux beaglebone 4.4.41-ti-r83 #1 SMP Tue Jan 17 00:01:19 UTC 2017 armv7l
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.
debian@beaglebone:~$

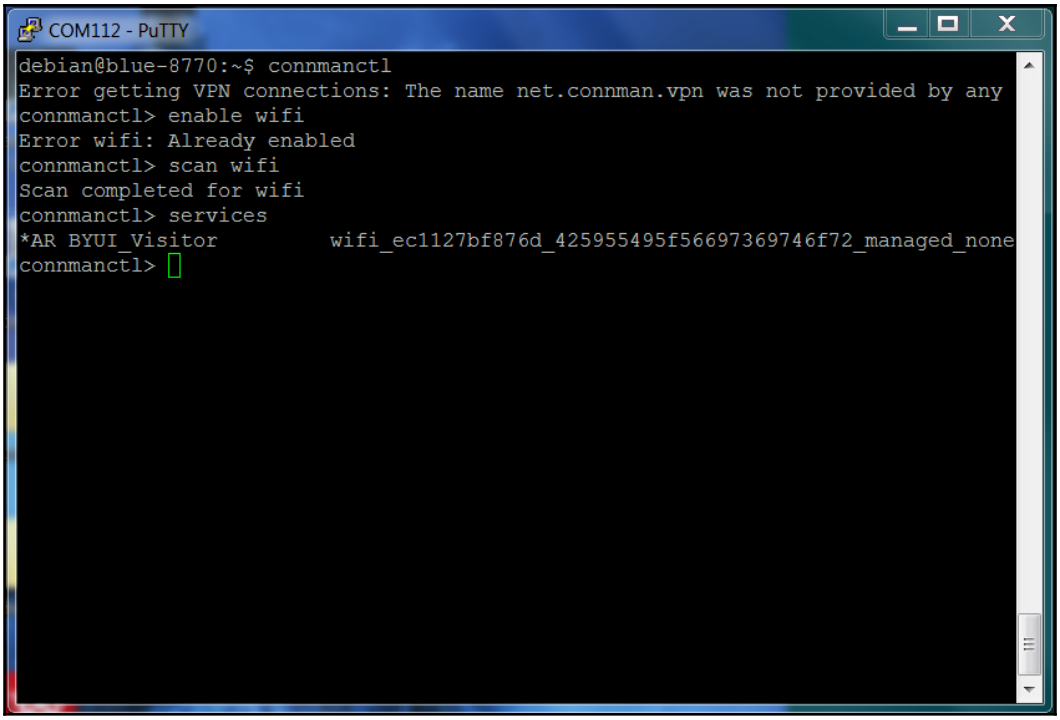

COM112 - PuTTY
Debian GNU/Linux 8 beaglebone ttyGS0
BeagleBoard.org Debian Image 2017-01-17
Support/FAQ: http://elinux.org/Beagleboard:BeagleBoneBlack_Debian
default username:password is [debian:temppwd]
beaglebone login: debian
Password:
Linux beaglebone 4.4.41-ti-r83 #1 SMP Tue Jan 17 00:01:19 UTC 2017 armv7l
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.
debian@beaglebone:~$ ls
bin
debian@beaglebone:~$

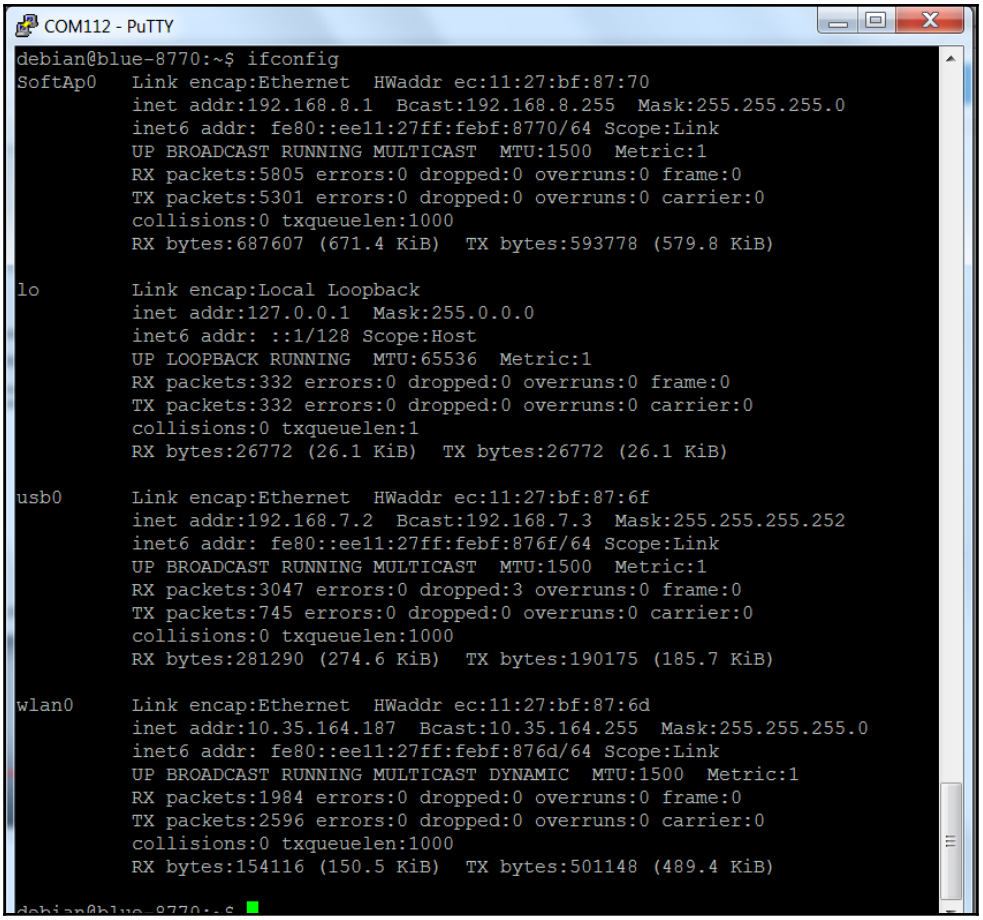

COM112 - PuTTY
debian@blue-8770:~$ ifconfig
SoftAp0 Link encap:Ethernet HWaddr ec:11:27:bf:87:70
inet addr:192.168.8.1 Bcast:192.168.8.255 Mask:255.255.255.0
inet6 addr: fe80::ee11:27ff:febf:8770/64 Scope:Link
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
RX packets:4371 errors:0 dropped:0 overruns:0 frame:0
TX packets:4073 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:540938 (528.2 KiB) TX bytes:475664 (464.5 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:320 errors:0 dropped:0 overruns:0 frame:0
TX packets:320 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1
RX bytes:25920 (25.3 KiB) TX bytes:25920 (25.3 KiB)
usb0 Link encap:Ethernet HWaddr ec:11:27:bf:87:6f
inet addr:192.168.7.2 Bcast:192.168.7.3 Mask:255.255.255.252
inet6 addr: fe80::ee11:27ff:febf:876f/64 Scope:Link
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
RX packets:2368 errors:0 dropped:3 overruns:0 frame:0
TX packets:494 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:221682 (216.4 KiB) TX bytes:155905 (152.2 KiB)
wlan0 Link encap:Ethernet HWaddr ec:11:27:bf:87:6d
UP BROADCAST MULTICAST DYNAMIC MTU:1500 Metric:1
RX packets:1346 errors:0 dropped:0 overruns:0 frame:0
TX packets:1838 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:112399 (109.7 KiB) TX bytes:392618 (383.4 KiB)
debian@blue-8770:~$

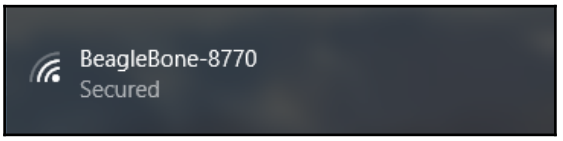

COM112 - PuTTY
debian@blue-8770:~$ sudo cat /var/lib/connman/settings
[global]
OfflineMode=false
[Wired]
Enable=true
Tethering=false
[WiFi]
Enable=true
Tethering=false
Tethering.Identifier=BeagleBone-876D
Tethering.Passphrase=BeagleBone
[Gadget]
Enable=false
Tethering=false
[P2P]
Enable=false
Tethering=false
[Bluetooth]
Enable=true
Tethering=false
debian@blue-8770:~$

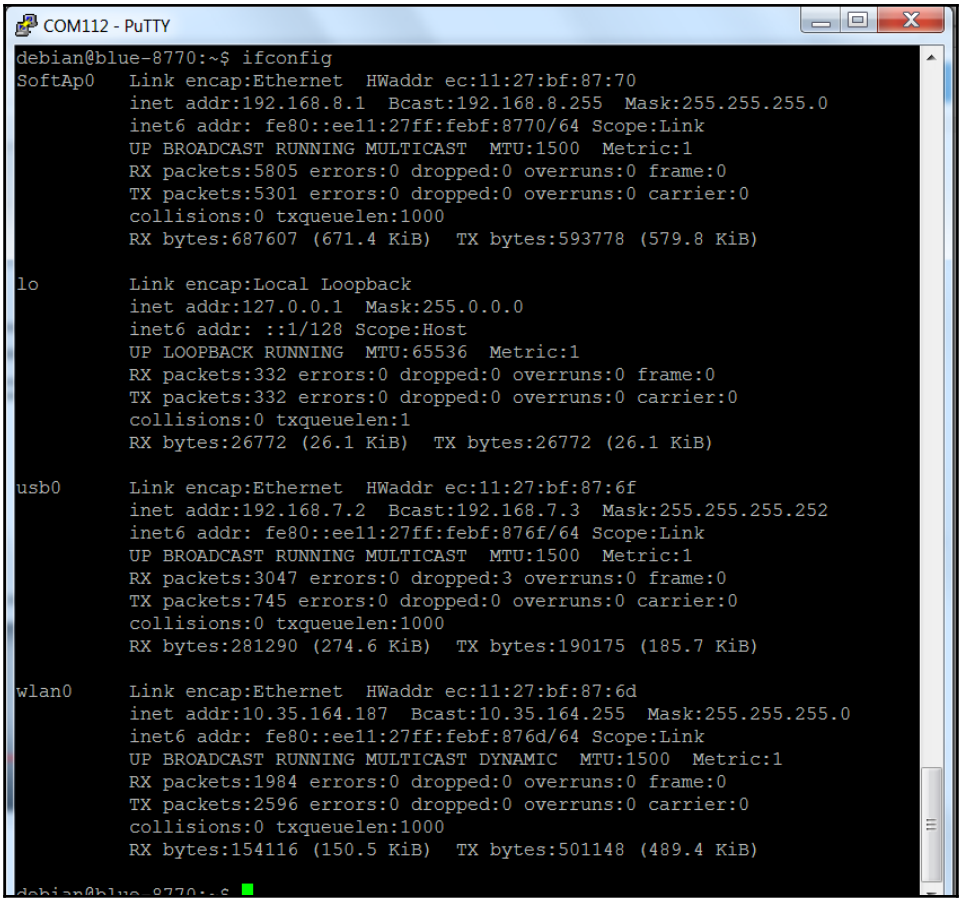

COM112 - PuTTY
debian@blue-8770:~$ connmanctl
Error getting VPN connections: The name net.connman.vpn was not provided by any
connmanctl>

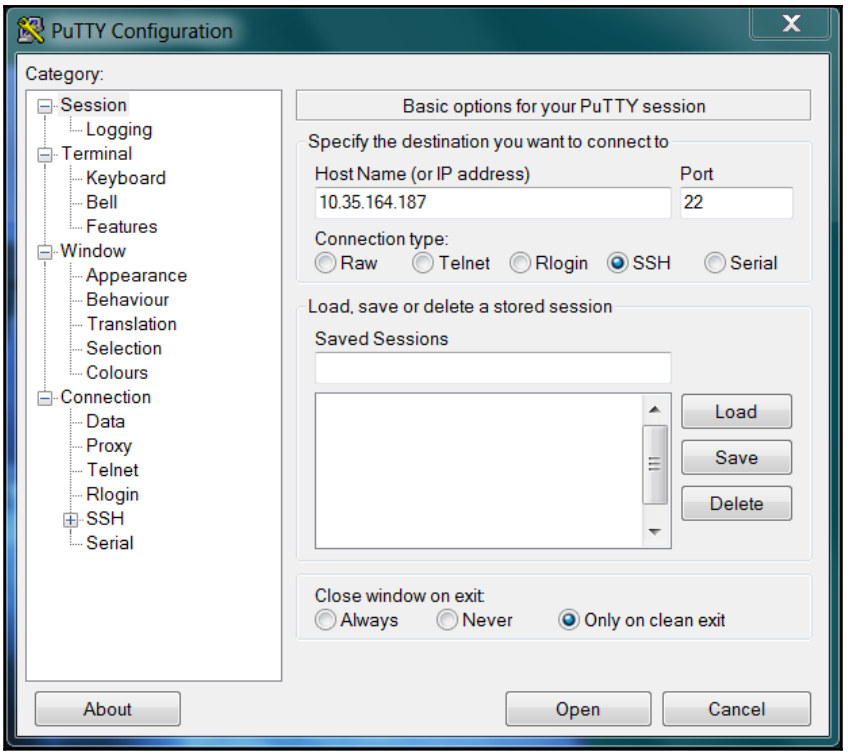

COM112 - PuTTY
debian@blue-8770:~$ connmanctl
Error getting VPN connections: The name net.connman.vpn was not provided by any
connmanctl> enable wifi
Error wifi: Already enabled
connmanctl>

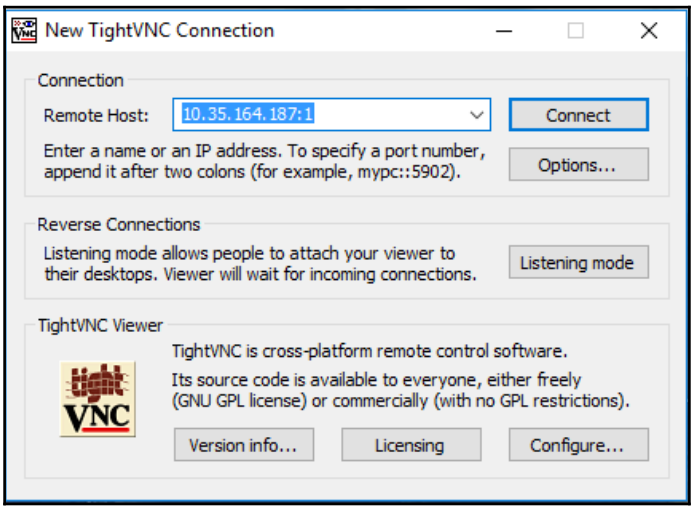

COM112 - PuTTY
debian@blue-8770:~$ connmanctl
Error getting VPN connections: The name net.connman.vpn was not provided by any
connmanctl> enable wifi
Error wifi: Already enabled
connmanctl> scan wifi
Scan completed for wifi
connmanctl> services
*AR BYUI_Visitor wifi_ec1127bf876d_425955495f56697369746f72_managed_none
connmanctl>

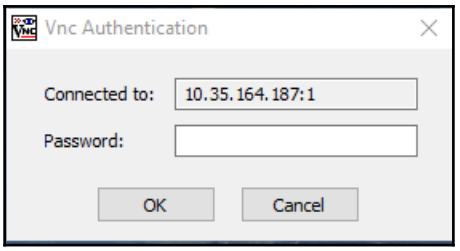

COM112 - PuTTY
debian@blue-8770:~$ ifconfig
SoftAp0 Link encap:Ethernet HWaddr ec:11:27:bf:87:70
inet addr:192.168.8.1 Bcast:192.168.8.255 Mask:255.255.255.0
inet6 addr: fe80::ee11:27ff:febf:8770/64 Scope:Link
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
RX packets:5805 errors:0 dropped:0 overruns:0 frame:0
TX packets:5301 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:687607 (671.4 KiB) TX bytes:593778 (579.8 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:332 errors:0 dropped:0 overruns:0 frame:0
TX packets:332 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1
RX bytes:26772 (26.1 KiB) TX bytes:26772 (26.1 KiB)
usb0 Link encap:Ethernet HWaddr ec:11:27:bf:87:6f
inet addr:192.168.7.2 Bcast:192.168.7.3 Mask:255.255.255.252
inet6 addr: fe80::ee11:27ff:febf:876f/64 Scope:Link
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
RX packets:3047 errors:0 dropped:3 overruns:0 frame:0
TX packets:745 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:281290 (274.6 KiB) TX bytes:190175 (185.7 KiB)
wlan0 Link encap:Ethernet HWaddr ec:11:27:bf:87:6d
inet addr:10.35.164.187 Bcast:10.35.164.255 Mask:255.255.255.0
inet6 addr: fe80::ee11:27ff:febf:876d/64 Scope:Link
UP BROADCAST RUNNING MULTICAST DYNAMIC MTU:1500 Metric:1
RX packets:1984 errors:0 dropped:0 overruns:0 frame:0
TX packets:2596 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:154116 (150.5 KiB) TX bytes:501148 (489.4 KiB)

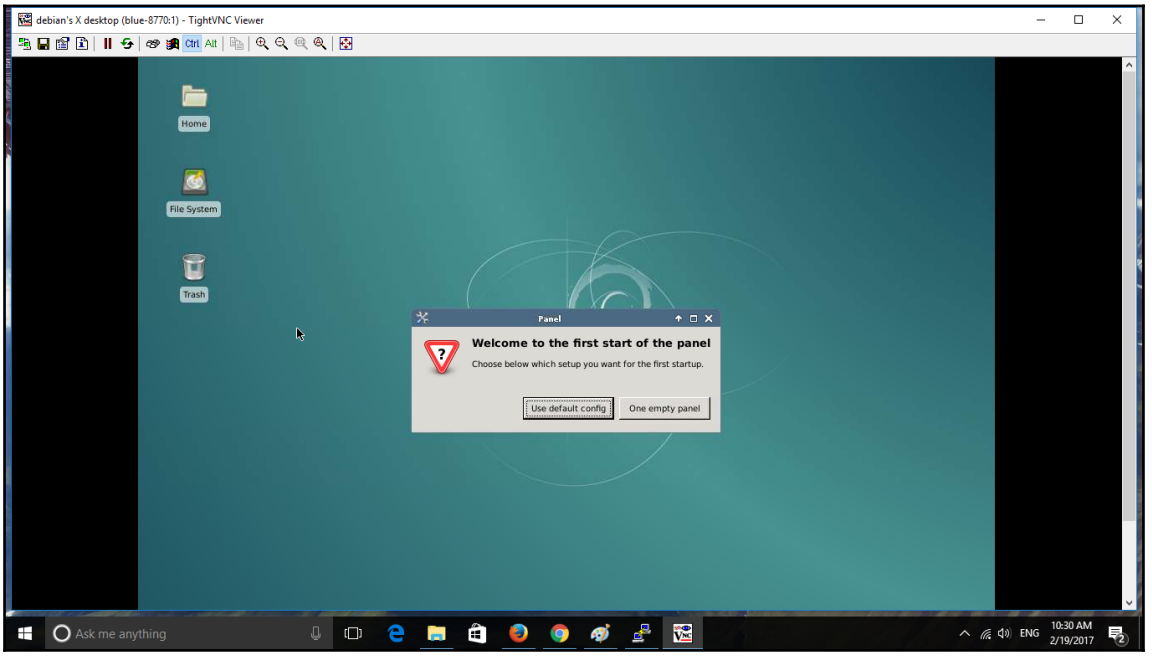

BeagleBone-8770
Secured

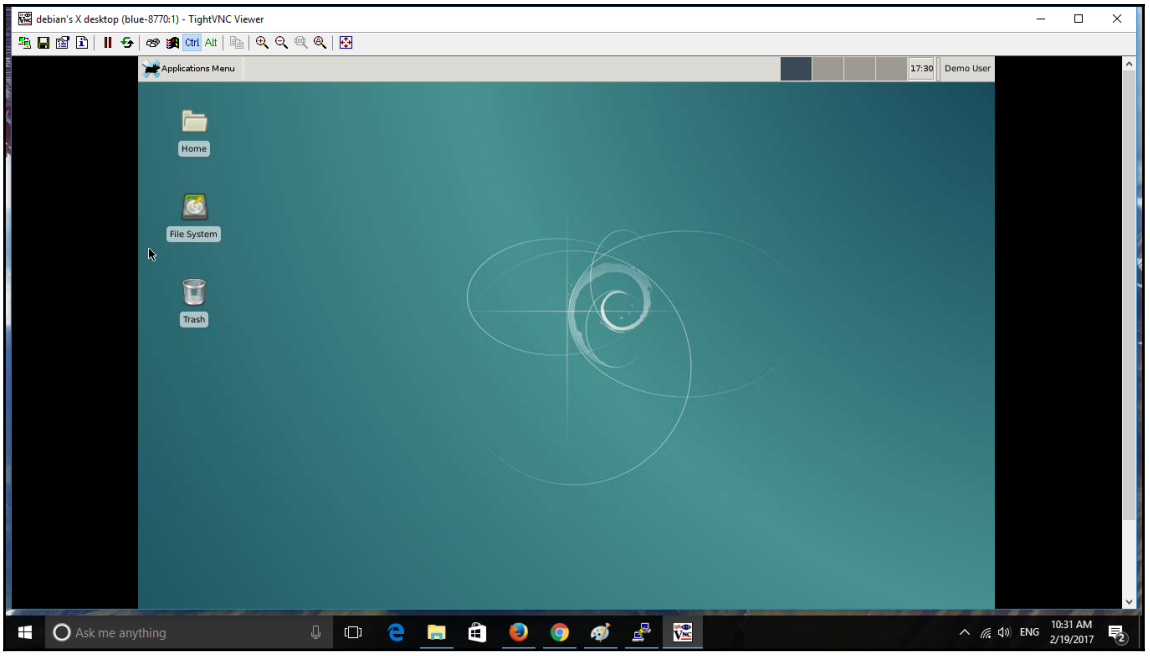

COM112 - PuTTY
debian@blue-8770:~$ ifconfig
SoftAp0 Link encap:Ethernet HWaddr ec:11:27:bf:87:70
inet addr:192.168.8.1 Bcast:192.168.8.255 Mask:255.255.255.0
inet6 addr: fe80::ee11:27ff:febf:8770/64 Scope:Link
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
RX packets:5805 errors:0 dropped:0 overruns:0 frame:0
TX packets:5301 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:687607 (671.4 KiB) TX bytes:593778 (579.8 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:332 errors:0 dropped:0 overruns:0 frame:0
TX packets:332 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1
RX bytes:26772 (26.1 KiB) TX bytes:26772 (26.1 KiB)
usb0 Link encap:Ethernet HWaddr ec:11:27:bf:87:6f
inet addr:192.168.7.2 Bcast:192.168.7.3 Mask:255.255.255.252
inet6 addr: fe80::ee11:27ff:febf:876f/64 Scope:Link
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
RX packets:3047 errors:0 dropped:3 overruns:0 frame:0
TX packets:745 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:281290 (274.6 KiB) TX bytes:190175 (185.7 KiB)
wlan0 Link encap:Ethernet HWaddr ec:11:27:bf:87:6d
inet addr:10.35.164.187 Bcast:10.35.164.255 Mask:255.255.255.0
inet6 addr: fe80::ee11:27ff:febf:876d/64 Scope:Link
UP BROADCAST RUNNING MULTICAST DYNAMIC MTU:1500 Metric:1
RX packets:1984 errors:0 dropped:0 overruns:0 frame:0
TX packets:2596 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:154116 (150.5 KiB) TX bytes:501148 (489.4 KiB)

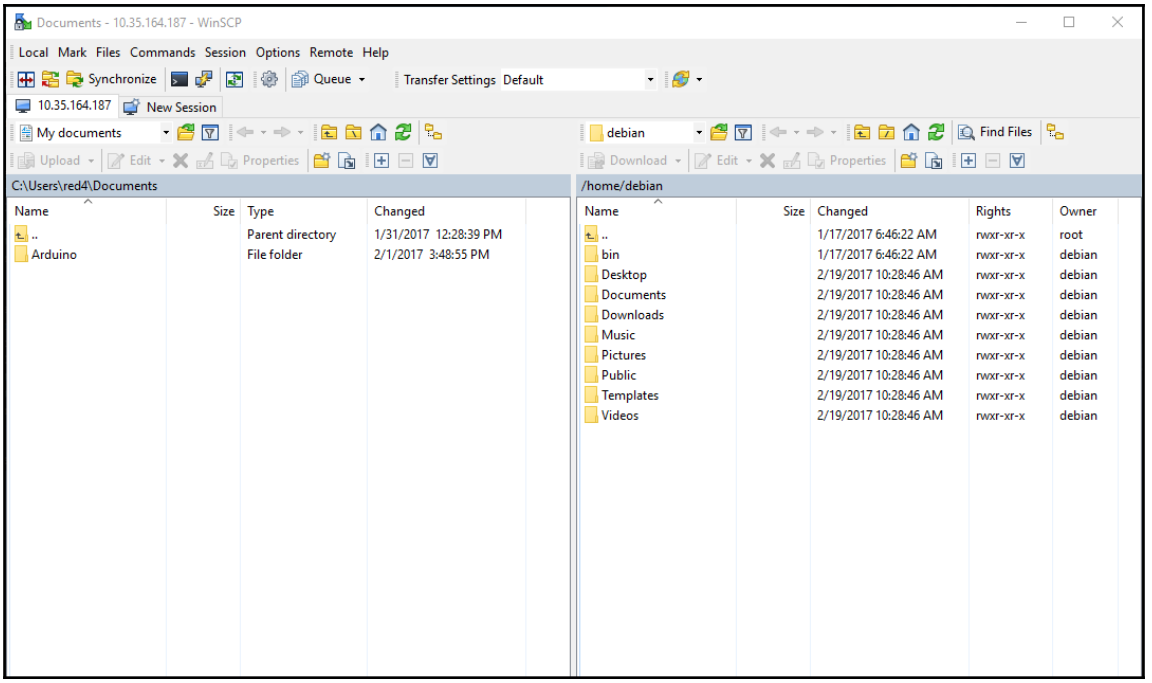

PuTTY Configuration
Category:
Session
Logging
Terminal
Keyboard
Bell
Features
Window
Appearance
Behaviour
Translation
Selection
Colours
Connection
Data
Proxy
Telnet
Rlogin
SSH
Serial
Basic options for your PuTTY session
Specify the destination you want to connect to
Host Name (or IP address)
Port
10.35.164.187
22
Connection type:
Raw
Telnet
Rlogin
SSH
Serial
Load, save or delete a stored session
Saved Sessions
Load
Save
Delete
Close window on exit:
Always
Never
Only on clean exit
About
Open
Cancel


New TightVNC Connection
Connection
Remote Host:
10.35.164.187:1
Connect
Enter a name or an IP address. To specify a port number, append it after two colons (for example, mypc::5902).
Options...
Reverse Connections
Listening mode allows people to attach your viewer to their desktops. Viewer will wait for incoming connections.
Listening mode
TightVNC Viewer
TightVNC is cross-platform remote control software.
Its source code is available to everyone, either freely (GNU GPL license) or commercially (with no GPL restrictions).
Version info...
Licensing
Configure...

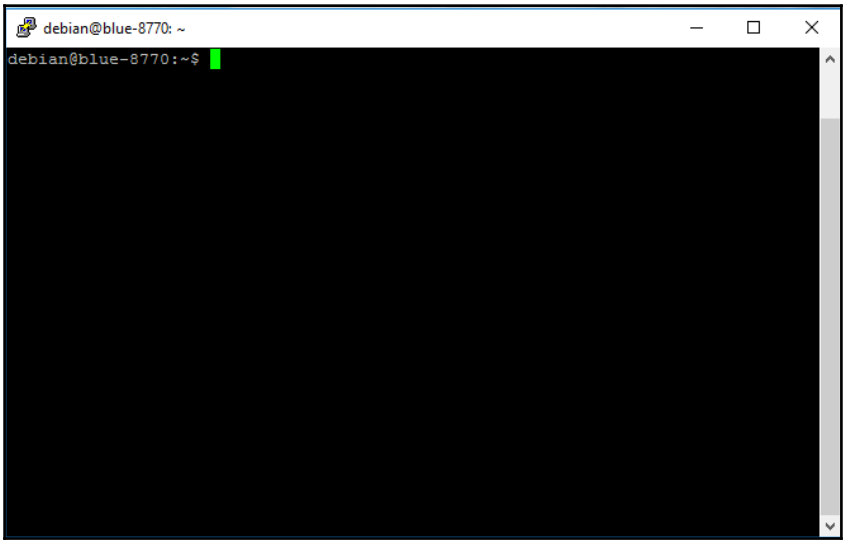

Vnc Authentication
Connected to:
10.35.164.187:1
Password:
OK
Cancel

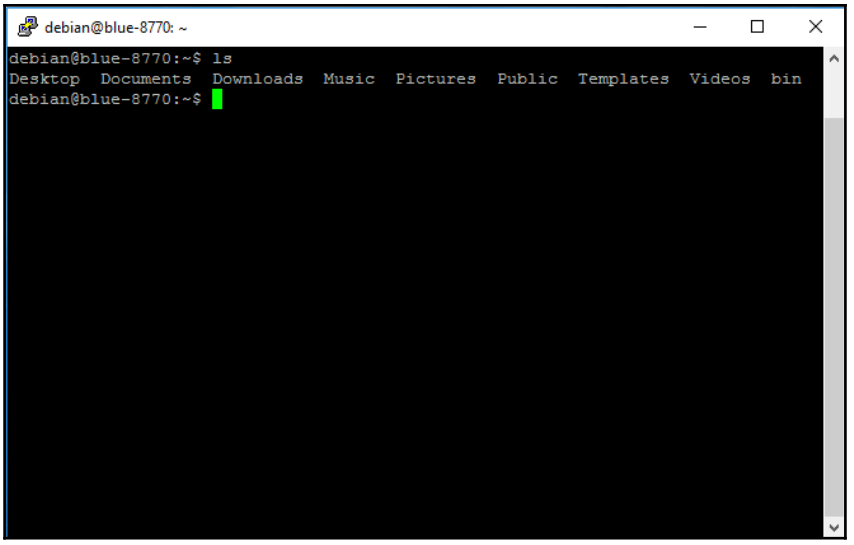

debian's X desktop (blue-8770:1) - TightVNC Viewer
Ctrl
Alt
Home
File System
Trash
Panel
Welcome to the first start of the panel
Choose below which setup you want for the first startup.
Use default config
One empty panel
Ask me anything
ENG
10:30 AM
2/19/2017

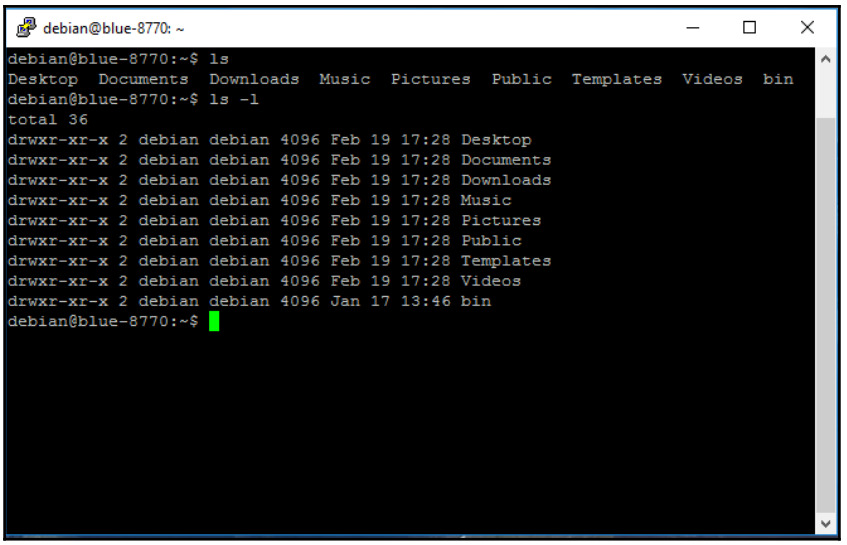

debian's X desktop (blue-8770:1) - TightVNC Viewer
Ctrl
Alt
Applications Menu
17:30
Demo User
Home
File System
Trash
Ask me anything
ENG
10:31 AM
2/19/2017

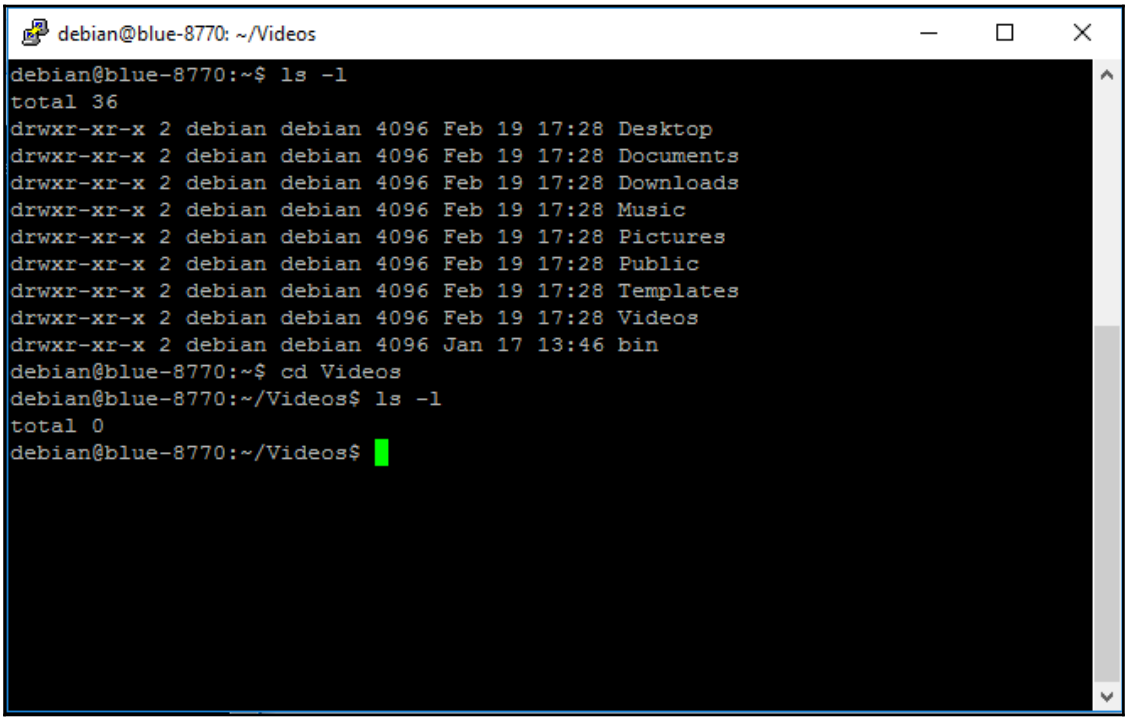

Documents - 10.35.164.187 - WinSCP
Local Mark Files Commands Session Options Remote Help
Synchronize
Queue
Transfer Settings Default
10.35.164.187
New Session
My documents
Upload
Edit
Properties
C:\Users\red4\Documents
Name
Size
Type
Changed
..
Parent directory
1/31/2017 12:28:39 PM
Arduino
File folder
2/1/2017 3:48:55 PM
debian
Find Files
Download
Edit
Properties
/home/debian
Name
Size
Changed
Rights
Owner
..
1/17/2017 6:46:22 AM
rwxr-xr-x
root
bin
1/17/2017 6:46:22 AM
rwxr-xr-x
debian
Desktop
2/19/2017 10:28:46 AM
rwxr-xr-x
debian
Documents
2/19/2017 10:28:46 AM
rwxr-xr-x
debian
Downloads
2/19/2017 10:28:46 AM
rwxr-xr-x
debian
Music
2/19/2017 10:28:46 AM
rwxr-xr-x
debian
Pictures
2/19/2017 10:28:46 AM
rwxr-xr-x
debian
Public
2/19/2017 10:28:46 AM
rwxr-xr-x
debian
Templates
2/19/2017 10:28:46 AM
rwxr-xr-x
debian
Videos
2/19/2017 10:28:46 AM
rwxr-xr-x
debian

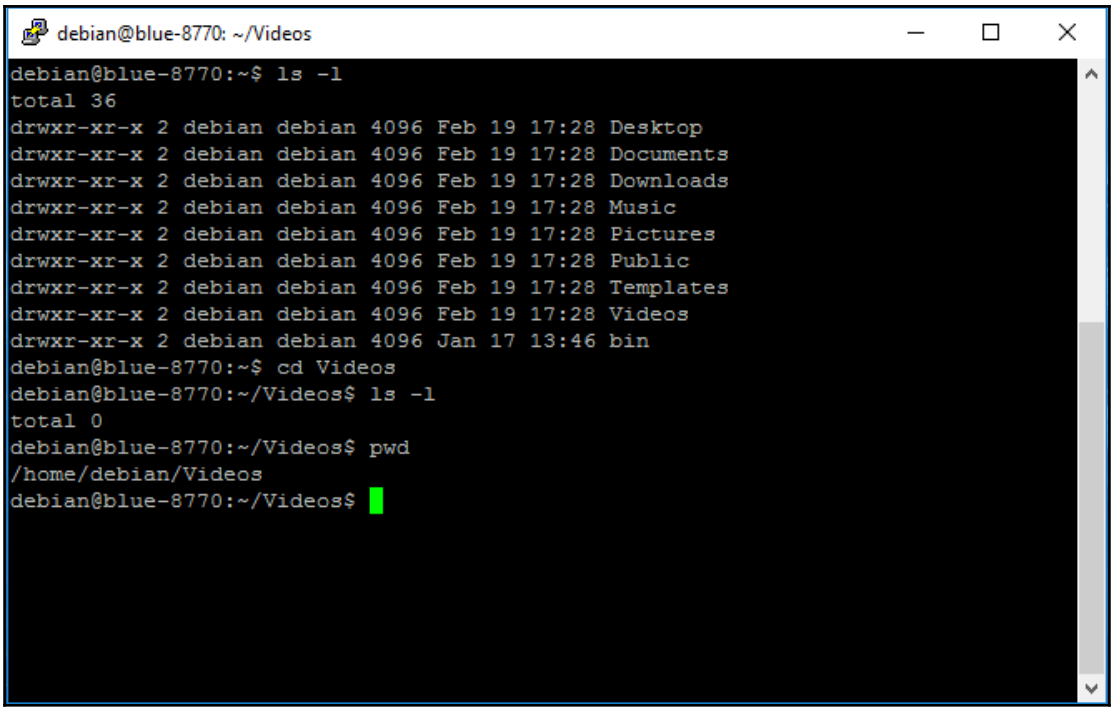
Chapter 2: Programming the BeagleBone Blue

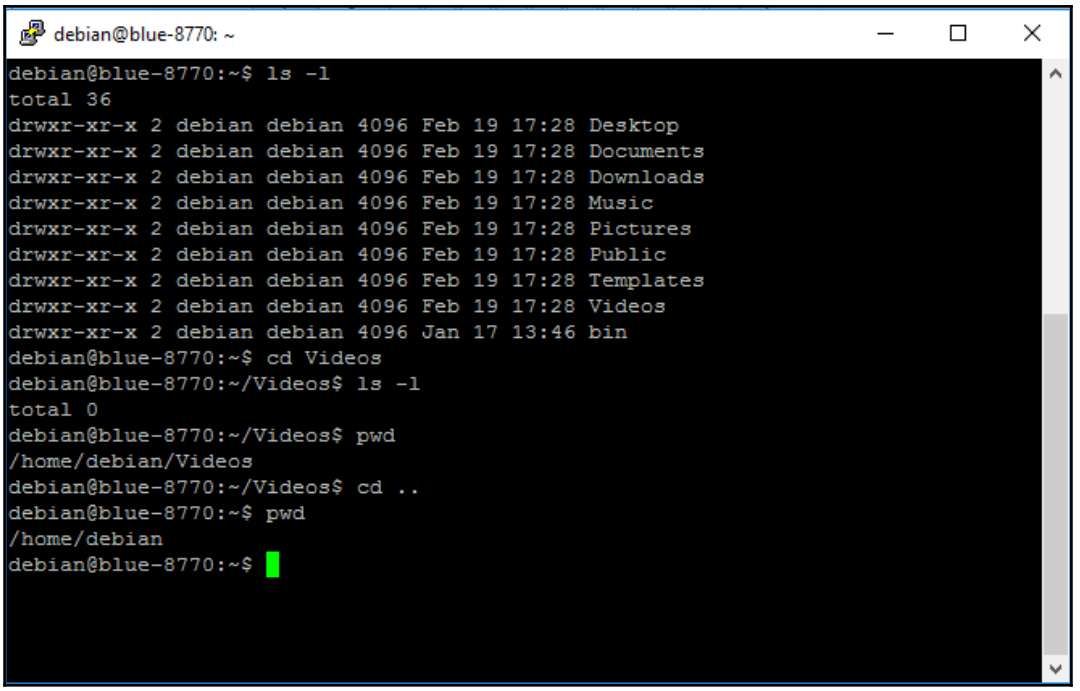


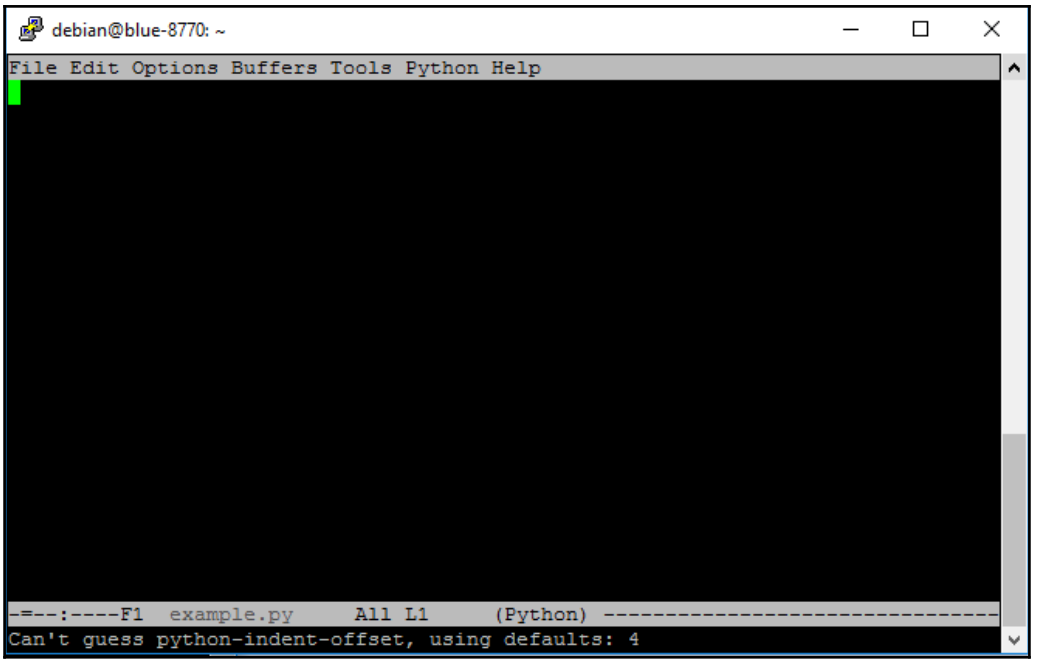


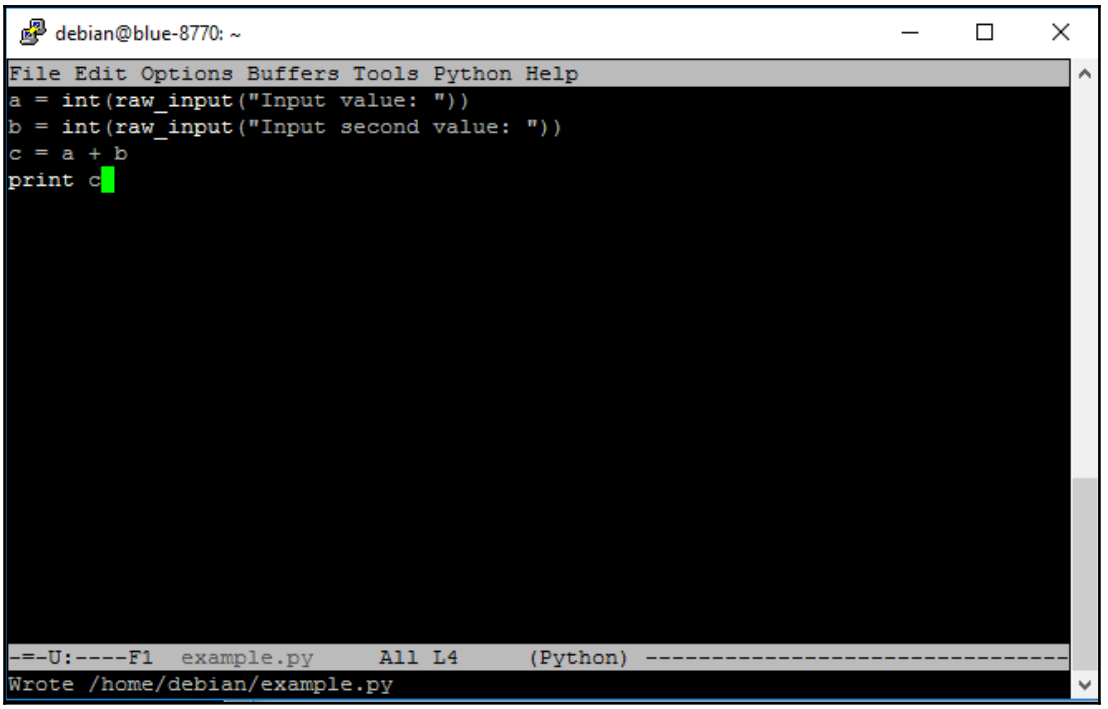

debian@blue-8770: ~
debian@blue-8770:~$ ls
Desktop Documents Downloads Music Pictures Public Templates Videos bin
debian@blue-8770:~$ ls -l
total 36
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Desktop
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Documents
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Downloads
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Music
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Pictures
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Public
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Templates
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Videos
drwxr-xr-x 2 debian debian 4096 Jan 17 13:46 bin
debian@blue-8770:~$

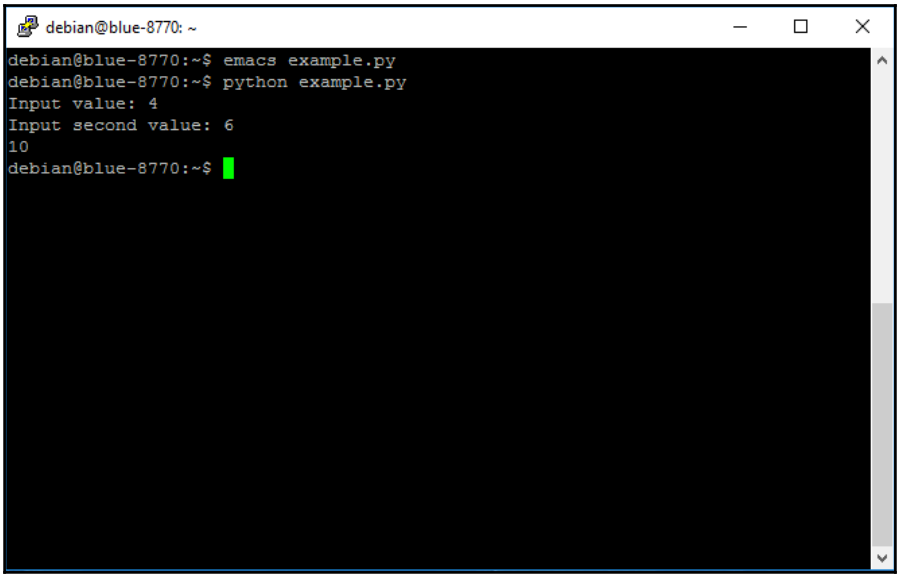

debian@blue-8770: ~/Videos
debian@blue-8770:~$ ls -l
total 36
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Desktop
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Documents
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Downloads
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Music
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Pictures
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Public
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Templates
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Videos
drwxr-xr-x 2 debian debian 4096 Jan 17 13:46 bin
debian@blue-8770:~$ cd Videos
debian@blue-8770:~/Videos$ ls -l
total 0
debian@blue-8770:~/Videos$

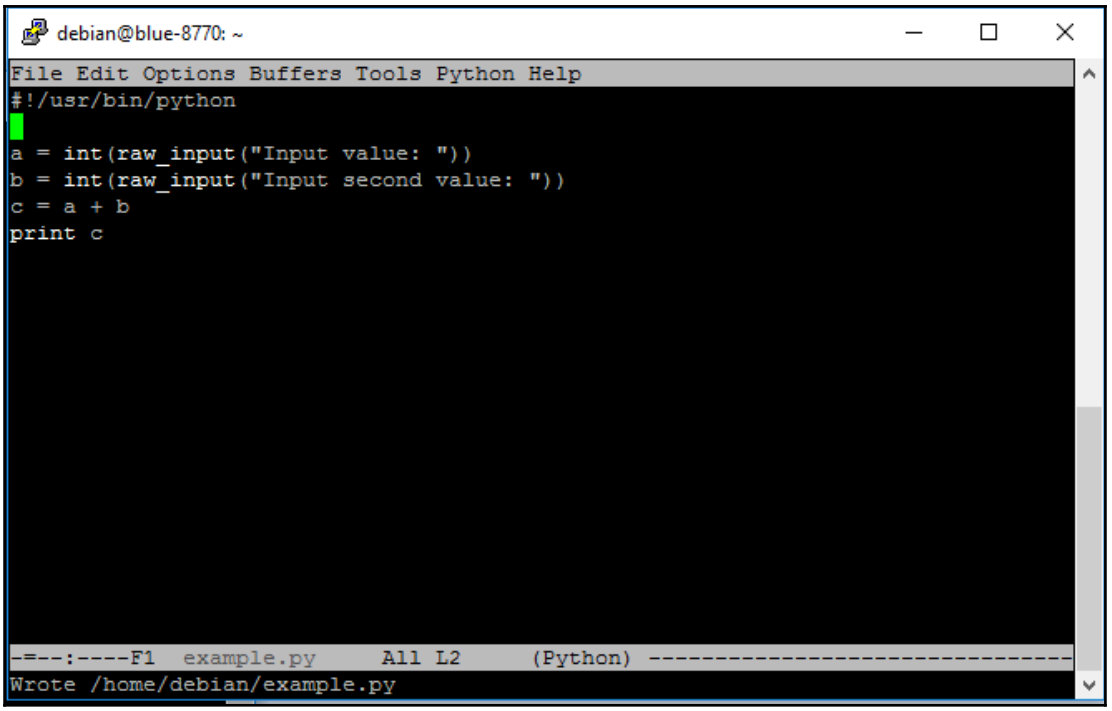

debian@blue-8770: ~/Videos
debian@blue-8770:~$ ls -l
total 36
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Desktop
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Documents
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Downloads
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Music
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Pictures
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Public
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Templates
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Videos
drwxr-xr-x 2 debian debian 4096 Jan 17 13:46 bin
debian@blue-8770:~$ cd Videos
debian@blue-8770:~/Videos$ ls -l
total 0
debian@blue-8770:~/Videos$ pwd
/home/debian/Videos
debian@blue-8770:~/Videos$

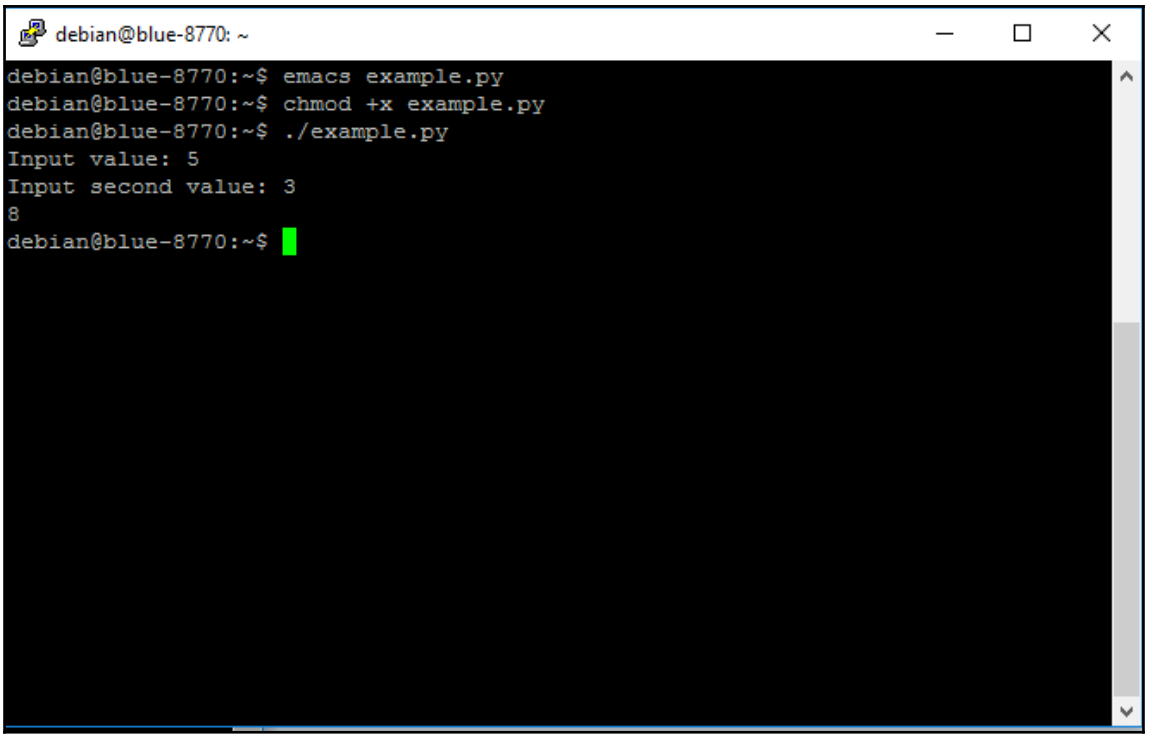

debian@blue-8770: ~
debian@blue-8770:~$ ls -l
total 36
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Desktop
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Documents
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Downloads
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Music
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Pictures
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Public
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Templates
drwxr-xr-x 2 debian debian 4096 Feb 19 17:28 Videos
drwxr-xr-x 2 debian debian 4096 Jan 17 13:46 bin
debian@blue-8770:~$ cd Videos
debian@blue-8770:~/Videos$ ls -l
total 0
debian@blue-8770:~/Videos$ pwd
/home/debian/Videos
debian@blue-8770:~/Videos$ cd ..
debian@blue-8770:~$ pwd
/home/debian
debian@blue-8770:~$

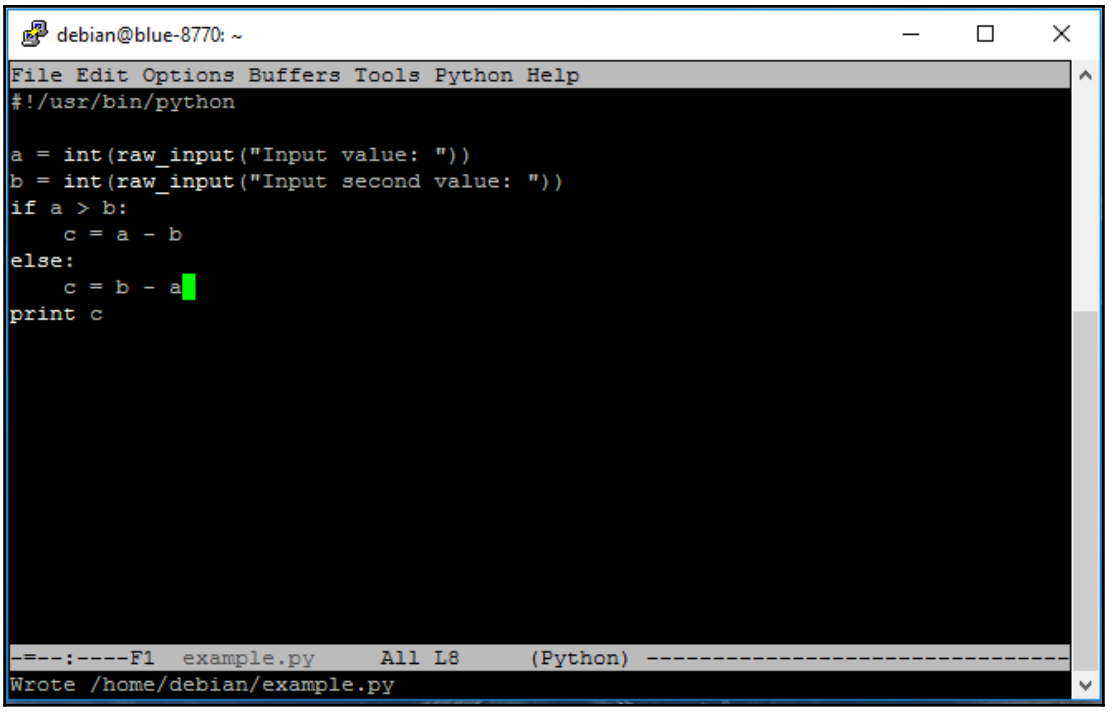

debian@blue-8770: ~
File Edit Options Buffers Tools Python Help
-=--:----F1 example.py   All L1   (Python) ----------
Can't guess python-indent-offset, using defaults: 4

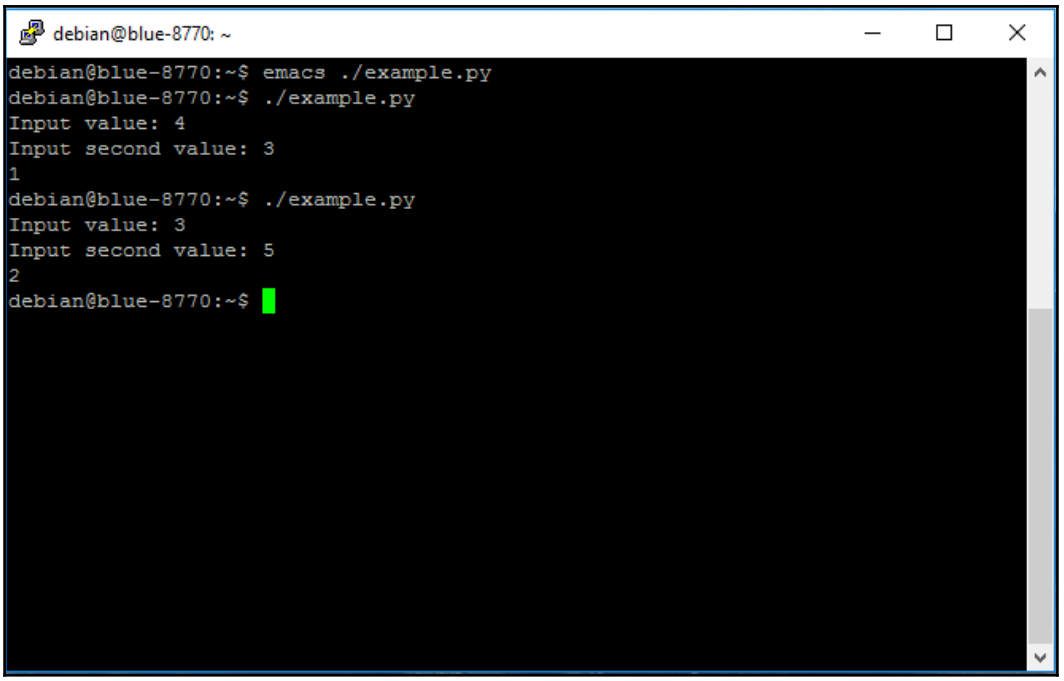

debian@blue-8770: ~
File Edit Options Buffers Tools Python Help
a = int(raw_input("Input value: "))
b = int(raw_input("Input second value: "))
c = a + b
print c
-=-U:----F1 example.py   All L4   (Python) ----------
Wrote /home/debian/example.py

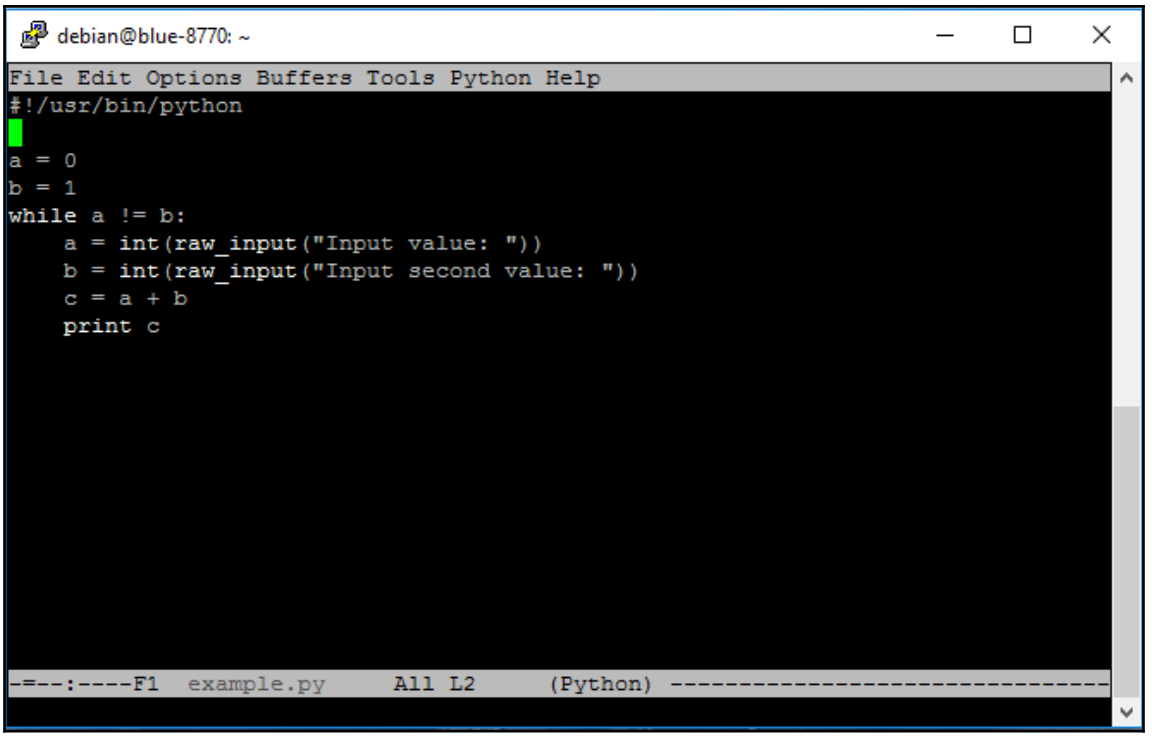

debian@blue-8770: ~
debian@blue-8770:~$ emacs example.py
debian@blue-8770:~$ python example.py
Input value: 4
Input second value: 6
10
debian@blue-8770:~$

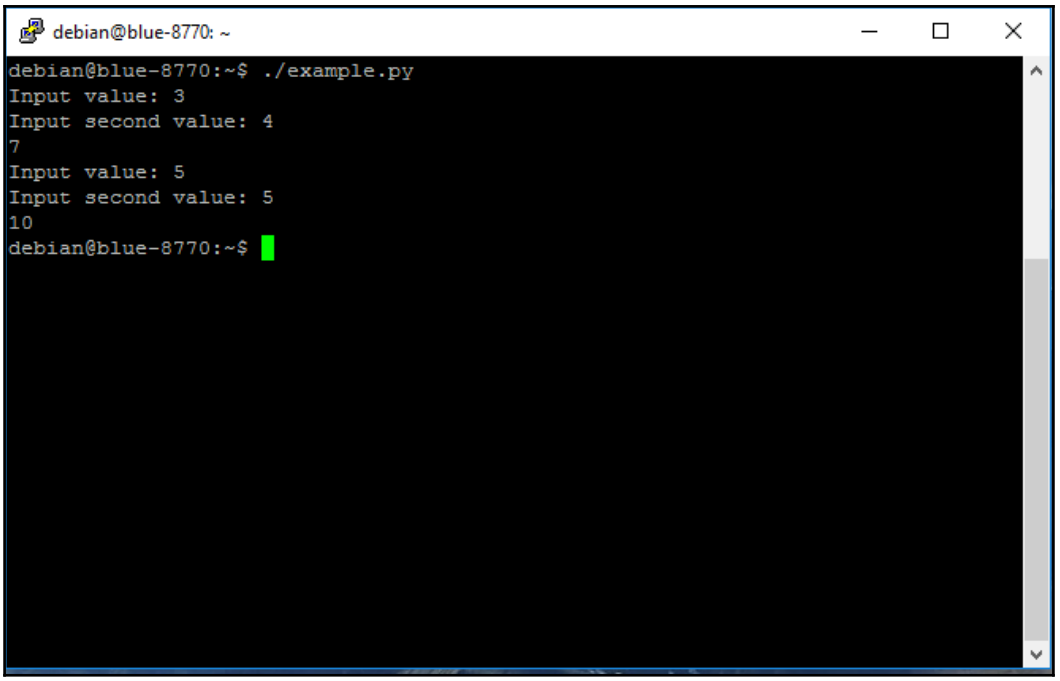

debian@blue-8770: ~
File Edit Options Buffers Tools Python Help
#!/usr/bin/python
a = int(raw_input("Input value: "))
b = int(raw_input("Input second value: "))
c = a + b
print c
-=--:----F1 example.py   All L2   (Python) ----------
Wrote /home/debian/example.py

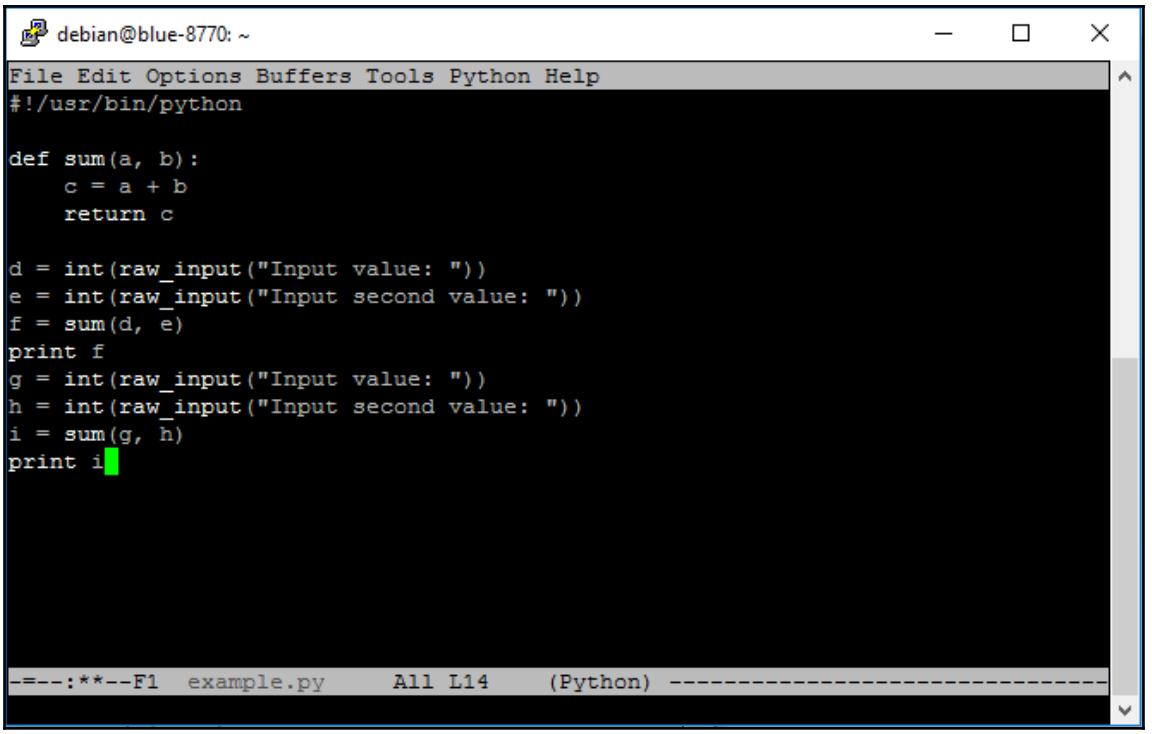

debian@blue-8770: ~
debian@blue-8770:~$ emacs example.py
debian@blue-8770:~$ chmod +x example.py
debian@blue-8770:~$ ./example.py
Input value: 5
Input second value: 3
8
debian@blue-8770:~$

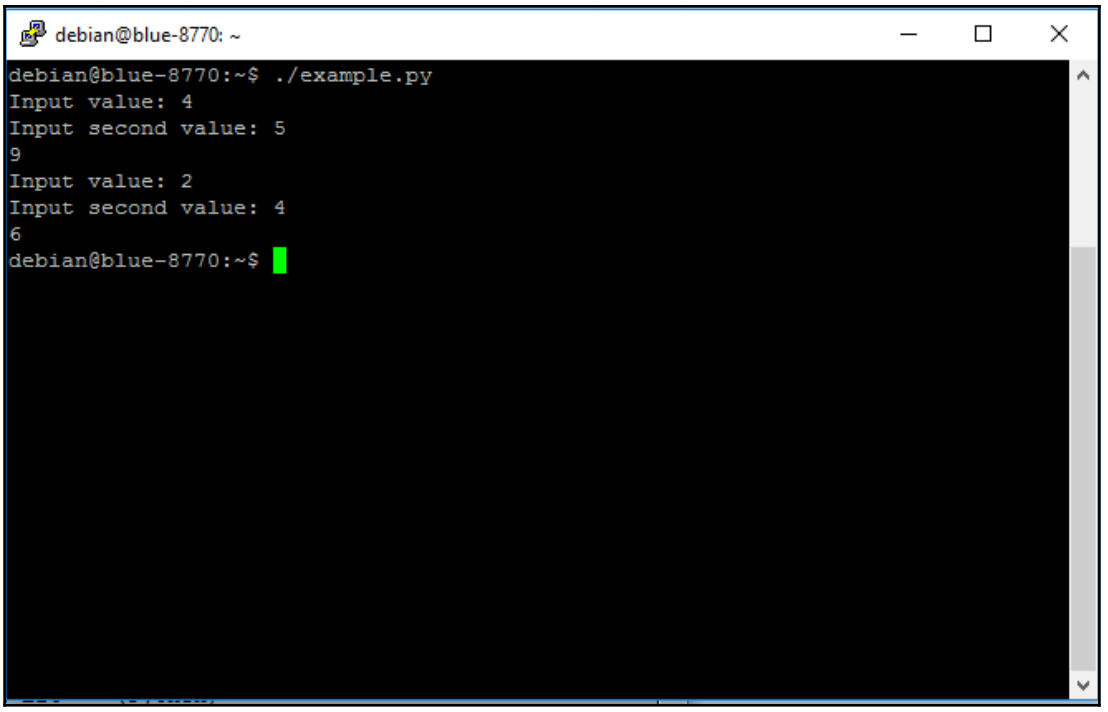

debian@blue-8770: ~
File Edit Options Buffers Tools Python Help
#!/usr/bin/python
a = int(raw_input("Input value: "))
b = int(raw_input("Input second value: "))
if a > b:
c = a - b
else:
c = b - a
print c
-=--:----F1 example.py All L8 (Python)
Wrote /home/debian/example.py

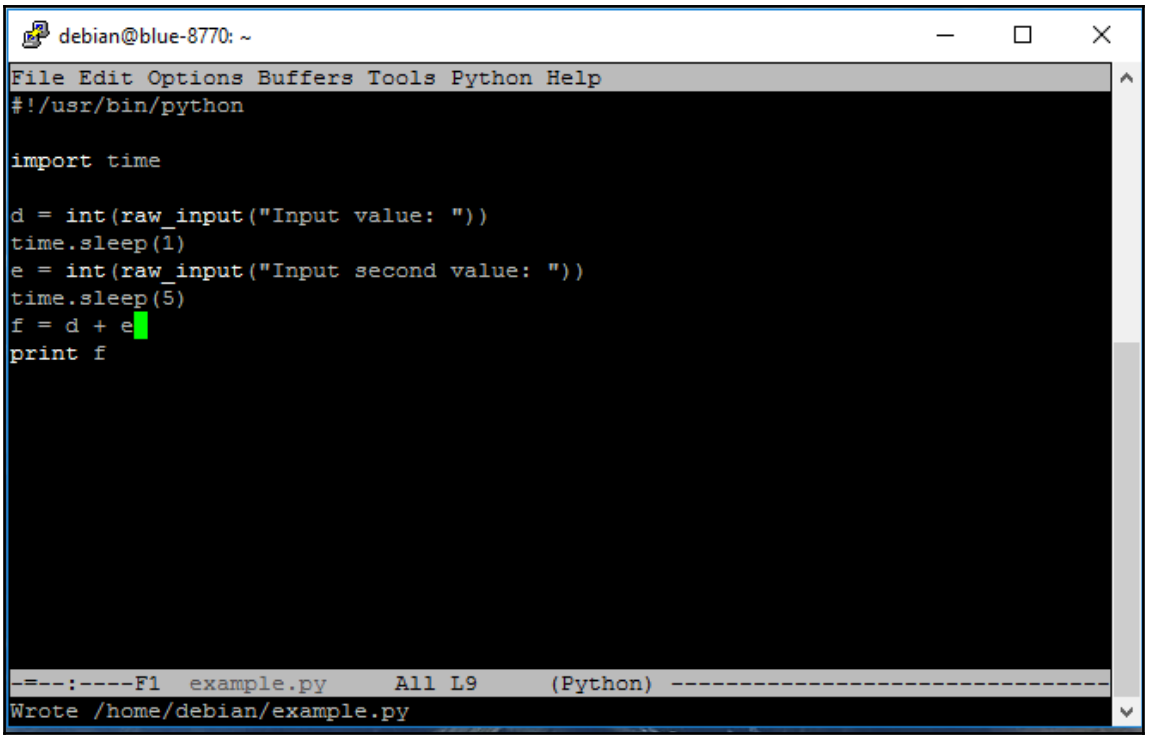

debian@blue-8770: ~
debian@blue-8770:~$ emacs ./example.py
debian@blue-8770:~$ ./example.py
Input value: 4
Input second value: 3
1
debian@blue-8770:~$ ./example.py
Input value: 3
Input second value: 5
2
debian@blue-8770:~$

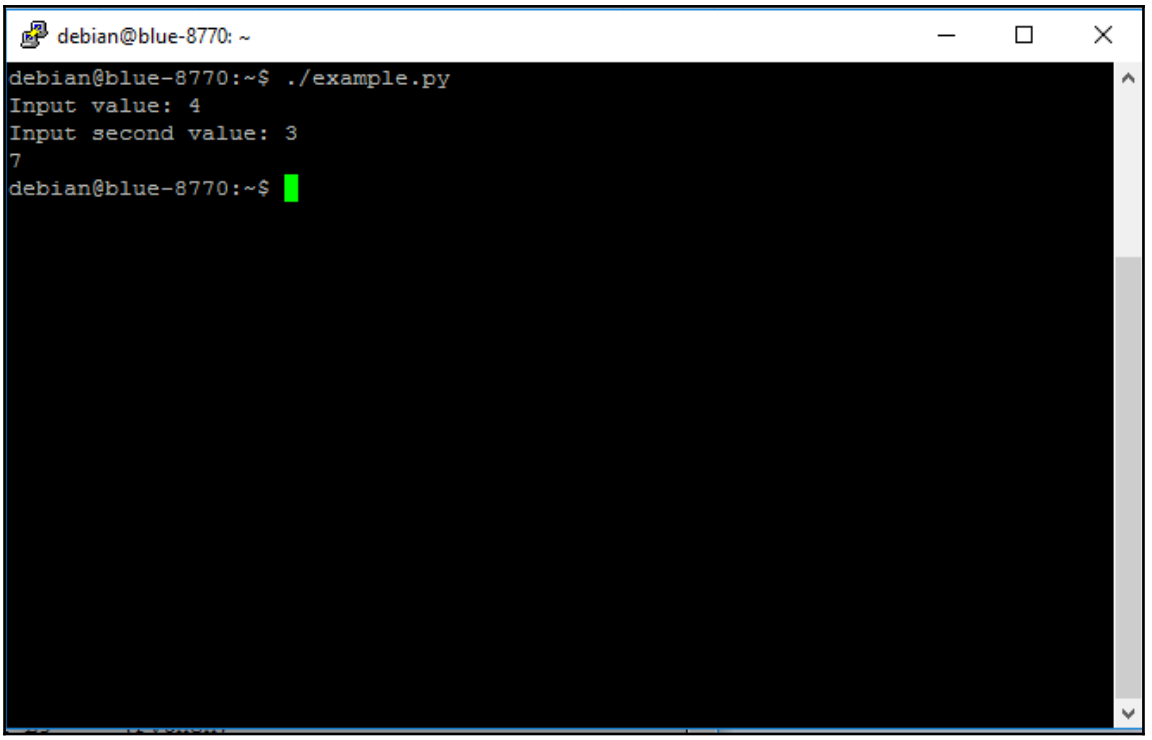

debian@blue-8770: ~
File Edit Options Buffers Tools Python Help
#!/usr/bin/python
a = 0
b = 1
while a != b:
a = int(raw_input("Input value: "))
b = int(raw_input("Input second value: "))
c = a + b
print c
-=--:----F1 example.py All L2 (Python)

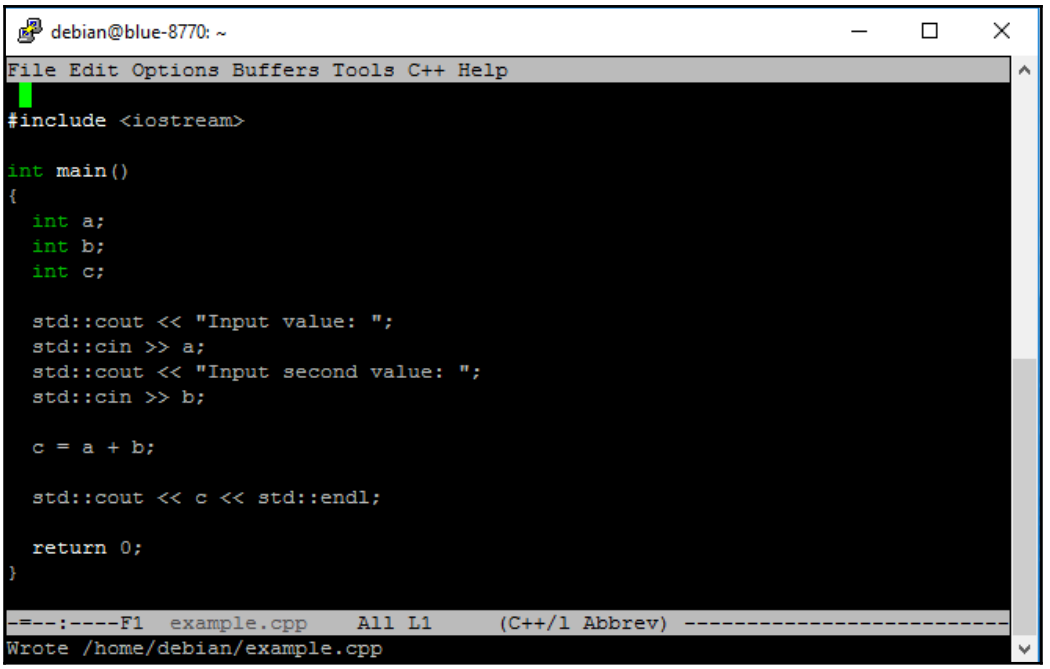

debian@blue-8770: ~
debian@blue-8770:~$ ./example.py
Input value: 3
Input second value: 4
7
Input value: 5
Input second value: 5
10
debian@blue-8770:~$

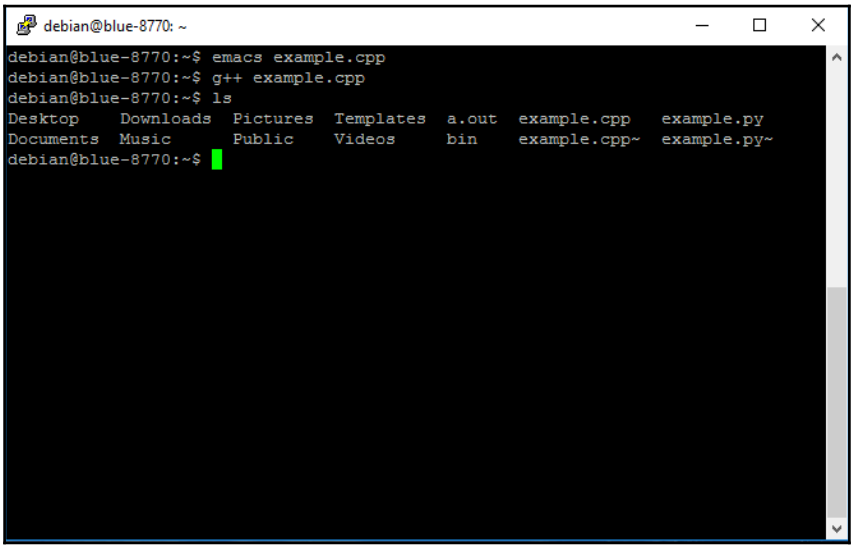

debian@blue-8770: ~
File Edit Options Buffers Tools Python Help
#!/usr/bin/python
def sum(a, b):
c = a + b
return c
d = int(raw_input("Input value: "))
e = int(raw_input("Input second value: "))
f = sum(d, e)
print f
g = int(raw_input("Input value: "))
h = int(raw_input("Input second value: "))
i = sum(g, h)
print i
-=--:**--F1 example.py All L14 (Python)

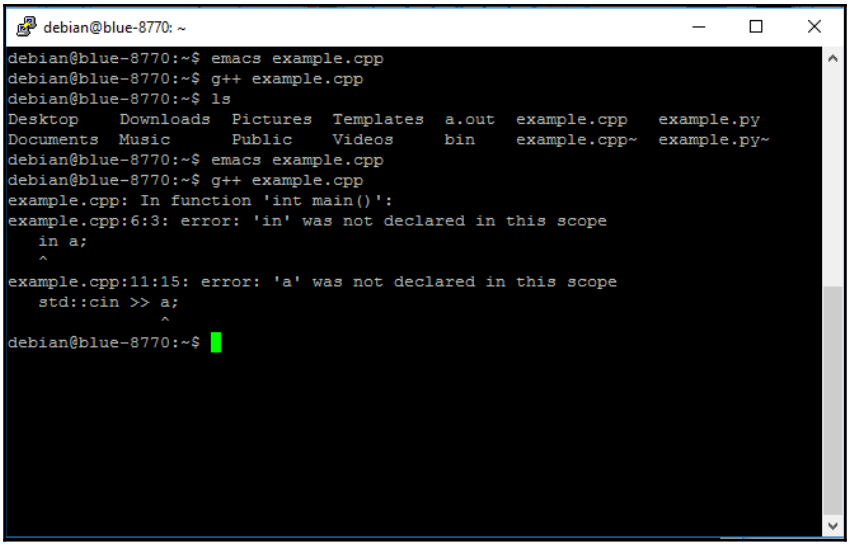

debian@blue-8770: ~
debian@blue-8770:~$ ./example.py
Input value: 4
Input second value: 5
9
Input value: 2
Input second value: 4
6
debian@blue-8770:~$

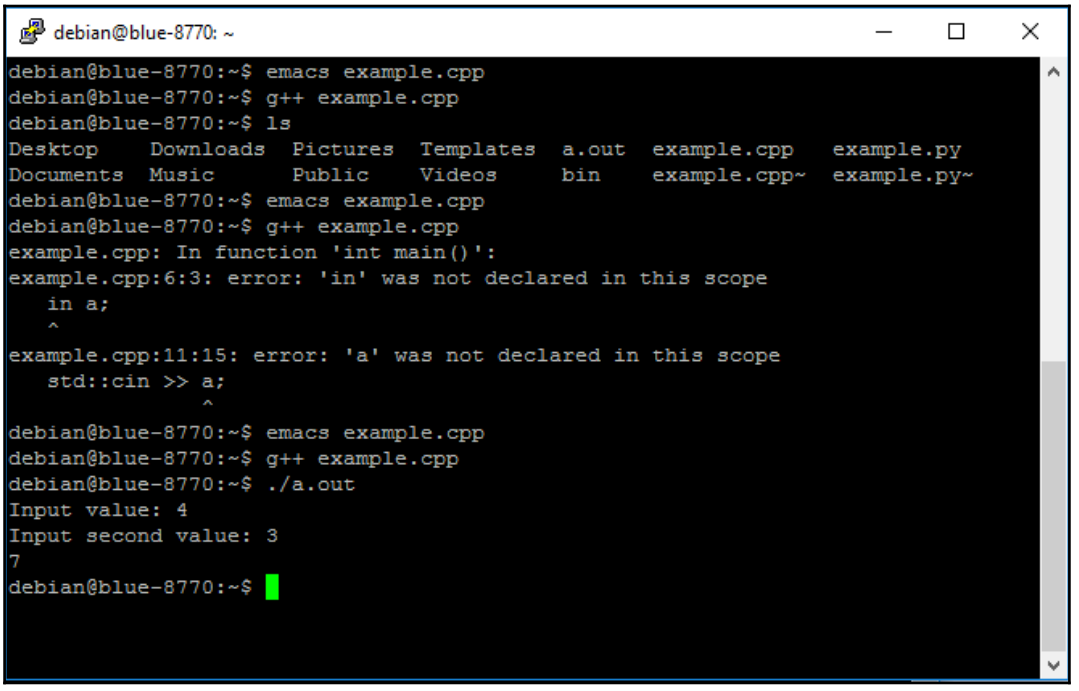

debian@blue-8770: ~
File Edit Options Buffers Tools Python Help
#!/usr/bin/python
import time
d = int(raw_input("Input value: "))
time.sleep(1)
e = int(raw_input("Input second value: "))
time.sleep(5)
f = d + e
print f
-=--:----F1 example.py All L9 (Python)
Wrote /home/debian/example.py


debian@blue-8770: ~
debian@blue-8770:~$ ./example.py
Input value: 4
Input second value: 3
7
debian@blue-8770:~$

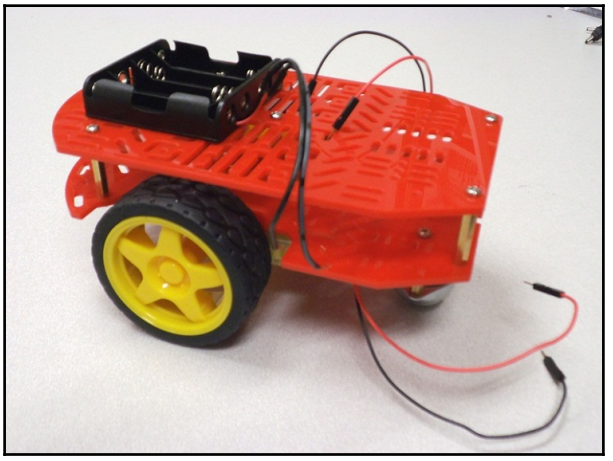

debian@blue-8770: ~
File Edit Options Buffers Tools C++ Help
#include <iostream>
int main()
{
int a;
int b;
int c;
std::cout << "Input value: ";
std::cin >> a;
std::cout << "Input second value: ";
std::cin >> b;
c = a + b;
std::cout << c << std::endl;
return 0;
}
-=--:----F1 example.cpp All L1 (C++/l Abbrev) ----------
Wrote /home/debian/example.cpp

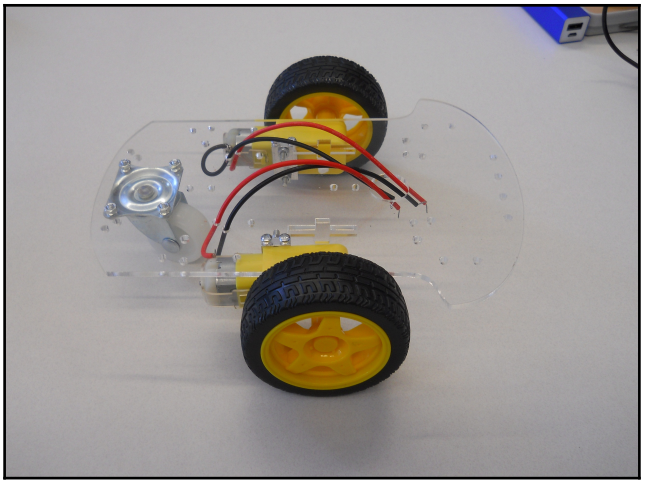

debian@blue-8770: ~
debian@blue-8770:~$ emacs example.cpp
debian@blue-8770:~$ g++ example.cpp
debian@blue-8770:~$ ls
Desktop Downloads Pictures Templates a.out example.cpp example.py
Documents Music Public Videos bin example.cpp~ example.py~
debian@blue-8770:~$

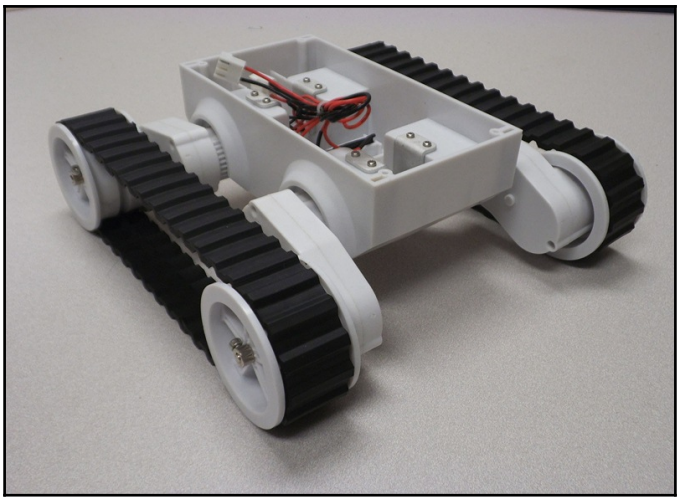

debian@blue-8770: ~
debian@blue-8770:~$ emacs example.cpp
debian@blue-8770:~$ g++ example.cpp
debian@blue-8770:~$ ls
Desktop Downloads Pictures Templates a.out example.cpp example.py
Documents Music Public Videos bin example.cpp~ example.py~
debian@blue-8770:~$ emacs example.cpp
debian@blue-8770:~$ g++ example.cpp
example.cpp: In function 'int main()':
example.cpp:6:3: error: 'in' was not declared in this scope
in a;
^
example.cpp:11:15: error: 'a' was not declared in this scope
std::cin >> a;
^
debian@blue-8770:~$

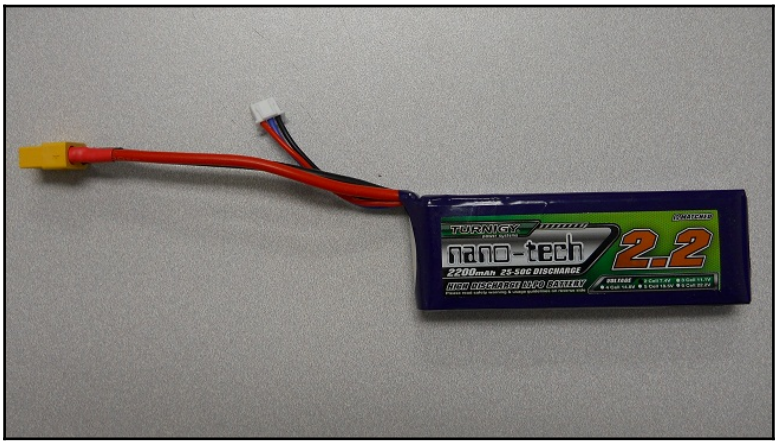

debian@blue-8770: ~
debian@blue-8770:~$ emacs example.cpp
debian@blue-8770:~$ g++ example.cpp
debian@blue-8770:~$ ls
Desktop Downloads Pictures Templates a.out example.cpp example.py
Documents Music Public Videos bin example.cpp~ example.py~
debian@blue-8770:~$ emacs example.cpp
debian@blue-8770:~$ g++ example.cpp
example.cpp: In function 'int main()':
example.cpp:6:3: error: 'in' was not declared in this scope
in a;
^
example.cpp:11:15: error: 'a' was not declared in this scope
std::cin >> a;
^
debian@blue-8770:~$ emacs example.cpp
debian@blue-8770:~$ g++ example.cpp
debian@blue-8770:~$ ./a.out
Input value: 4
Input second value: 3
7
debian@blue-8770:~$

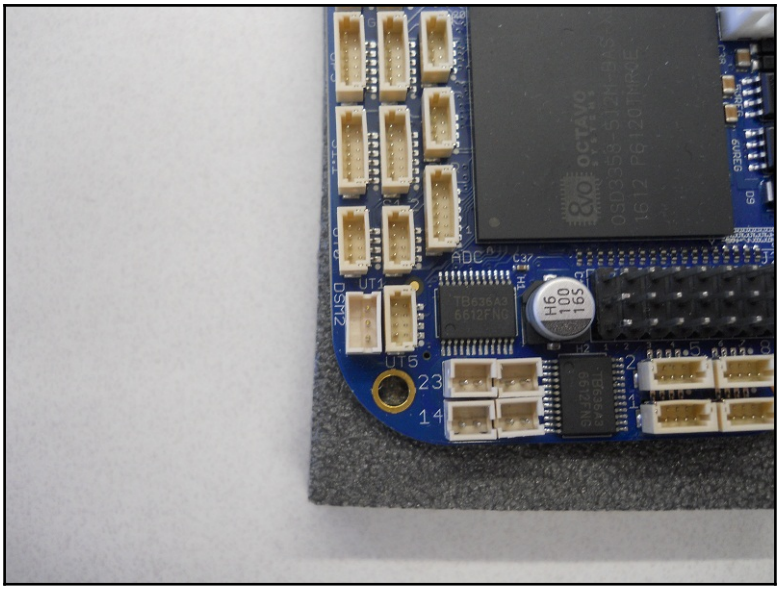
Chapter 3: Making the Unit Mobile - Controlling Wheeled Movement

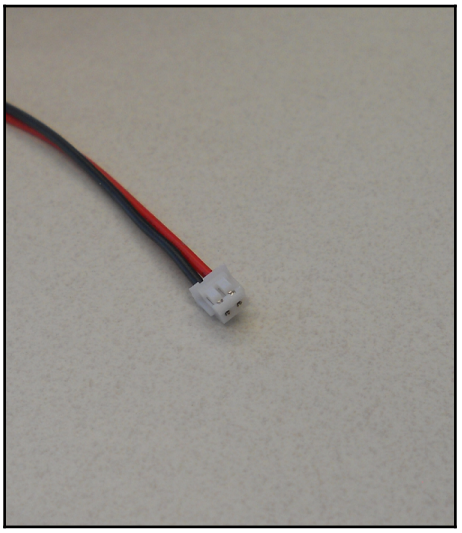


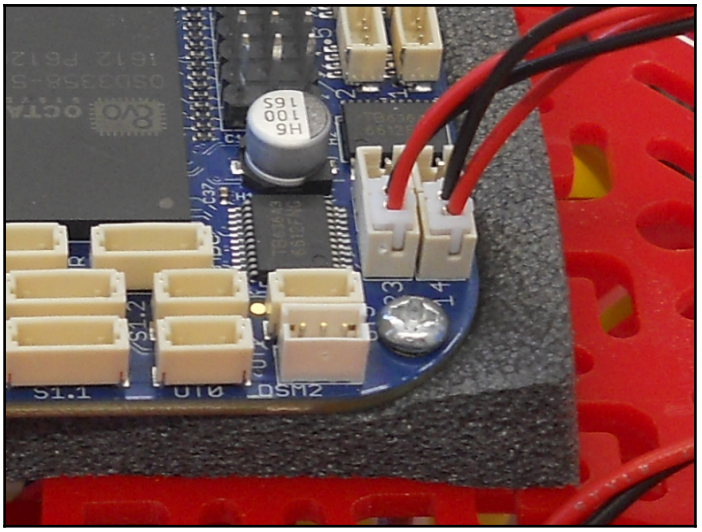


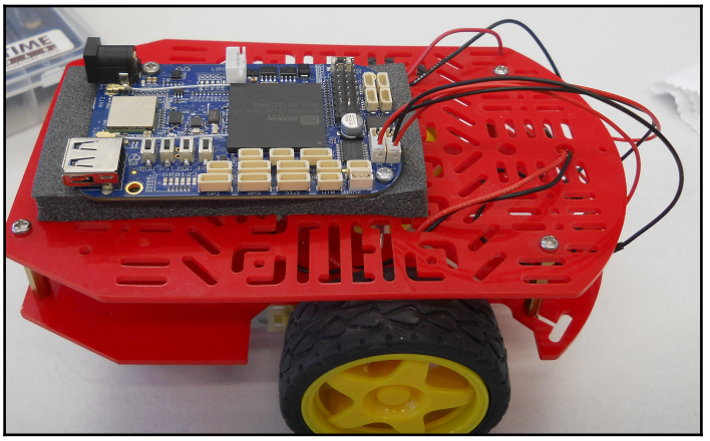


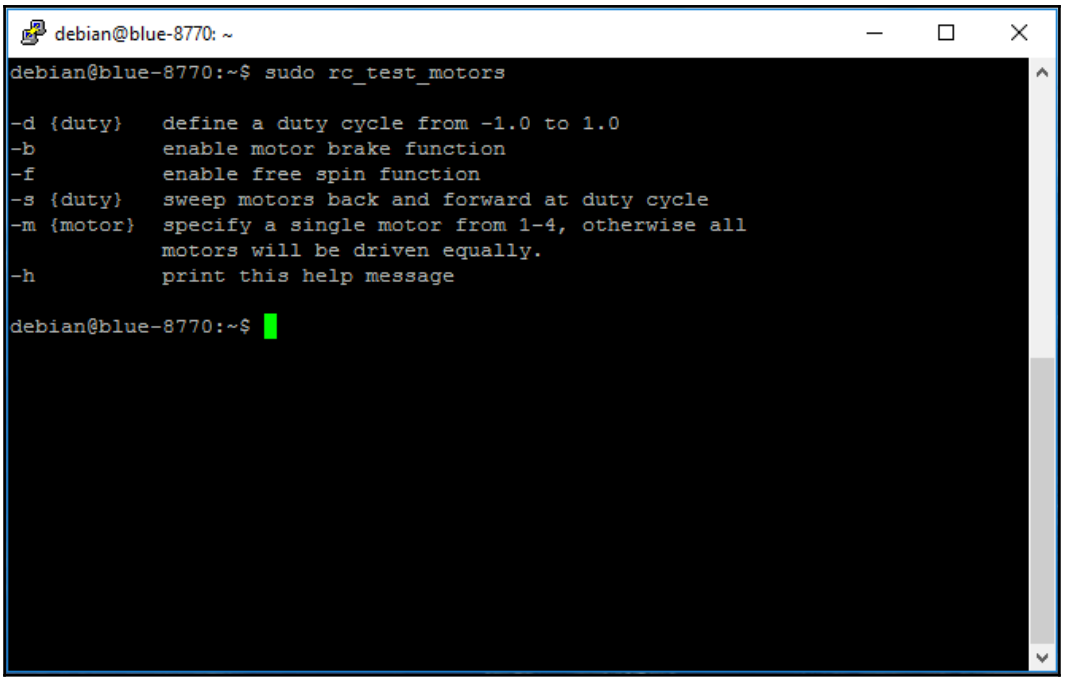

TURNIGY
nano-tech
2.2
2200mAh 25-50C DISCHARGE
HIGH DISCHARGE LiPO BATTERY

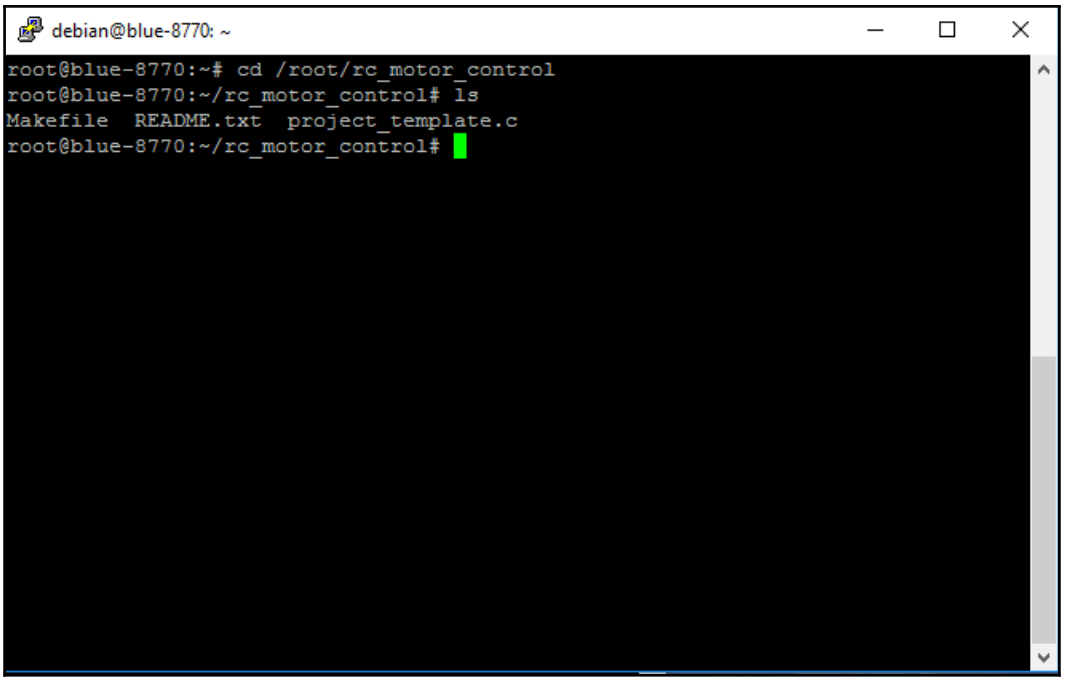

ADC
UT1
UT5
DSM2
23
14

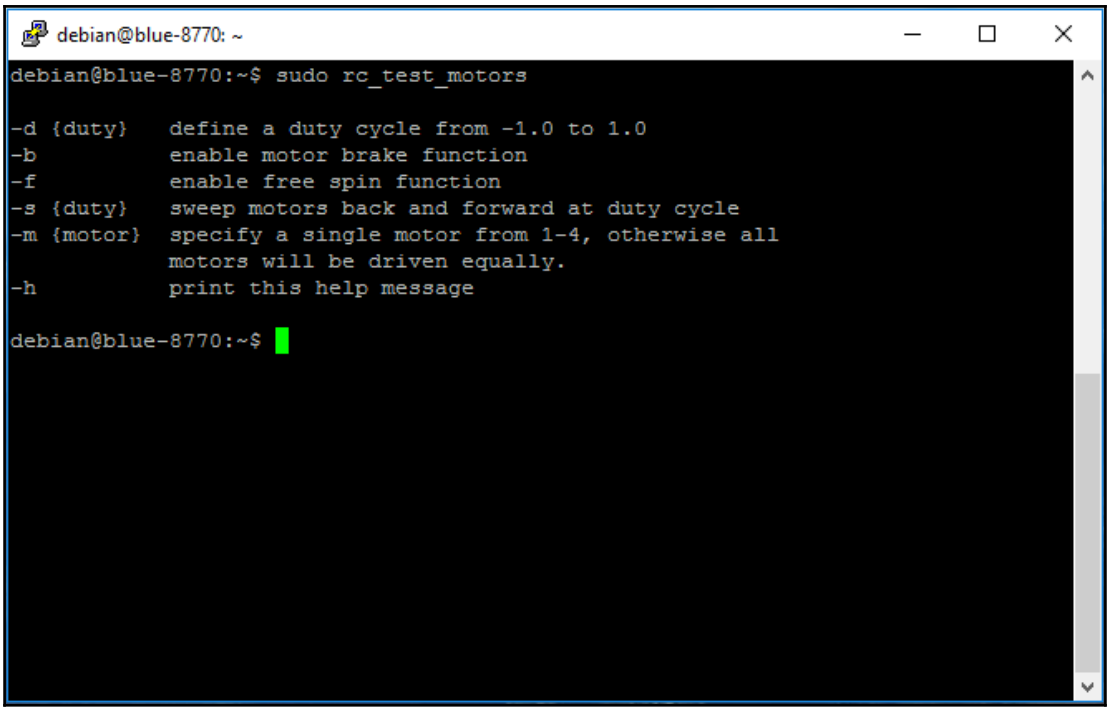


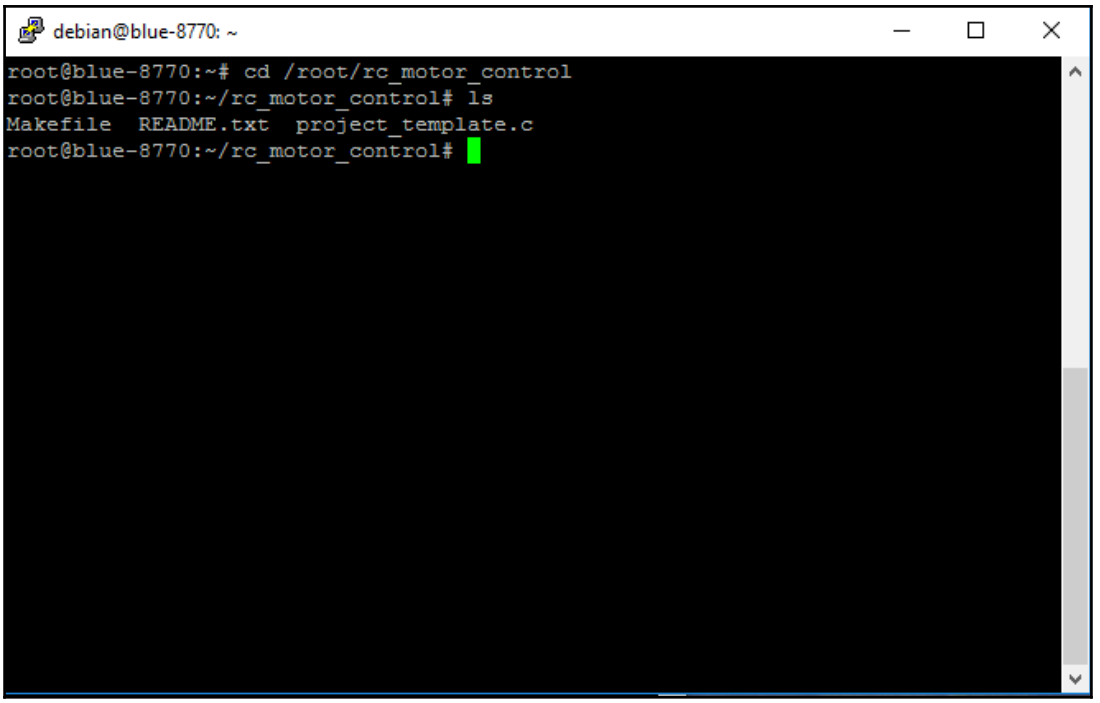

S1.1
DSM2

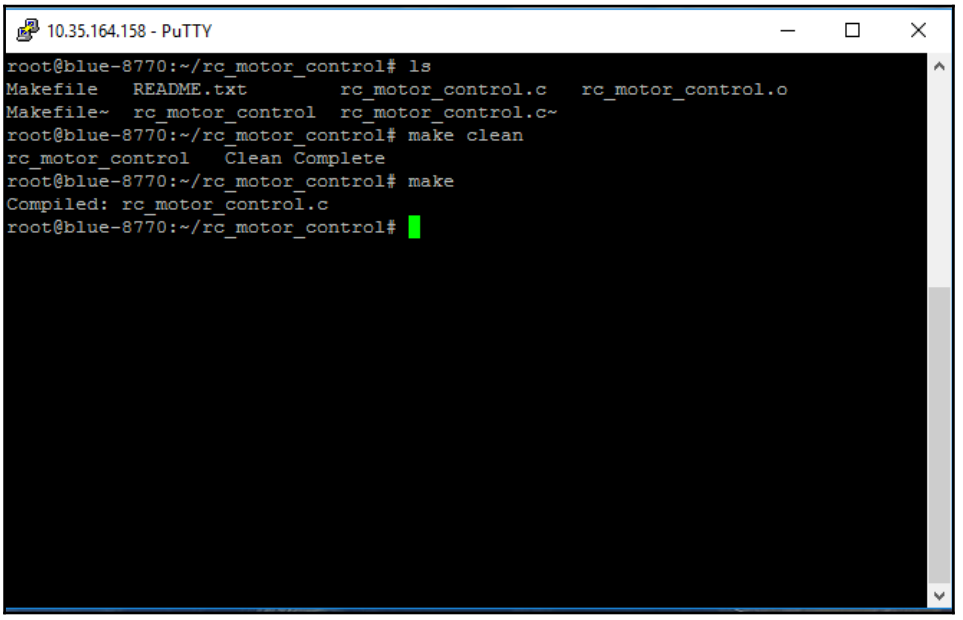



debian@blue-8770: ~
debian@blue-8770:~$ sudo rc_test_motors
-d {duty} define a duty cycle from -1.0 to 1.0
-b enable motor brake function
-f enable free spin function
-s {duty} sweep motors back and forward at duty cycle
-m {motor} specify a single motor from 1-4, otherwise all
motors will be driven equally.
-h print this help message
debian@blue-8770:~$

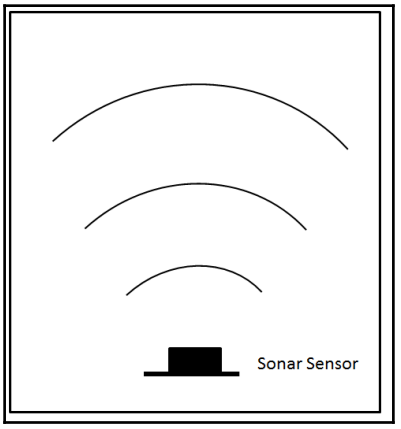

debian@blue-8770: ~
root@blue-8770:~# cd /root/rc_motor_control
root@blue-8770:~/rc_motor_control# ls
Makefile README.txt project_template.c
root@blue-8770:~/rc_motor_control#

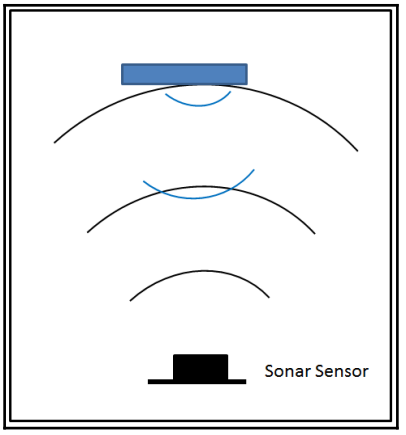

debian@blue-8770: ~
debian@blue-8770:~$ sudo rc_test_motors
-d {duty}   define a duty cycle from -1.0 to 1.0
-b   enable motor brake function
-f   enable free spin function
-s {duty}   sweep motors back and forward at duty cycle
-m {motor} specify a single motor from 1-4, otherwise all
            motors will be driven equally.
-h   print this help message
debian@blue-8770:~$

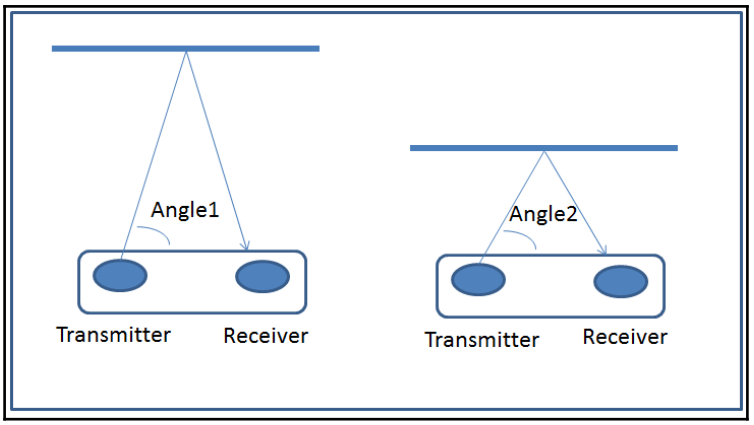

debian@blue-8770: ~
root@blue-8770:~# cd /root/rc_motor_control
root@blue-8770:~/rc_motor_control# ls
Makefile README.txt project_template.c
root@blue-8770:~/rc_motor_control#

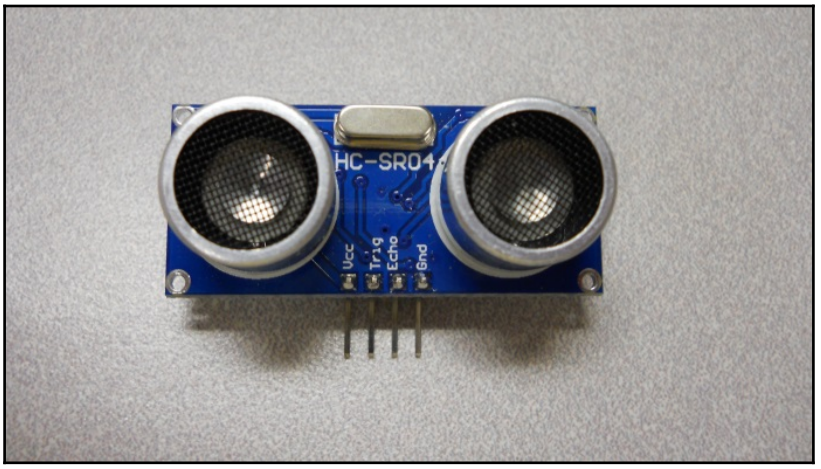

10.35.164.158 - PuTTY
root@blue-8770:~/rc_motor_control# ls
Makefile   README.txt   rc_motor_control.c   rc_motor_control.o
Makefile~ rc_motor_control rc_motor_control.c~
root@blue-8770:~/rc_motor_control# make clean
rc_motor_control   Clean Complete
root@blue-8770:~/rc_motor_control# make
Compiled: rc_motor_control.c
root@blue-8770:~/rc_motor_control#

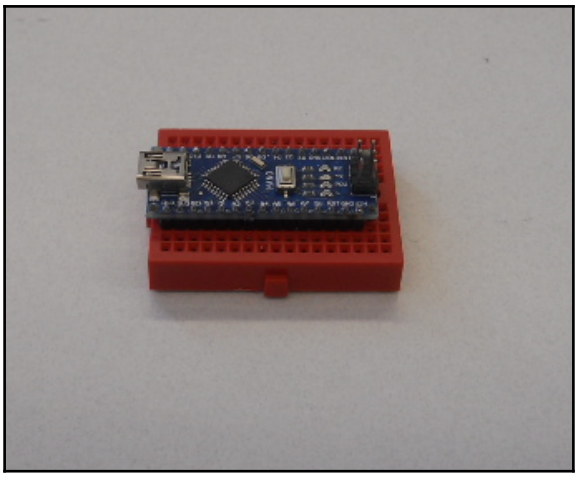
Chapter 4: Avoiding Obstacles Using Sensors

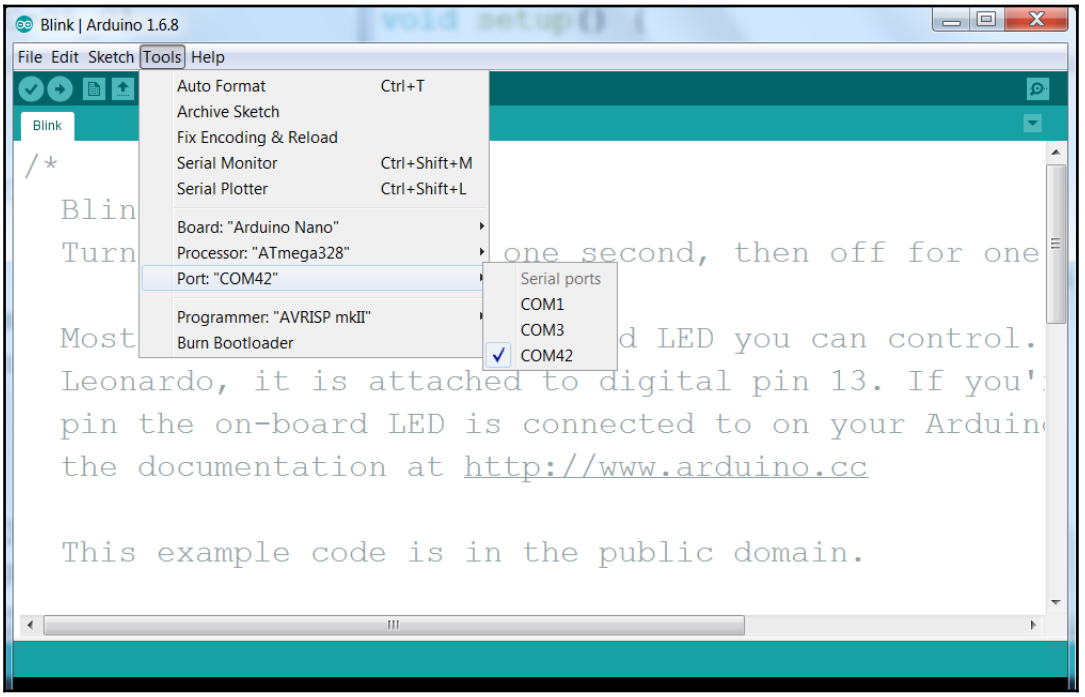


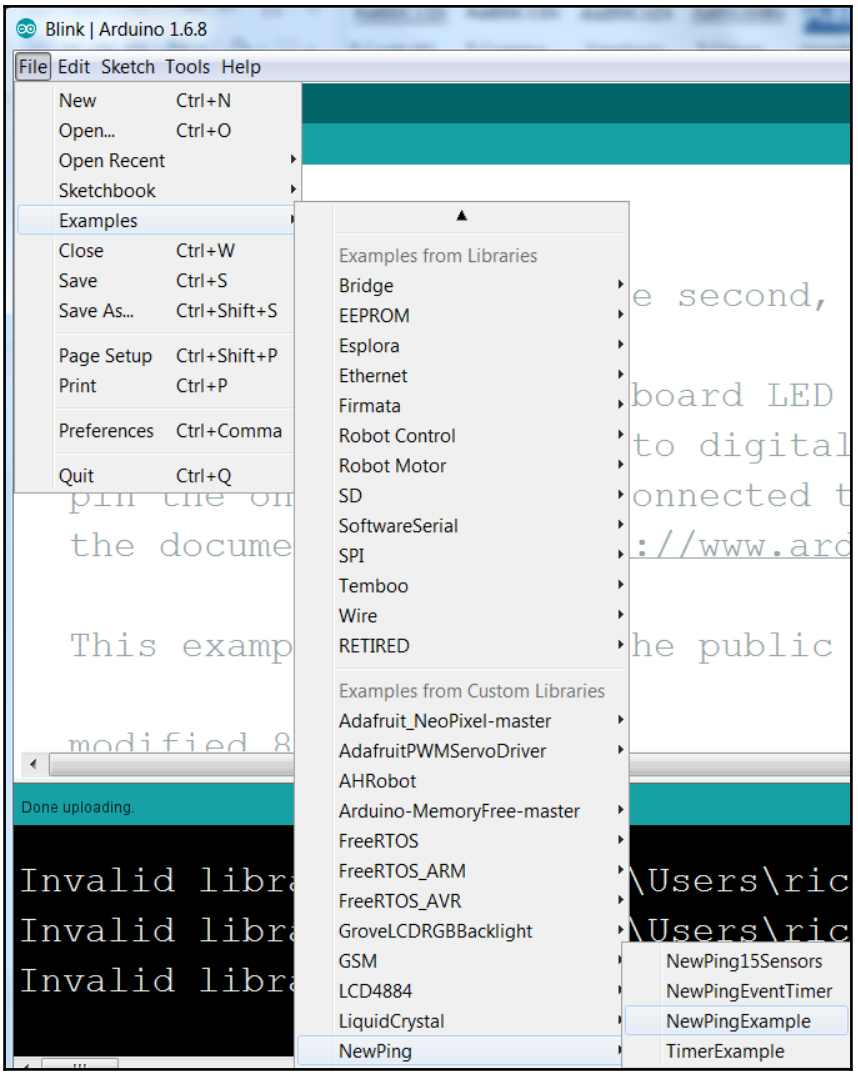


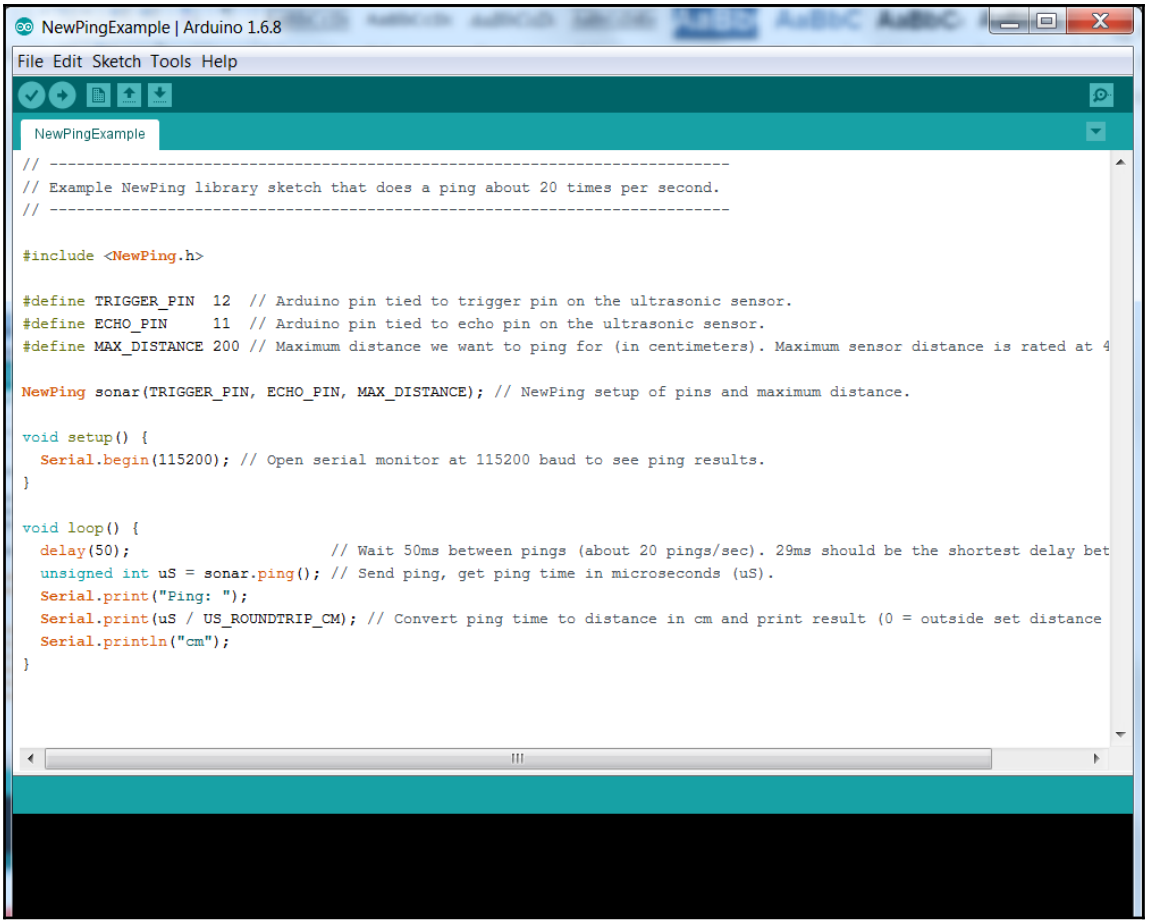

Angle1
Transmitter
Receiver
Angle2
Transmitter
Receiver

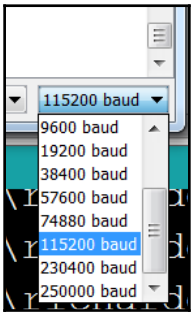

HC-SR04
Vcc
Trig
Echo
Gnd

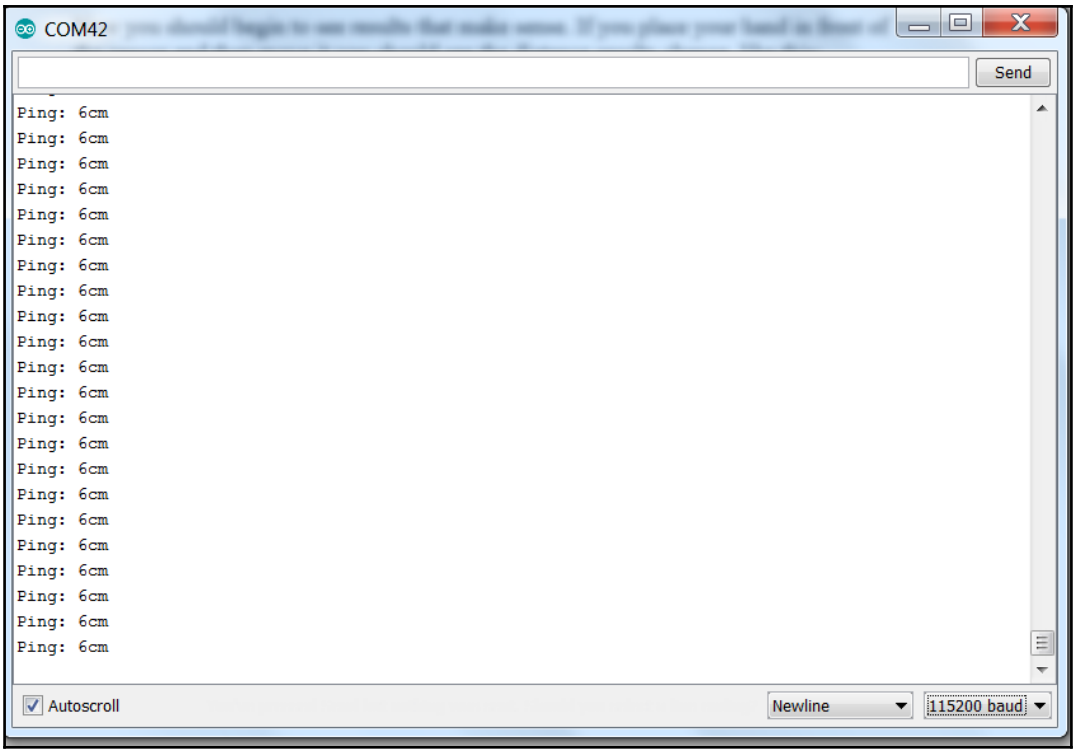


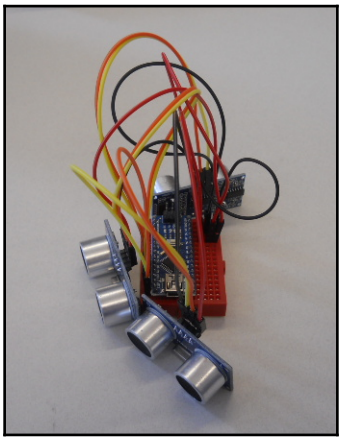

Blink | Arduino 1.6.8
File Edit Sketch Tools Help
Blink
Auto Format Ctrl+T
Archive Sketch
Fix Encoding & Reload
Serial Monitor Ctrl+Shift+M
Serial Plotter Ctrl+Shift+L
Board: "Arduino Nano"
Processor: "ATmega328"
Port: "COM42"
Programmer: "AVRISP mkII"
Burn Bootloader
Serial ports
COM1
COM3
COM42
/*
Blin
Turn
one second, then off for one
Most
d LED you can control.
Leonardo, it is attached to digital pin 13. If you'
pin the on-board LED is connected to on your Arduin
the documentation at http://www.arduino.cc
This example code is in the public domain.

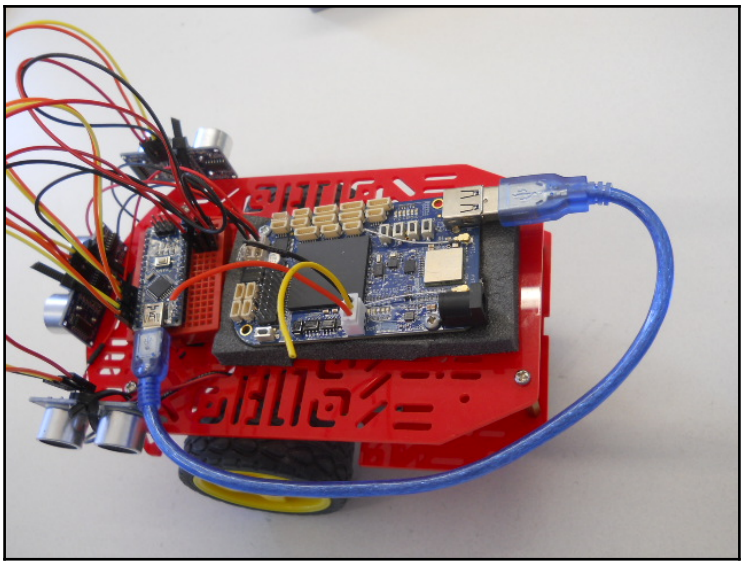

Blink | Arduino 1.6.8
File Edit Sketch Tools Help
New Ctrl+N
Open... Ctrl+O
Open Recent
Sketchbook
Examples
Close Ctrl+W
Save Ctrl+S
Save As... Ctrl+Shift+S
Page Setup Ctrl+Shift+P
Print Ctrl+P
Preferences Ctrl+Comma
Quit Ctrl+Q
Examples from Libraries
Bridge
EEPROM
Esplora
Ethernet
Firmata
Robot Control
Robot Motor
SD
SoftwareSerial
SPI
Temboo
Wire
RETIRED
Examples from Custom Libraries
Adafruit_NeoPixel-master
AdafruitPWMServoDriver
AHRobot
Arduino-MemoryFree-master
FreeRTOS
FreeRTOS_ARM
FreeRTOS_AVR
GroveLCDRGBBacklight
GSM
LCD4884
LiquidCrystal
NewPing
NewPing15Sensors
NewPingEventTimer
NewPingExample
TimerExample
e second,
board LED
to digital
onnected t
://www.arc
the docume
This examp
he public
modified 8
Done uploading.
Invalid libra
Invalid libra
Invalid libra
\Users\ric
\Users\ric


NewPingExample | Arduino 1.6.8
File Edit Sketch Tools Help
NewPingExample
// ---
// Example NewPing library sketch that does a ping about 20 times per second.
// ---
#include <NewPing.h>
#define TRIGGER_PIN 12 // Arduino pin tied to trigger pin on the ultrasonic sensor.
#define ECHO_PIN 11 // Arduino pin tied to echo pin on the ultrasonic sensor.
#define MAX_DISTANCE 200 // Maximum distance we want to ping for (in centimeters). Maximum sensor distance is rated at 4
NewPing sonar(TRIGGER_PIN, ECHO_PIN, MAX_DISTANCE); // NewPing setup of pins and maximum distance.
void setup() {
Serial.begin(115200); // Open serial monitor at 115200 baud to see ping results.
}
void loop() {
delay(50); // Wait 50ms between pings (about 20 pings/sec). 29ms should be the shortest delay bet
unsigned int uS = sonar.ping(); // Send ping, get ping time in microseconds (uS).
Serial.print("Ping: ");
Serial.print(uS / US_ROUNDTRIP_CM); // Convert ping time to distance in cm and print result (0 = outside set distance
Serial.println("cm");
}


115200 baud
9600 baud
19200 baud
38400 baud
57600 baud
74880 baud
115200 baud
230400 baud
250000 baud

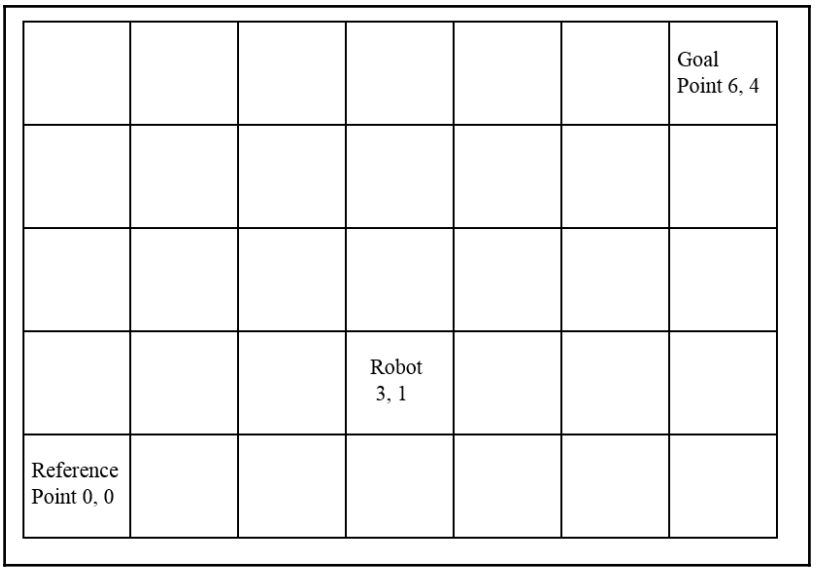

COM42
Send
Ping: 6cm
Ping: 6cm
Ping: 6cm
Ping: 6cm
Ping: 6cm
Ping: 6cm
Ping: 6cm
Ping: 6cm
Ping: 6cm
Ping: 6cm
Ping: 6cm
Ping: 6cm
Ping: 6cm
Ping: 6cm
Ping: 6cm
Ping: 6cm
Ping: 6cm
Ping: 6cm
Ping: 6cm
Ping: 6cm
Ping: 6cm
Ping: 6cm
Ping: 6cm
Autoscroll
Newline
115200 baud





10.35.164.158 - PuTTY

```
59,25,118
59,26,121
59,0,121
59,0,119
59,0,119
59,0,118
58,30,119
59,0,121
58,29,119
59,31,119
59,28,120
```

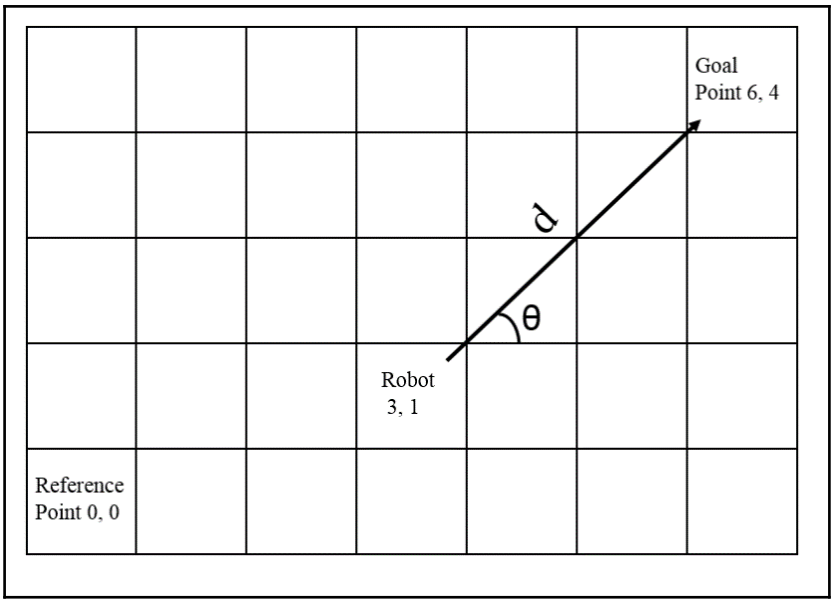


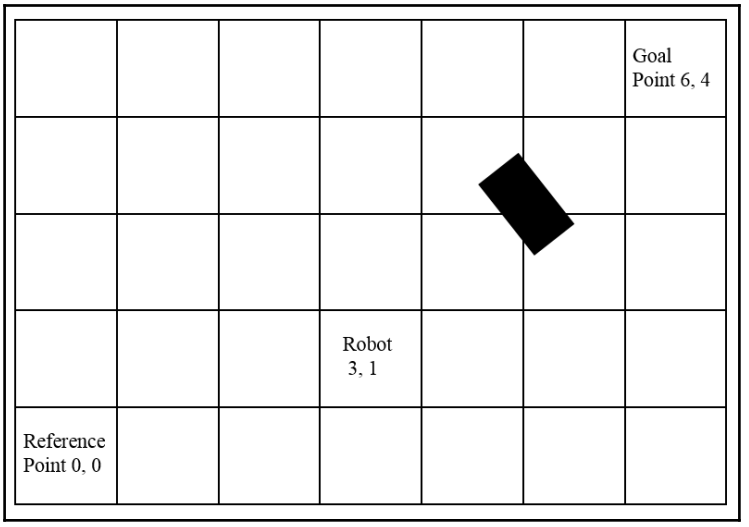
$$d = \sqrt{((Xgoal - Xgoal)^2 + (Ygoal - Yrobot)^2)}$$

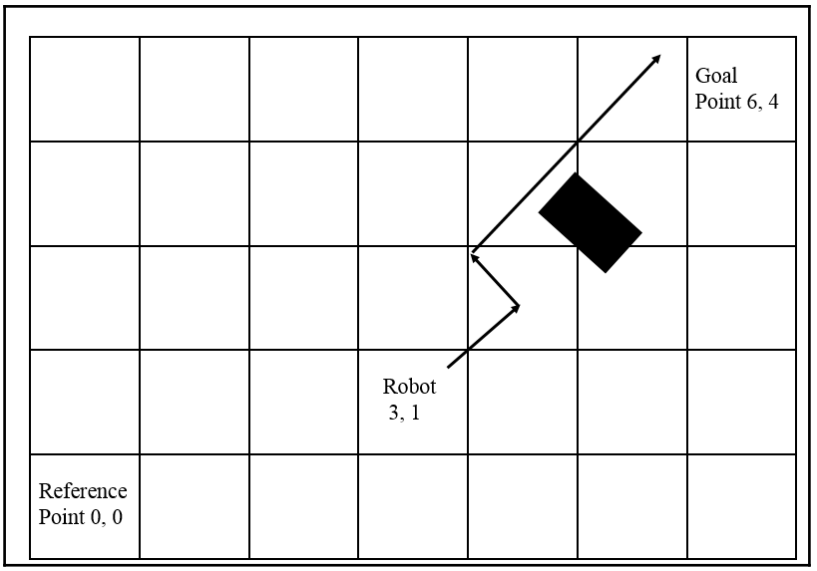
$$d = \sqrt{((Xgoal - Xgoal)^2 + (Ygoal - Yrobot)^2)}$$

$$\theta = \arctan(\frac{Ygoal - Yrobot}{Xgoal - Xrobot})$$

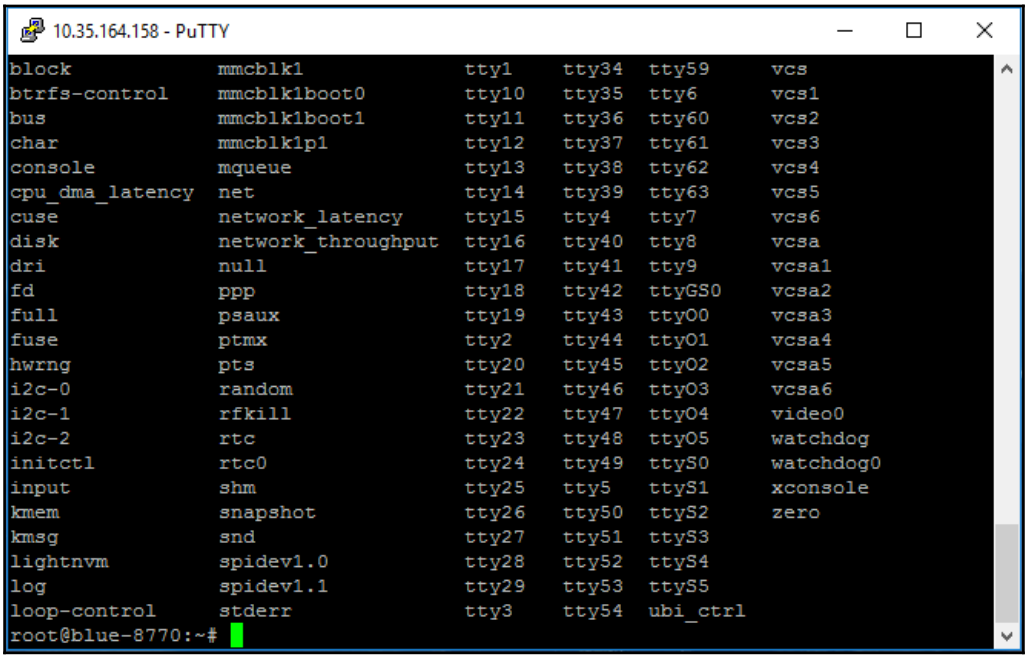
$$\theta = \arctan(\frac{Ygoal - Yrobot}{Xgoal - Xrobot})$$


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

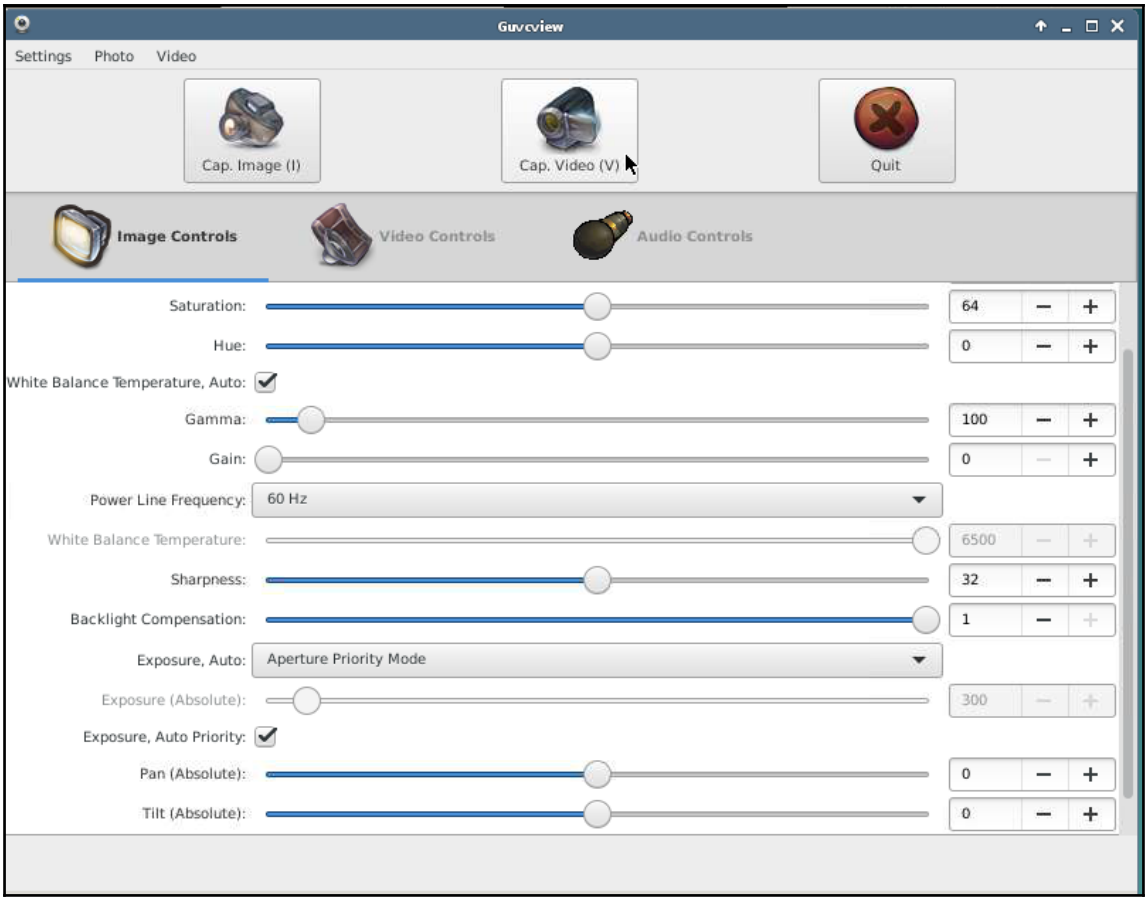

Goal
Point 6, 4
Robot
3, 1
Reference
Point 0, 0

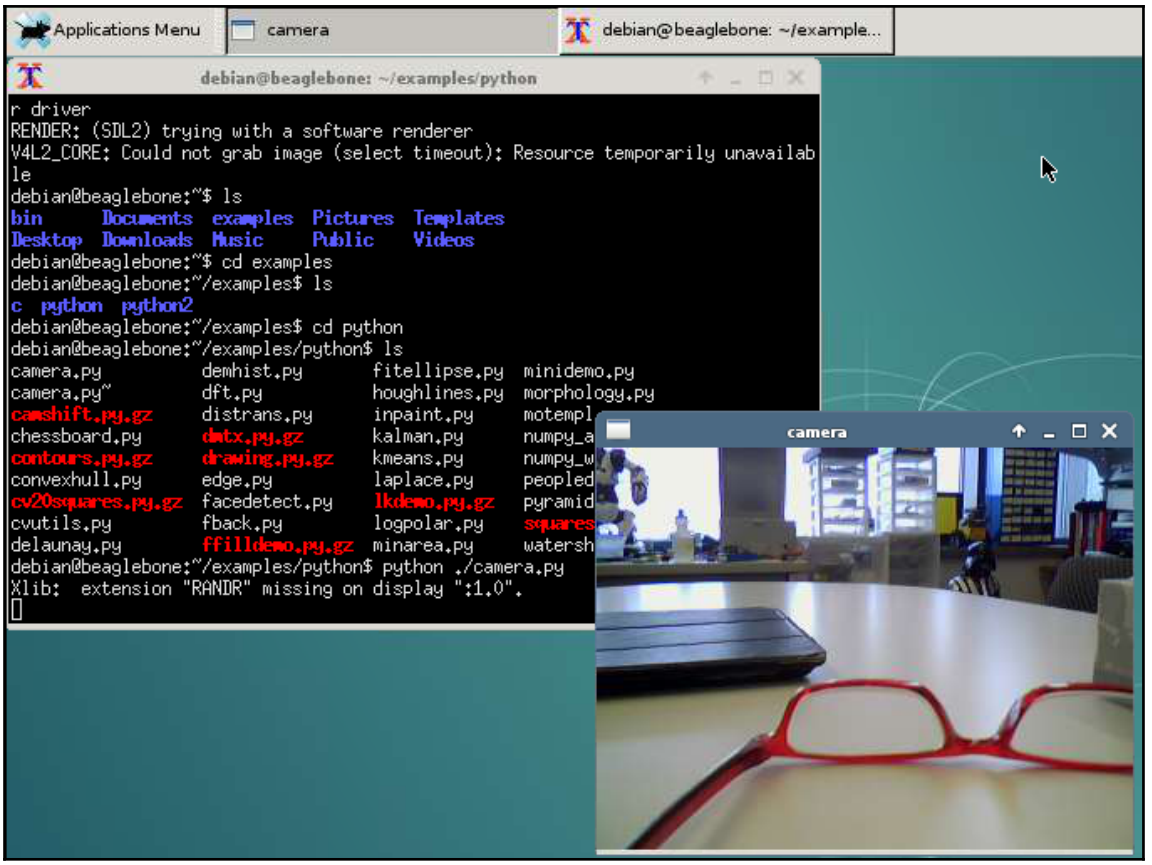

Goal
Point 6, 4
Robot
3, 1
Reference
Point 0, 0

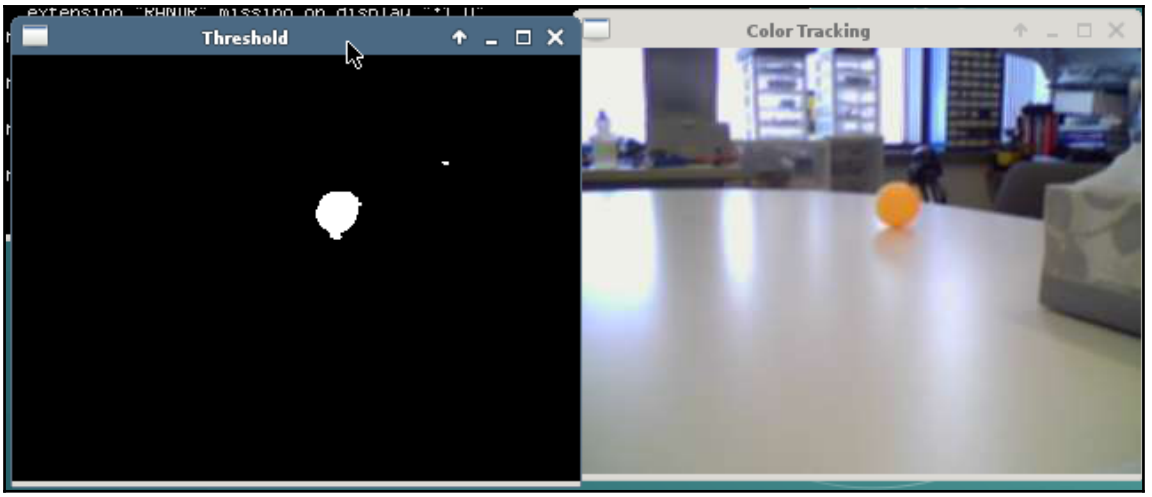
Chapter 5: Allowing Our BeagleBone Blue to See

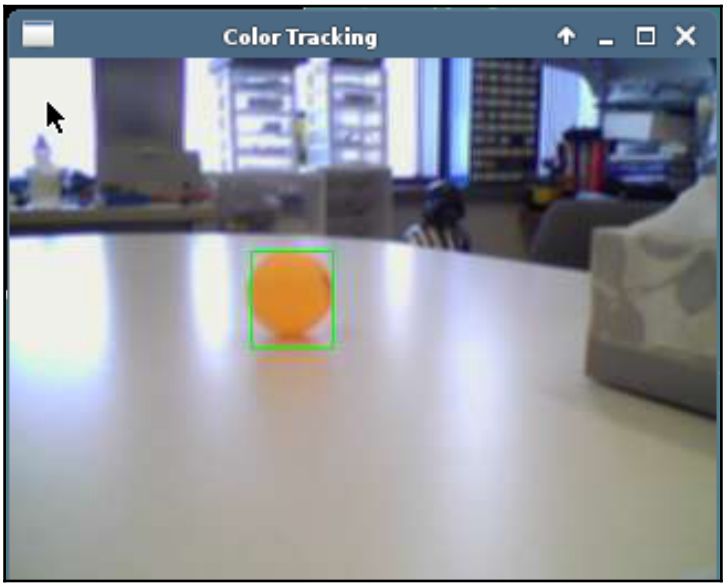



Guvcview (7.94 fps)

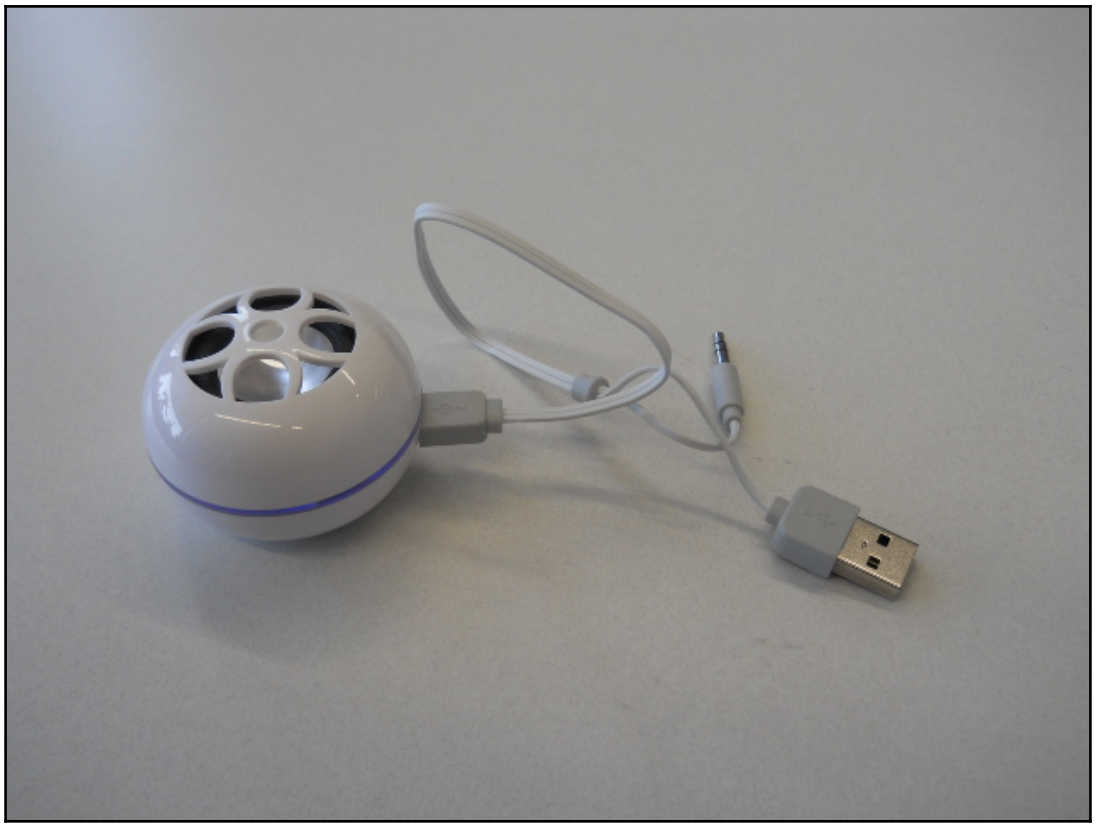

Guvcview
Settings
Photo
Video
Cap. Image (I)
Cap. Video (V)
Quit
Image Controls
Video Controls
Audio Controls
Saturation:
64
Hue:
0
White Balance Temperature, Auto:
Gamma:
100
Gain:
0
Power Line Frequency:
60 Hz
White Balance Temperature:
6500
Sharpness:
32
Backlight Compensation:
1
Exposure, Auto:
Aperture Priority Mode
Exposure (Absolute):
300
Exposure, Auto Priority:
Pan (Absolute):
0
Tilt (Absolute):
0

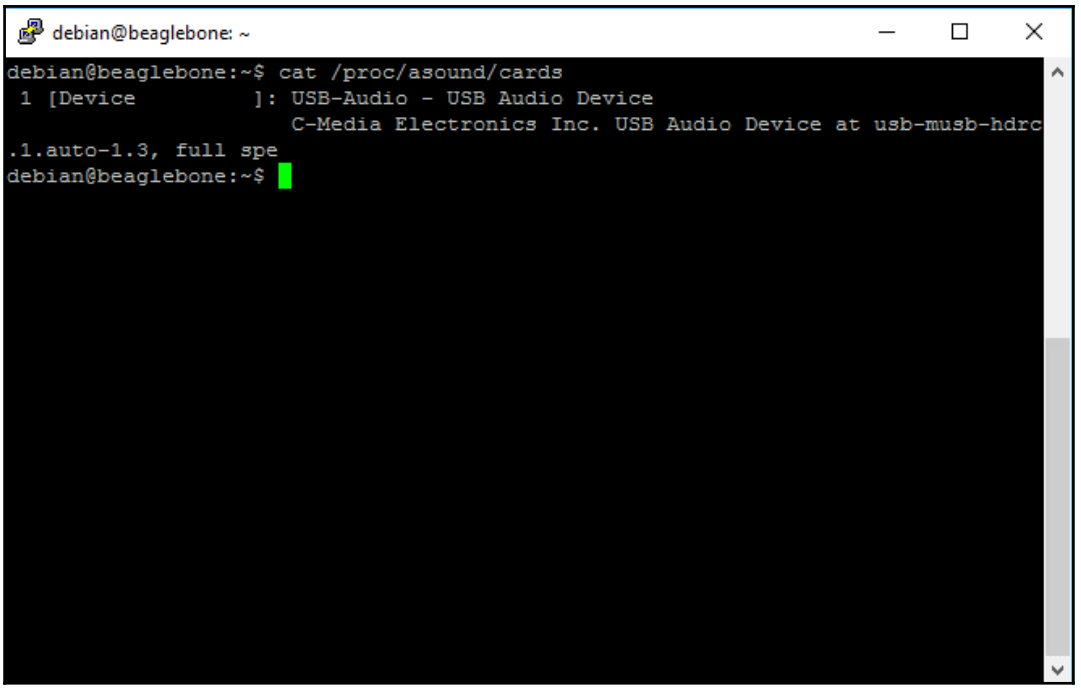

Applications Menu
camera
debian@beaglebone: ~/example...
debian@beaglebone: ~/examples/python
r driver
RENDER: (SDL2) trying with a software renderer
V4L2_CORE: Could not grab image (select timeout): Resource temporarily unavailab
le
debian@beaglebone:~$ ls
bin Documents examples Pictures Templates
Desktop Downloads Music Public Videos
debian@beaglebone:~$ cd examples
debian@beaglebone:~/examples$ ls
c python python2
debian@beaglebone:~/examples$ cd python
debian@beaglebone:~/examples/python$ ls
camera.py demhist.py fitellipse.py minidemo.py
camera.py~ dft.py houghlines.py morphology.py
camshift.py.gz distrans.py inpaint.py motempl
chessboard.py dmtx.py.gz kalman.py numpy_a
contours.py.gz drawing.py.gz kmeans.py numpy_w
convexhull.py edge.py laplace.py peopled
cv2squares.py.gz facedetect.py lkdemo.py.gz pyramid
cvutils.py fback.py logpolar.py squares
delaunay.py ffilldemo.py.gz minarea.py watersh
debian@beaglebone:~/examples/python$ python ./camera.py
Xlib: extension "RANDR" missing on display ":1.0".
camera

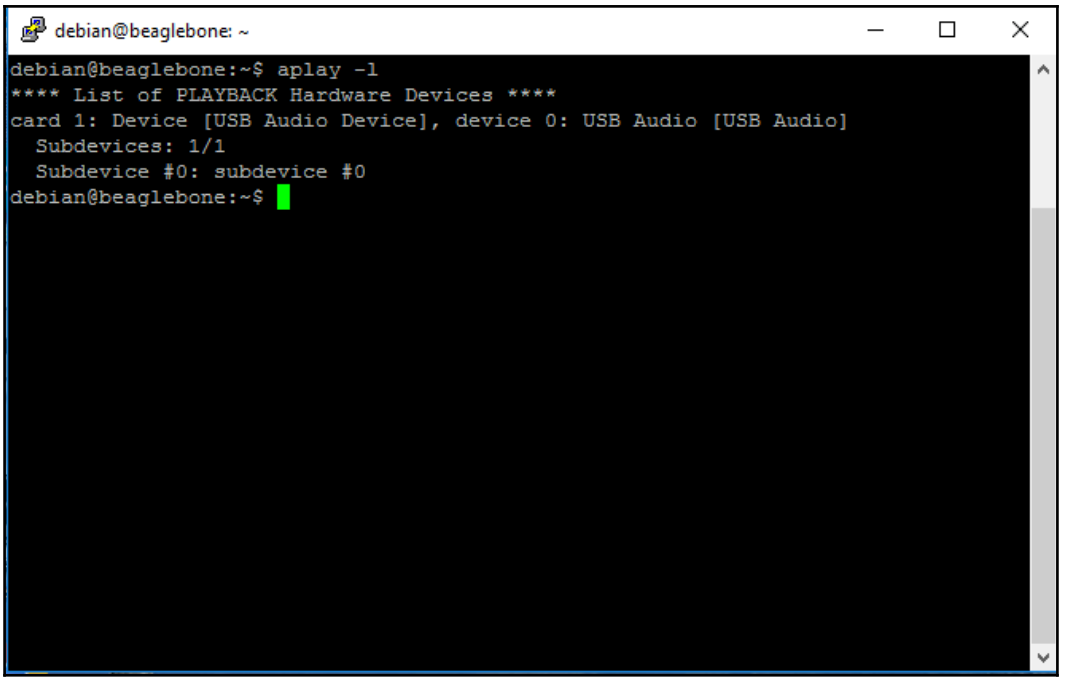

Threshold
Color Tracking

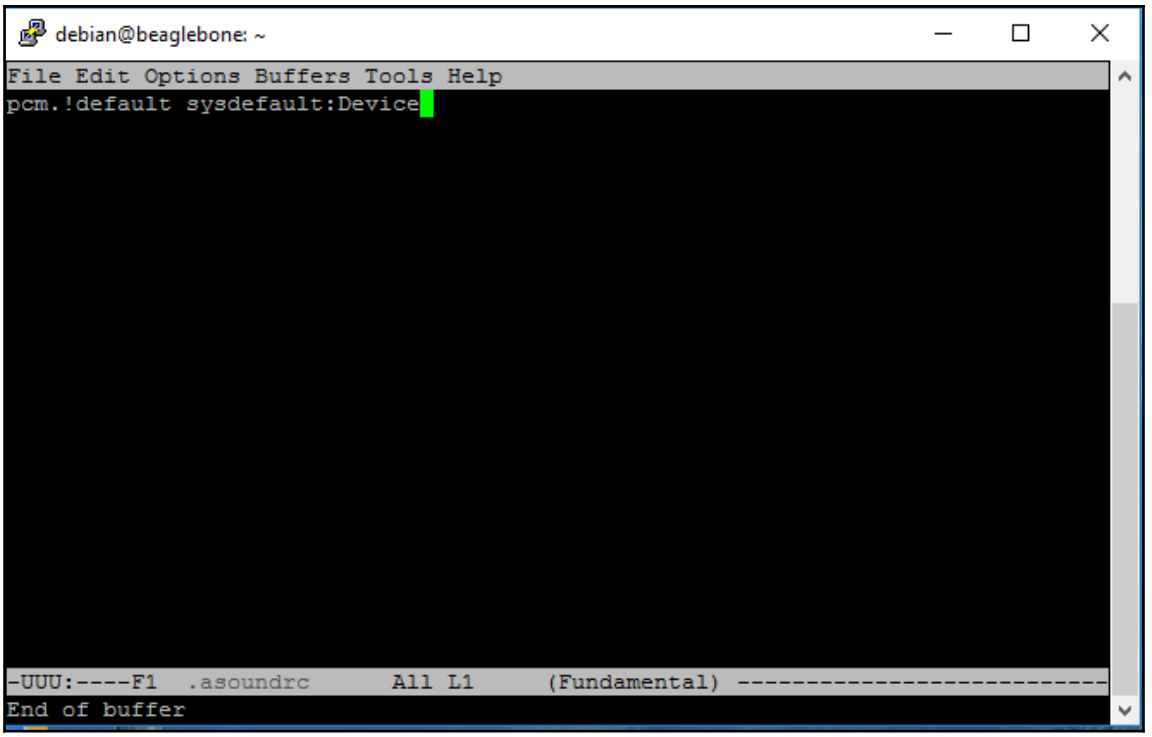

Color Tracking

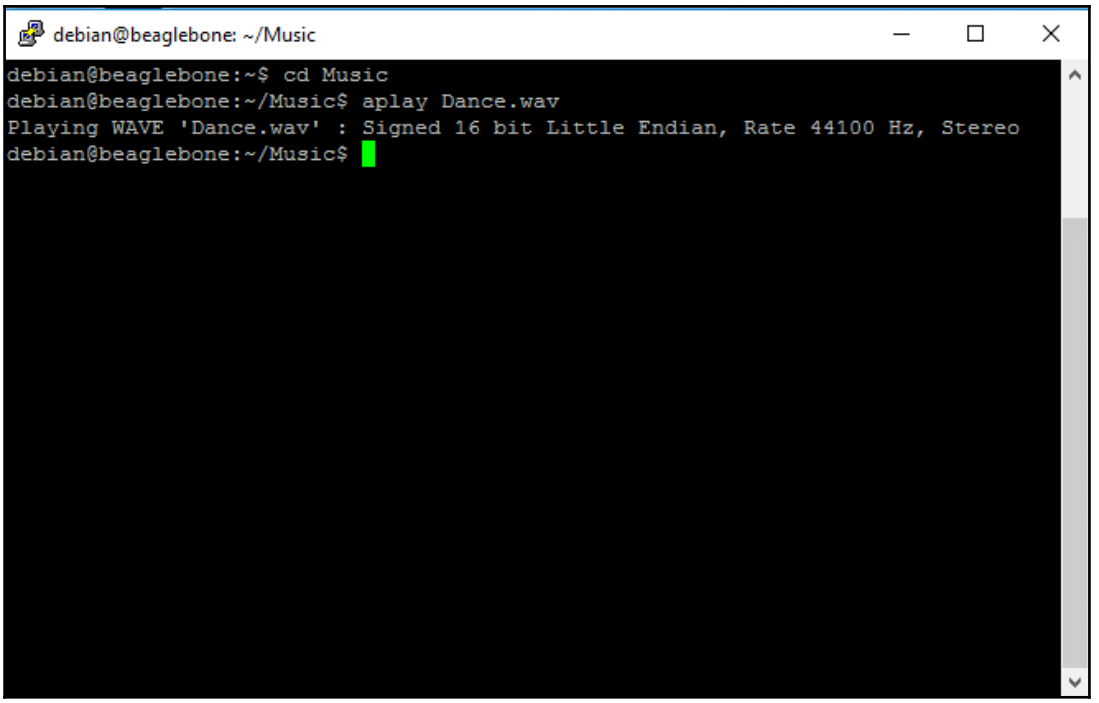
Chapter 6: Providing Speech Input and Output



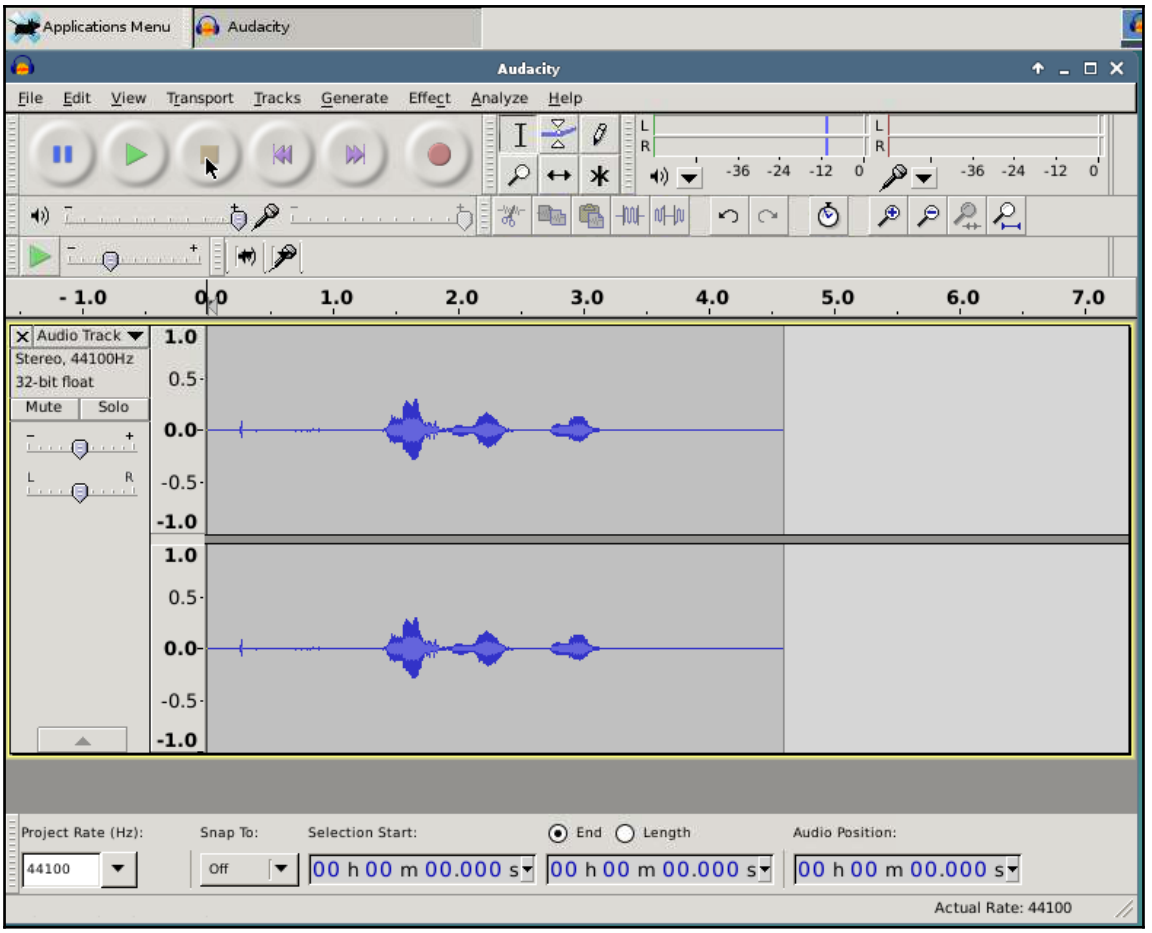

debian@beaglebone: ~
debian@beaglebone:~$ cat /proc/asound/cards
1 [Device]: USB-Audio - USB Audio Device
C-Media Electronics Inc. USB Audio Device at usb-musb-hdrc
.1.auto-1.3, full spe
debian@beaglebone:~$

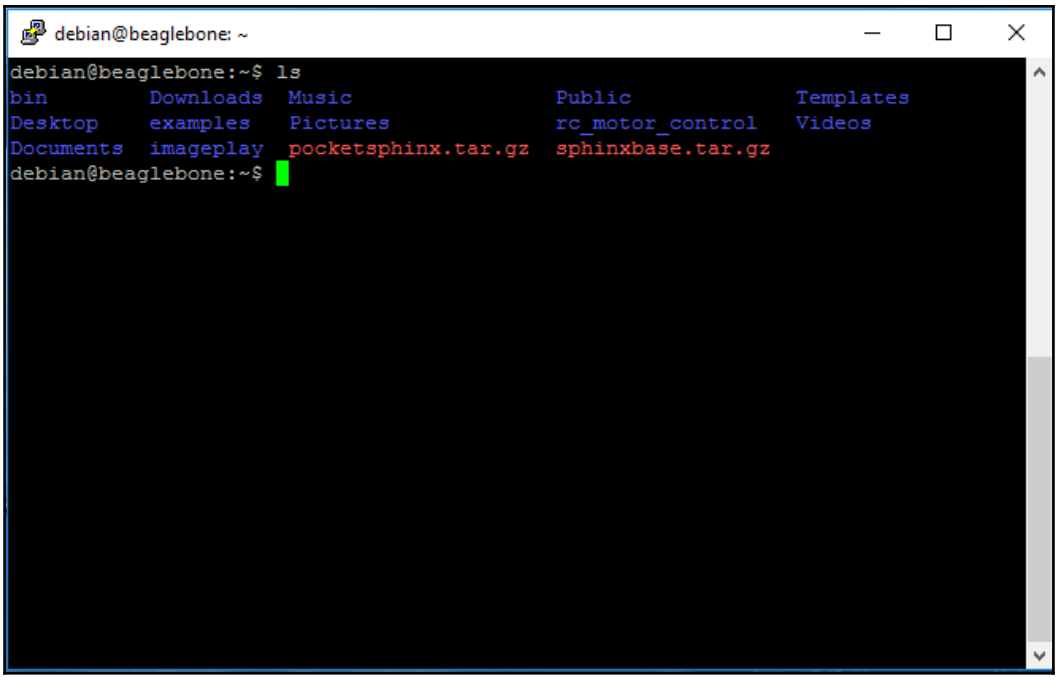

debian@beaglebone: ~
debian@beaglebone:~$ aplay -l
**** List of PLAYBACK Hardware Devices ****
card 1: Device [USB Audio Device], device 0: USB Audio [USB Audio]
Subdevices: 1/1
Subdevice #0: subdevice #0
debian@beaglebone:~$

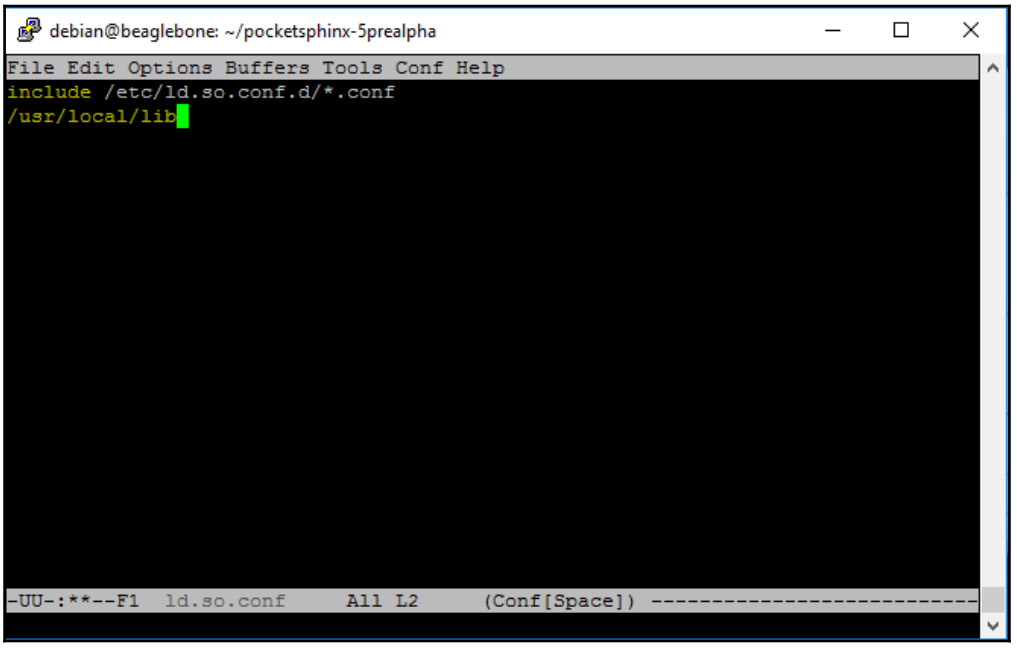

debian@beaglebone: ~
File Edit Options Buffers Tools Help
pcm.!default sysdefault:Device
-UUU:----F1 .asoundrc   All L1   (Fundamental) ----------
End of buffer

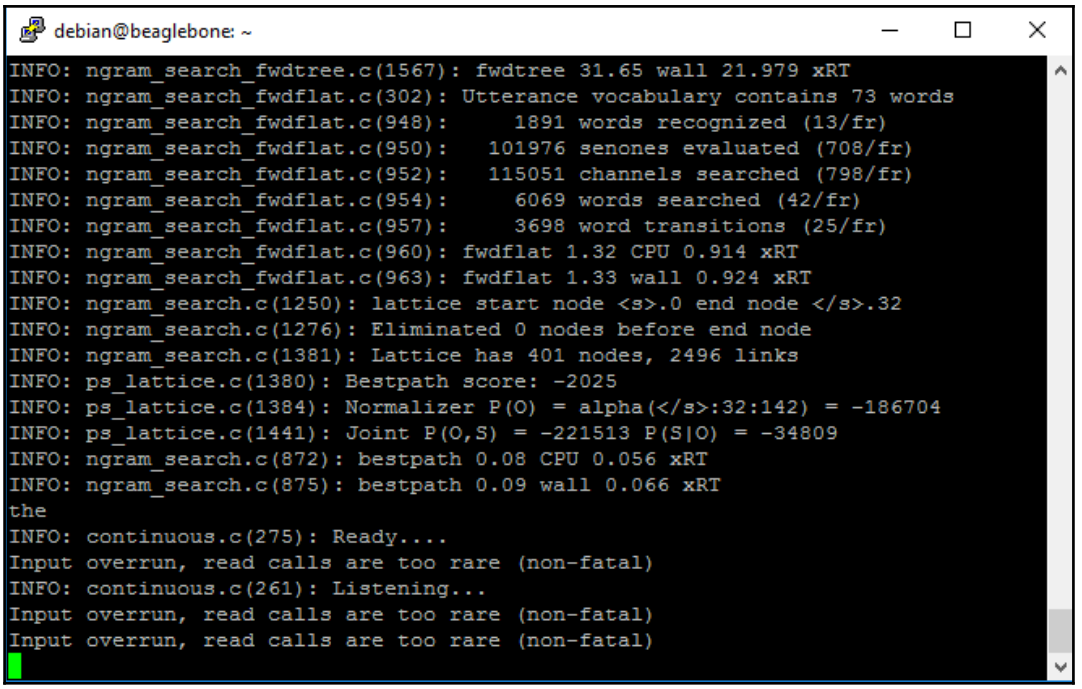

debian@beaglebone: ~/Music
debian@beaglebone:~$ cd Music
debian@beaglebone:~/Music$ aplay Dance.wav
Playing WAVE 'Dance.wav' : Signed 16 bit Little Endian, Rate 44100 Hz, Stereo
debian@beaglebone:~/Music$

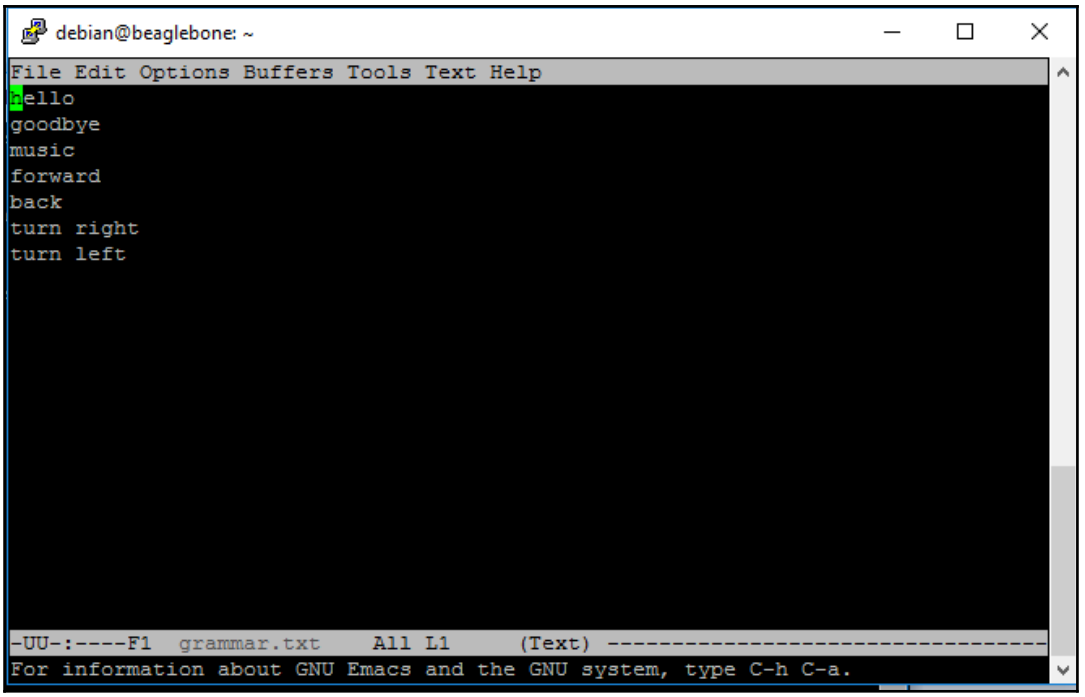

Audio Mixer - USB Audio Device (Alsa mixer)
Audio Mixer - USB Audio Device (Alsa mixer)
Configure sound card(s) and control the volume of selected tracks
Sound card:
USB Audio Device (Alsa mixer)
Playback
Capture
Speaker
Microphone
Select Controls...
Quit

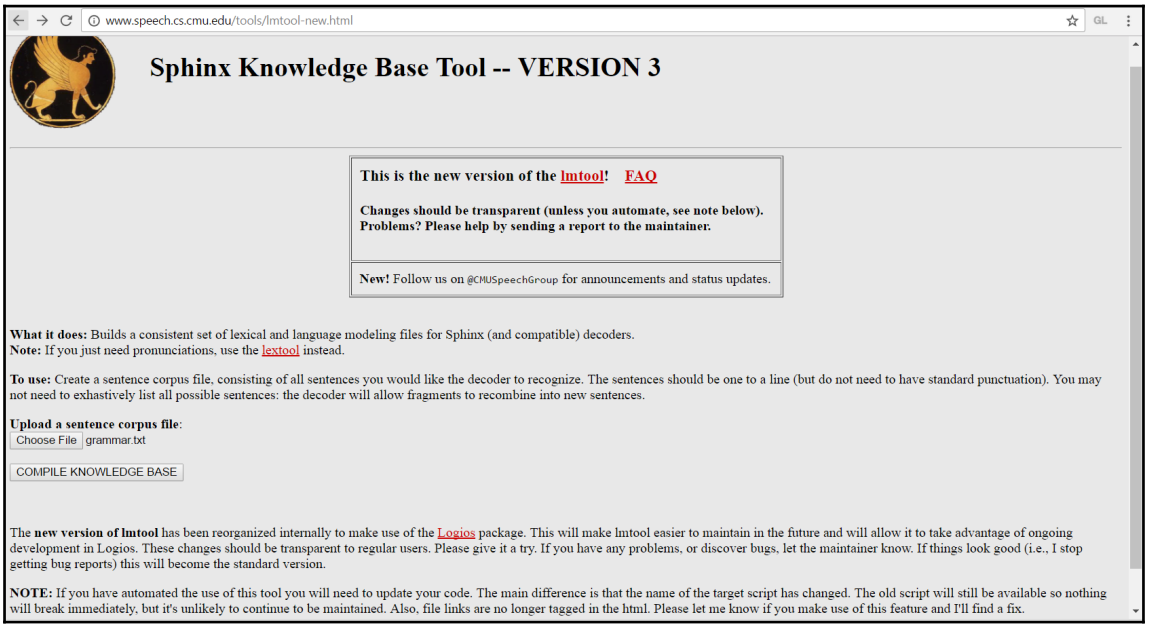

Applications Menu
Audacity
Audacity
File Edit View Transport Tracks Generate Effect Analyze Help
L R
-36 -24 -12 0
-36 -24 -12 0
- 1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0
Audio Track
Stereo, 44100Hz
32-bit float
Mute Solo
L R
1.0 0.5 0.0 -0.5 -1.0
1.0 0.5 0.0 -0.5 -1.0
Project Rate (Hz):
44100
Snap To:
Off
Selection Start:
End Length
Audio Position:
00 h 00 m 00.000 s
00 h 00 m 00.000 s
00 h 00 m 00.000 s
Actual Rate: 44100

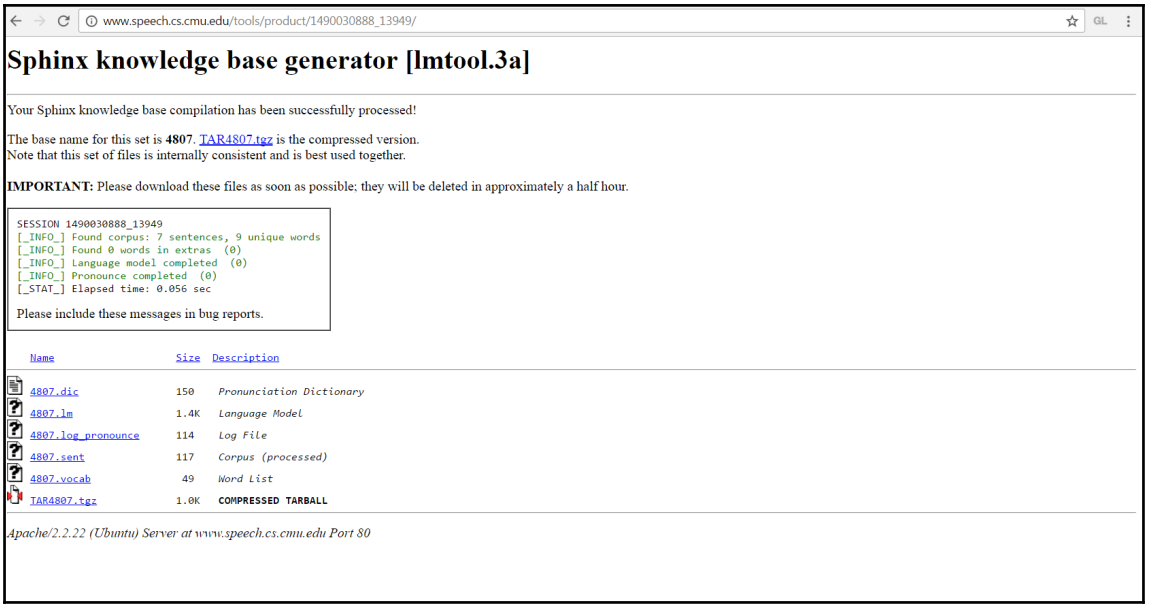

debian@beaglebone: ~
debian@beaglebone:~$ ls
bin Downloads Music Public Templates
Desktop examples Pictures rc_motor_control Videos
Documents imageplay pocketsphinx.tar.gz sphinxbase.tar.gz
debian@beaglebone:~$


debian@beaglebone: ~/pocketsphinx-5prealpha
File Edit Options Buffers Tools Conf Help
include /etc/ld.so.conf.d/*.conf
/usr/local/lib
-UU-:**--F1 ld.so.conf All L2 (Conf[Space]) ----------


debian@beaglebone: ~
INFO: ngram_search_fwdtree.c(1567): fwdtree 31.65 wall 21.979 xRT
INFO: ngram_search_fwdflat.c(302): Utterance vocabulary contains 73 words
INFO: ngram_search_fwdflat.c(948):   1891 words recognized (13/fr)
INFO: ngram_search_fwdflat.c(950):   101976 senones evaluated (708/fr)
INFO: ngram_search_fwdflat.c(952):   115051 channels searched (798/fr)
INFO: ngram_search_fwdflat.c(954):   6069 words searched (42/fr)
INFO: ngram_search_fwdflat.c(957):   3698 word transitions (25/fr)
INFO: ngram_search_fwdflat.c(960): fwdflat 1.32 CPU 0.914 xRT
INFO: ngram_search_fwdflat.c(963): fwdflat 1.33 wall 0.924 xRT
INFO: ngram_search.c(1250): lattice start node <s>.0 end node </s>.32
INFO: ngram_search.c(1276): Eliminated 0 nodes before end node
INFO: ngram_search.c(1381): Lattice has 401 nodes, 2496 links
INFO: ps_lattice.c(1380): Bestpath score: -2025
INFO: ps_lattice.c(1384): Normalizer P(O) = alpha(</s>:32:142) = -186704
INFO: ps_lattice.c(1441): Joint P(O,S) = -221513 P(S|O) = -34809
INFO: ngram_search.c(872): bestpath 0.08 CPU 0.056 xRT
INFO: ngram_search.c(875): bestpath 0.09 wall 0.066 xRT
the
INFO: continuous.c(275): Ready....
Input overrun, read calls are too rare (non-fatal)
INFO: continuous.c(261): Listening...
Input overrun, read calls are too rare (non-fatal)
Input overrun, read calls are too rare (non-fatal)


debian@beaglebone: ~
File Edit Options Buffers Tools Text Help
hello
goodbye
music
forward
back
turn right
turn left
-UU-:----F1 grammar.txt All L1 (Text)
For information about GNU Emacs and the GNU system, type C-h C-a.


www.speech.cs.cmu.edu/tools/lmtool-new.html
Sphinx Knowledge Base Tool -- VERSION 3
This is the new version of the lmtool! FAQ
Changes should be transparent (unless you automate, see note below).
Problems? Please help by sending a report to the maintainer.
New! Follow us on @CMUSpeechGroup for announcements and status updates.
What it does: Builds a consistent set of lexical and language modeling files for Sphinx (and compatible) decoders.
Note: If you just need pronunciations, use the lextool instead.
To use: Create a sentence corpus file, consisting of all sentences you would like the decoder to recognize. The sentences should be one to a line (but do not need to have standard punctuation). You may not need to exhastively list all possible sentences: the decoder will allow fragments to recombine into new sentences.
Upload a sentence corpus file:
Choose File grammar.txt
COMPILE KNOWLEDGE BASE
The new version of lmtool has been reorganized internally to make use of the Logios package. This will make lmtool easier to maintain in the future and will allow it to take advantage of ongoing development in Logios. These changes should be transparent to regular users. Please give it a try. If you have any problems, or discover bugs, let the maintainer know. If things look good (i.e., I stop getting bug reports) this will become the standard version.
NOTE: If you have automated the use of this tool you will need to update your code. The main difference is that the name of the target script has changed. The old script will still be available so nothing will break immediately, but it's unlikely to continue to be maintained. Also, file links are no longer tagged in the html. Please let me know if you make use of this feature and I'll find a fix.



www.speech.cs.cmu.edu/tools/product/1490030888_13949/

Sphinx knowledge base generator [lmtool.3a]

Your Sphinx knowledge base compilation has been successfully processed!

The base name for this set is **4807**. TAR4807.tgz is the compressed version.
Note that this set of files is internally consistent and is best used together.

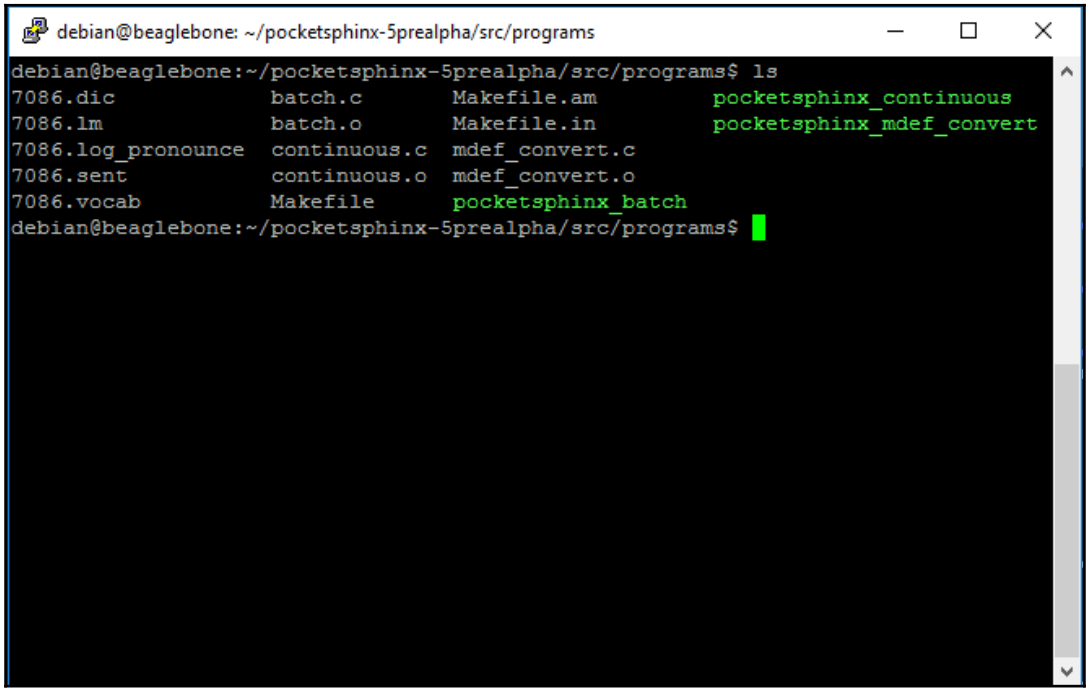
IMPORTANT: Please download these files as soon as possible; they will be deleted in approximately a half hour.

```
SESSION 1490030888_13949
[_INFO_] Found corpus: 7 sentences, 9 unique words
[_INFO_] Found 0 words in extras  (0)
[_INFO_] Language model completed  (0)
[_INFO_] Pronounce completed  (0)
[_STAT_] Elapsed time: 0.056 sec
```

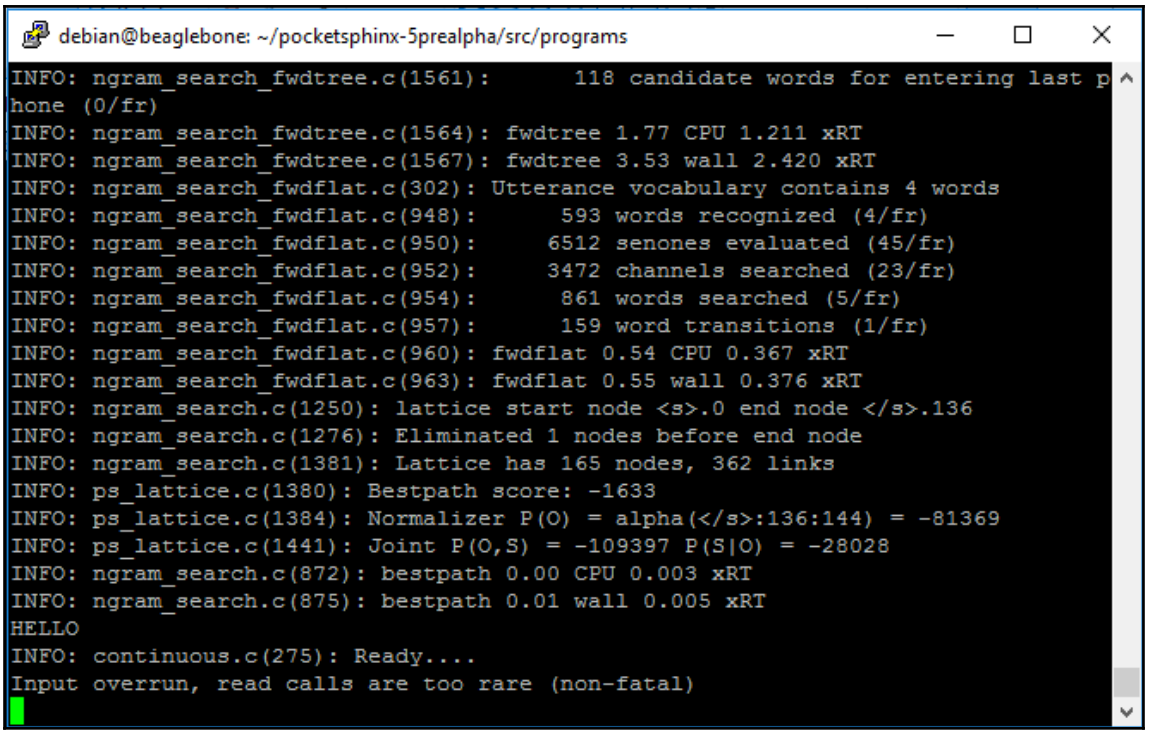
Please include these messages in bug reports.

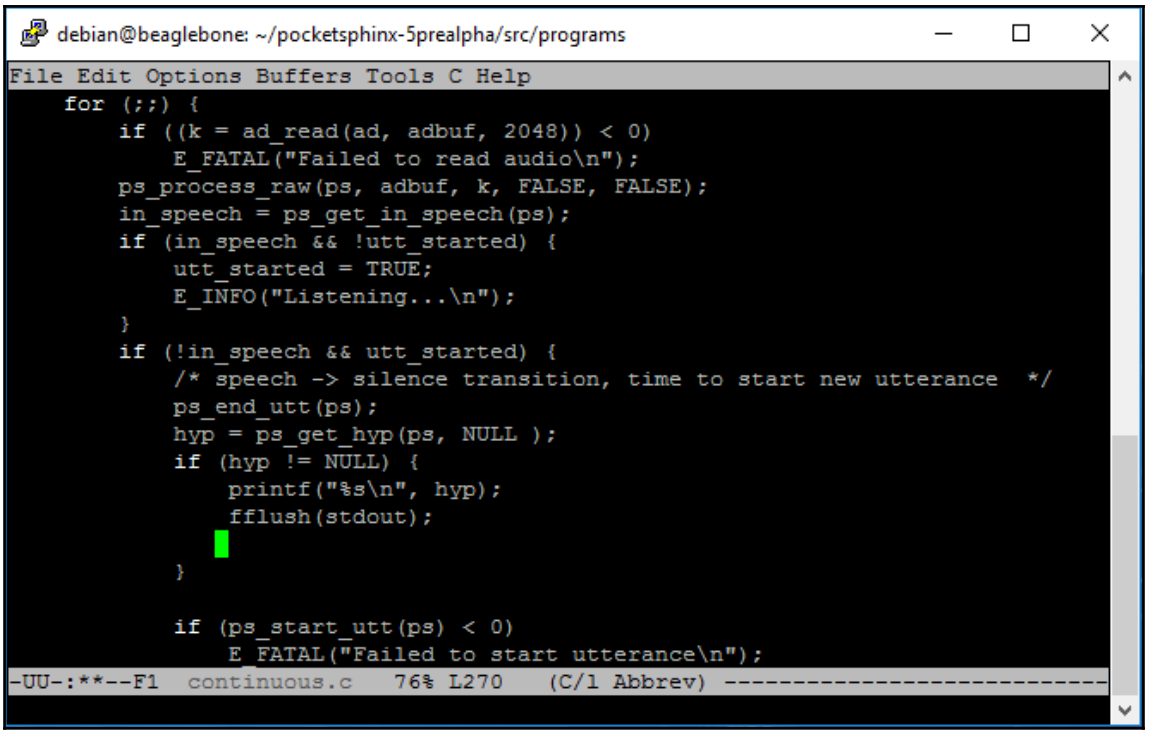
Name	Size	Description
4807.dic	150	*Pronunciation Dictionary*
4807.lm	1.4K	*Language Model*
4807.log_pronounce	114	*Log File*
4807.sent	117	*Corpus (processed)*
4807.vocab	49	*Word List*
TAR4807.tgz	1.0K	**COMPRESSED TARBALL**

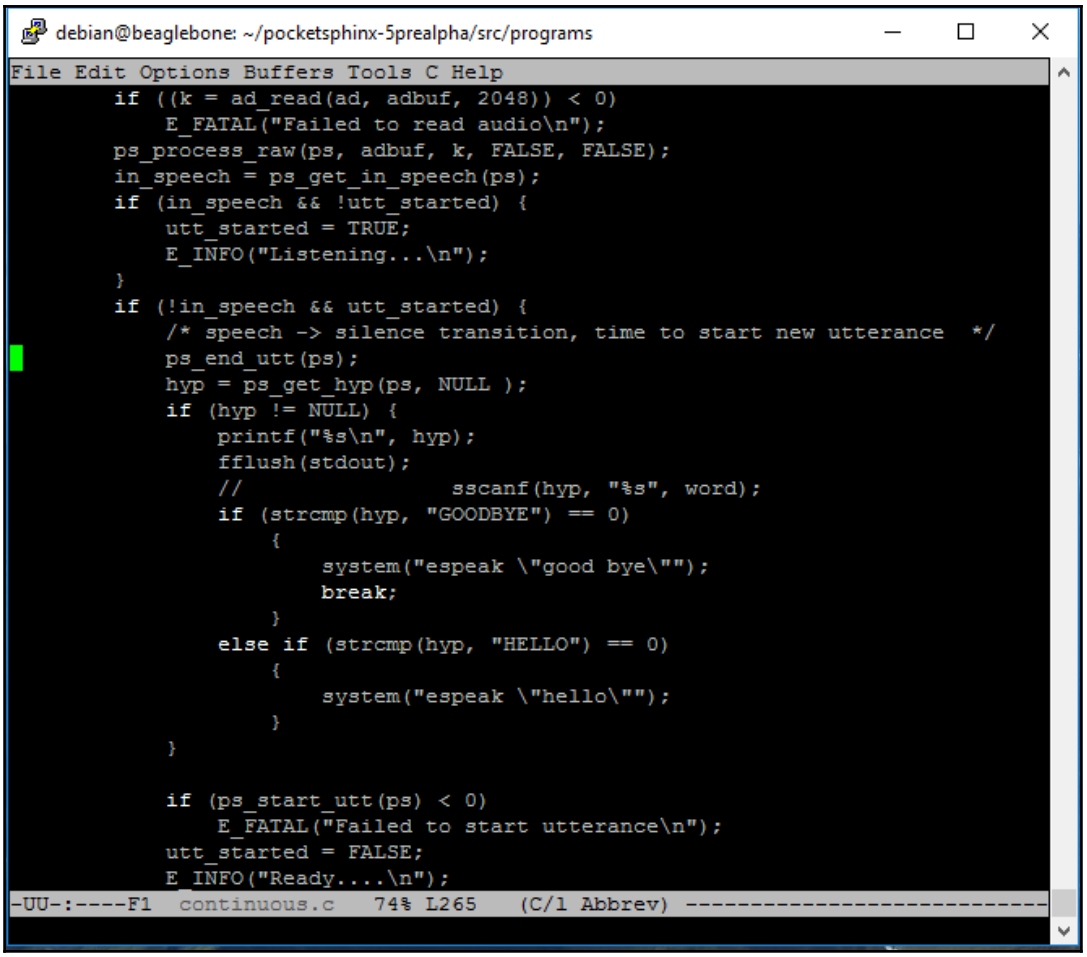
Apache/2.2.22 (Ubuntu) Server at www.speech.cs.cmu.edu Port 80

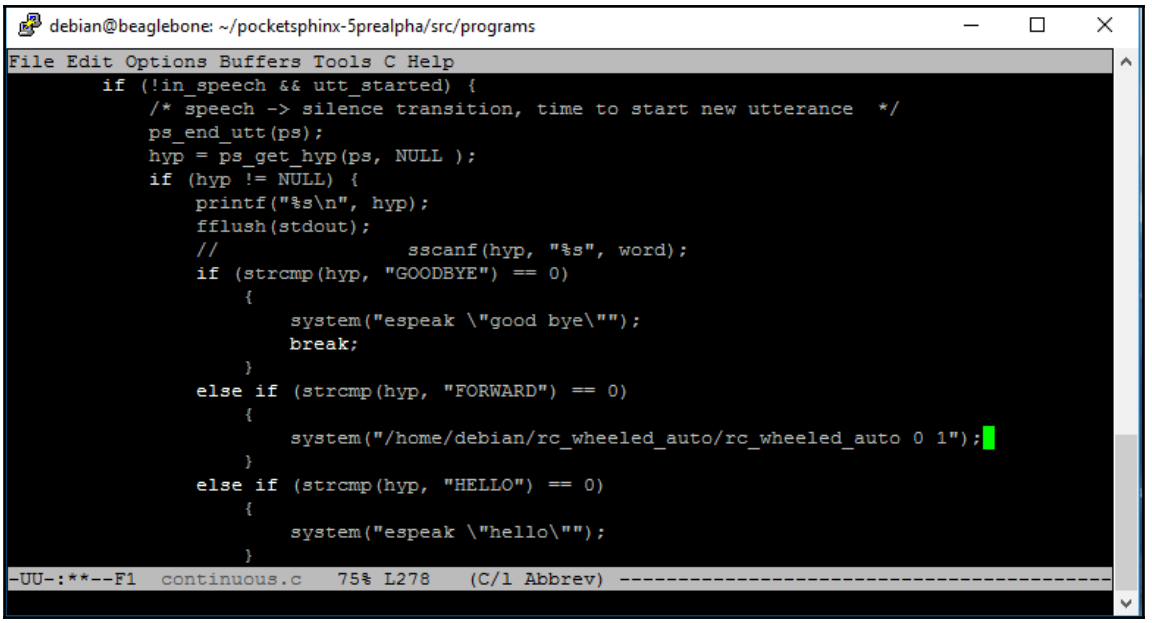


```
debian@beaglebone: ~/pocketsphinx-5prealpha/src/programs
debian@beaglebone:~/pocketsphinx-5prealpha/src/programs$ ls
7086.dic            batch.c       Makefile.am         pocketsphinx_continuous
7086.lm             batch.o       Makefile.in         pocketsphinx_mdef_convert
7086.log_pronounce  continuous.c  mdef_convert.c
7086.sent           continuous.o  mdef_convert.o
7086.vocab          Makefile      pocketsphinx_batch
debian@beaglebone:~/pocketsphinx-5prealpha/src/programs$
```

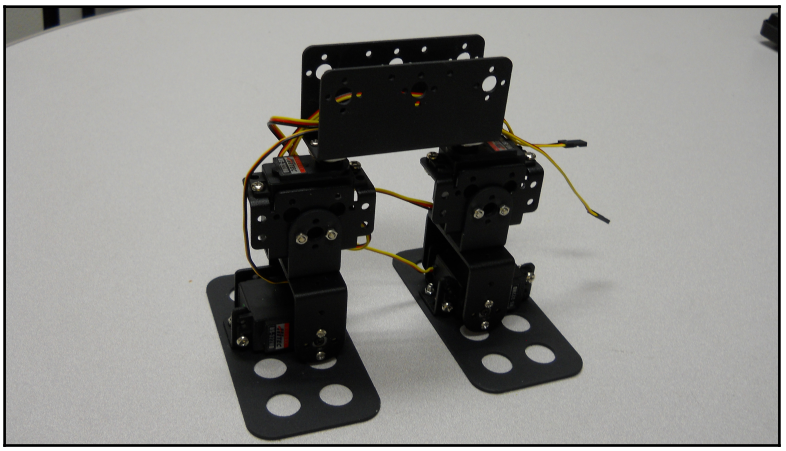

debian@beaglebone: ~/pocketsphinx-5prealpha/src/programs
INFO: ngram_search_fwdtree.c(1561):   118 candidate words for entering last p
hone (0/fr)
INFO: ngram_search_fwdtree.c(1564): fwdtree 1.77 CPU 1.211 xRT
INFO: ngram_search_fwdtree.c(1567): fwdtree 3.53 wall 2.420 xRT
INFO: ngram_search_fwdflat.c(302): Utterance vocabulary contains 4 words
INFO: ngram_search_fwdflat.c(948):   593 words recognized (4/fr)
INFO: ngram_search_fwdflat.c(950):   6512 senones evaluated (45/fr)
INFO: ngram_search_fwdflat.c(952):   3472 channels searched (23/fr)
INFO: ngram_search_fwdflat.c(954):   861 words searched (5/fr)
INFO: ngram_search_fwdflat.c(957):   159 word transitions (1/fr)
INFO: ngram_search_fwdflat.c(960): fwdflat 0.54 CPU 0.367 xRT
INFO: ngram_search_fwdflat.c(963): fwdflat 0.55 wall 0.376 xRT
INFO: ngram_search.c(1250): lattice start node <s>.0 end node </s>.136
INFO: ngram_search.c(1276): Eliminated 1 nodes before end node
INFO: ngram_search.c(1381): Lattice has 165 nodes, 362 links
INFO: ps_lattice.c(1380): Bestpath score: -1633
INFO: ps_lattice.c(1384): Normalizer P(O) = alpha(</s>:136:144) = -81369
INFO: ps_lattice.c(1441): Joint P(O,S) = -109397 P(S|O) = -28028
INFO: ngram_search.c(872): bestpath 0.00 CPU 0.003 xRT
INFO: ngram_search.c(875): bestpath 0.01 wall 0.005 xRT
HELLO
INFO: continuous.c(275): Ready....
Input overrun, read calls are too rare (non-fatal)

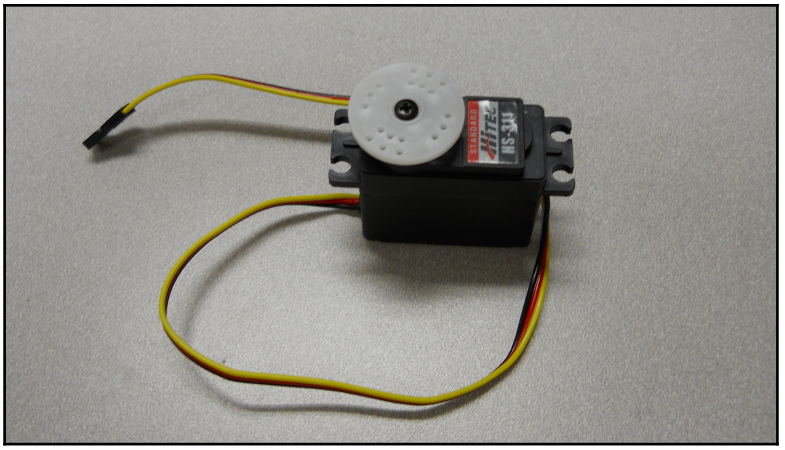

debian@beaglebone: ~/pocketsphinx-5prealpha/src/programs
File Edit Options Buffers Tools C Help
for (;;) {
if ((k = ad_read(ad, adbuf, 2048)) < 0)
E_FATAL("Failed to read audio\n");
ps_process_raw(ps, adbuf, k, FALSE, FALSE);
in_speech = ps_get_in_speech(ps);
if (in_speech && !utt_started) {
utt_started = TRUE;
E_INFO("Listening...\n");
}
if (!in_speech && utt_started) {
/* speech -> silence transition, time to start new utterance */
ps_end_utt(ps);
hyp = ps_get_hyp(ps, NULL);
if (hyp != NULL) {
printf("%s\n", hyp);
fflush(stdout);
}
if (ps_start_utt(ps) < 0)
E_FATAL("Failed to start utterance\n");
-UU-:**--F1 continuous.c 76% L270 (C/l Abbrev)

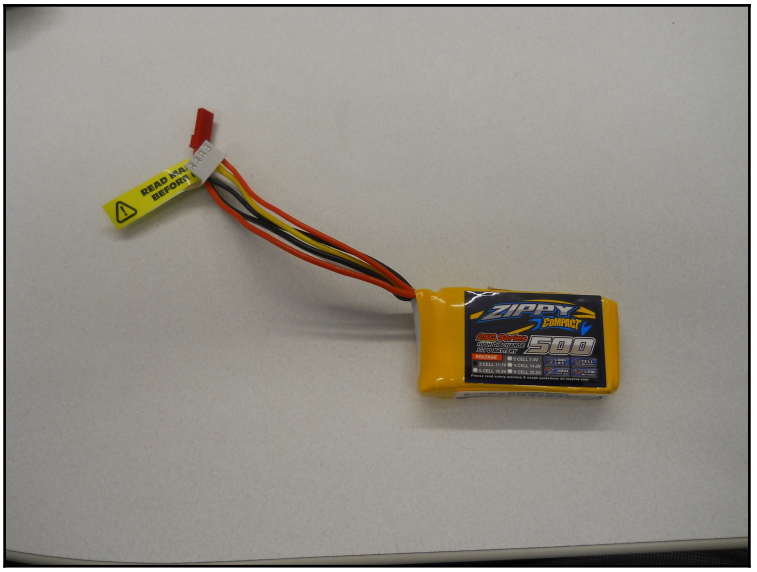

debian@beaglebone: ~/pocketsphinx-5prealpha/src/programs
File Edit Options Buffers Tools C Help
if ((k = ad_read(ad, adbuf, 2048)) < 0)
E_FATAL("Failed to read audio\n");
ps_process_raw(ps, adbuf, k, FALSE, FALSE);
in_speech = ps_get_in_speech(ps);
if (in_speech && !utt_started) {
utt_started = TRUE;
E_INFO("Listening...\n");
}
if (!in_speech && utt_started) {
/* speech -> silence transition, time to start new utterance */
ps_end_utt(ps);
hyp = ps_get_hyp(ps, NULL);
if (hyp != NULL) {
printf("%s\n", hyp);
fflush(stdout);
// sscanf(hyp, "%s", word);
if (strcmp(hyp, "GOODBYE") == 0)
{
system("espeak \"good bye\"");
break;
}
else if (strcmp(hyp, "HELLO") == 0)
{
system("espeak \"hello\"");
}
}
if (ps_start_utt(ps) < 0)
E_FATAL("Failed to start utterance\n");
utt_started = FALSE;
E_INFO("Ready....\n");
-UU-:----F1 continuous.c 74% L265 (C/l Abbrev)

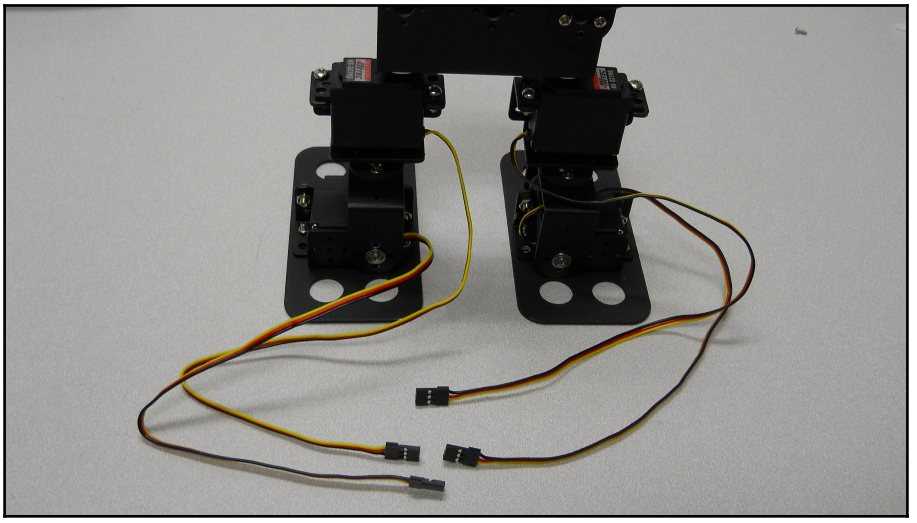

debian@beaglebone: ~/pocketsphinx-5prealpha/src/programs
File Edit Options Buffers Tools C Help
if (!in_speech && utt_started) {
/* speech -> silence transition, time to start new utterance */
ps_end_utt(ps);
hyp = ps_get_hyp(ps, NULL);
if (hyp != NULL) {
printf("%s\n", hyp);
fflush(stdout);
// sscanf(hyp, "%s", word);
if (strcmp(hyp, "GOODBYE") == 0)
{
system("espeak \"good bye\"");
break;
}
else if (strcmp(hyp, "FORWARD") == 0)
{
system("/home/debian/rc_wheeled_auto/rc_wheeled_auto 0 1");
}
else if (strcmp(hyp, "HELLO") == 0)
{
system("espeak \"hello\"");
}
-UU-:**--F1 continuous.c 75% L278 (C/l Abbrev)

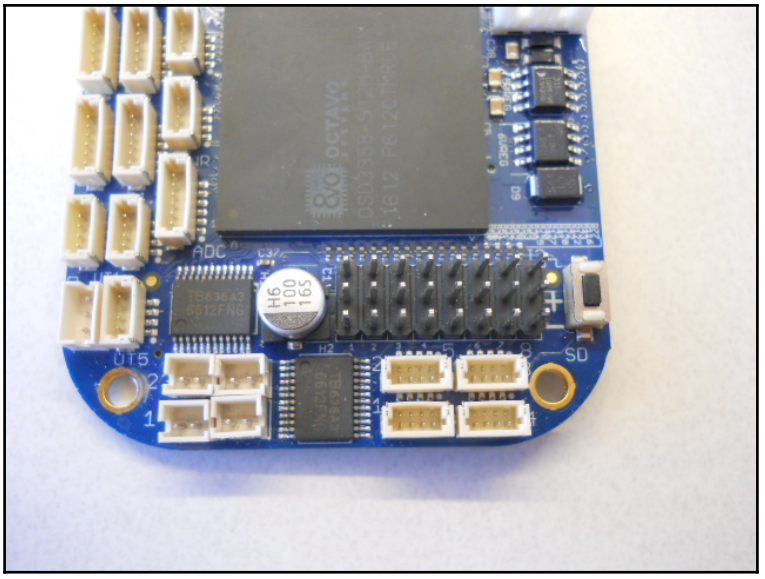
Chapter 7: Making the Unit Very Mobile - Controlling Legged Movement

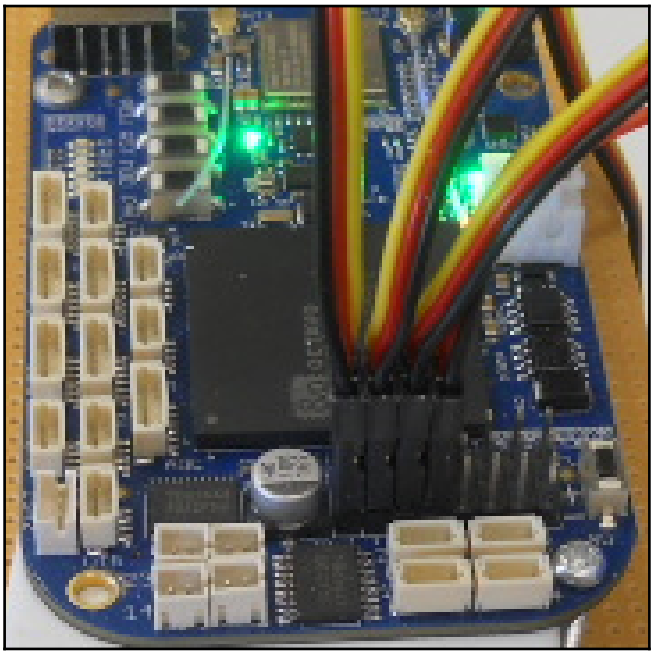




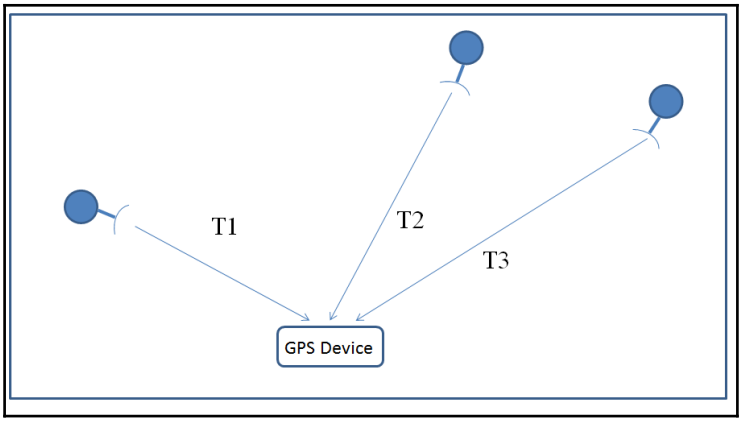

ZIPPY
COMPACT
500

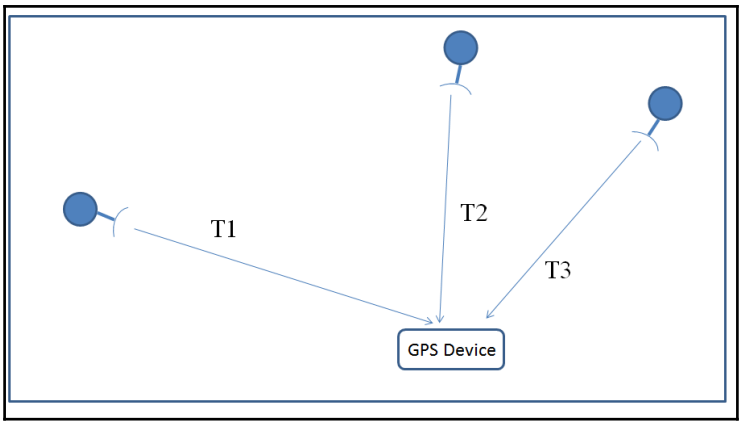


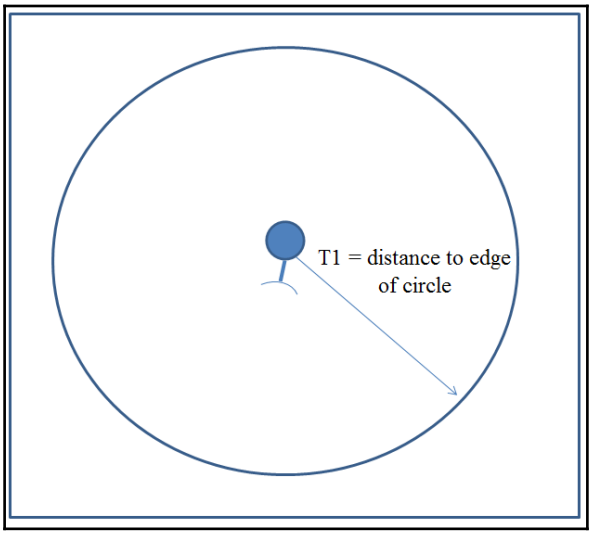

ADC
SD

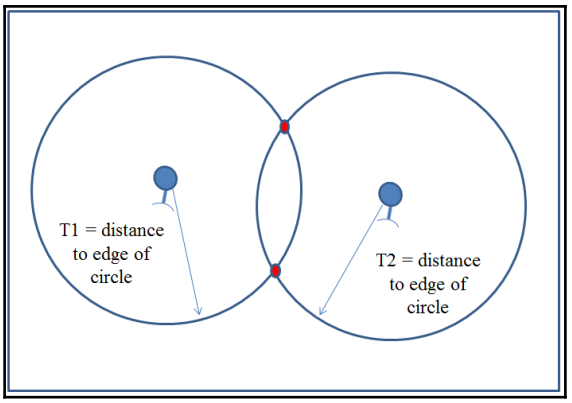


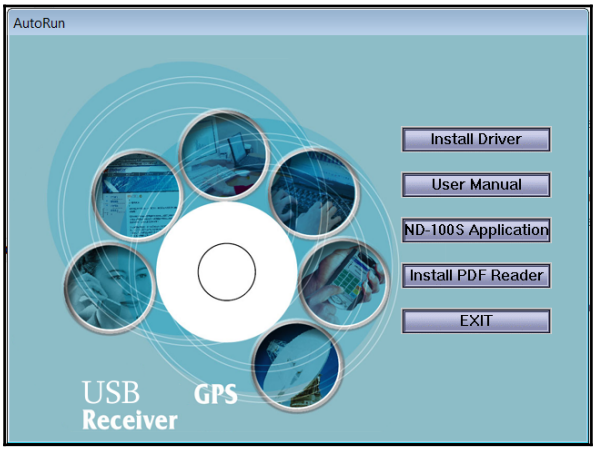
Chapter 8: Using a GPS Receiver to Locate Your Robot

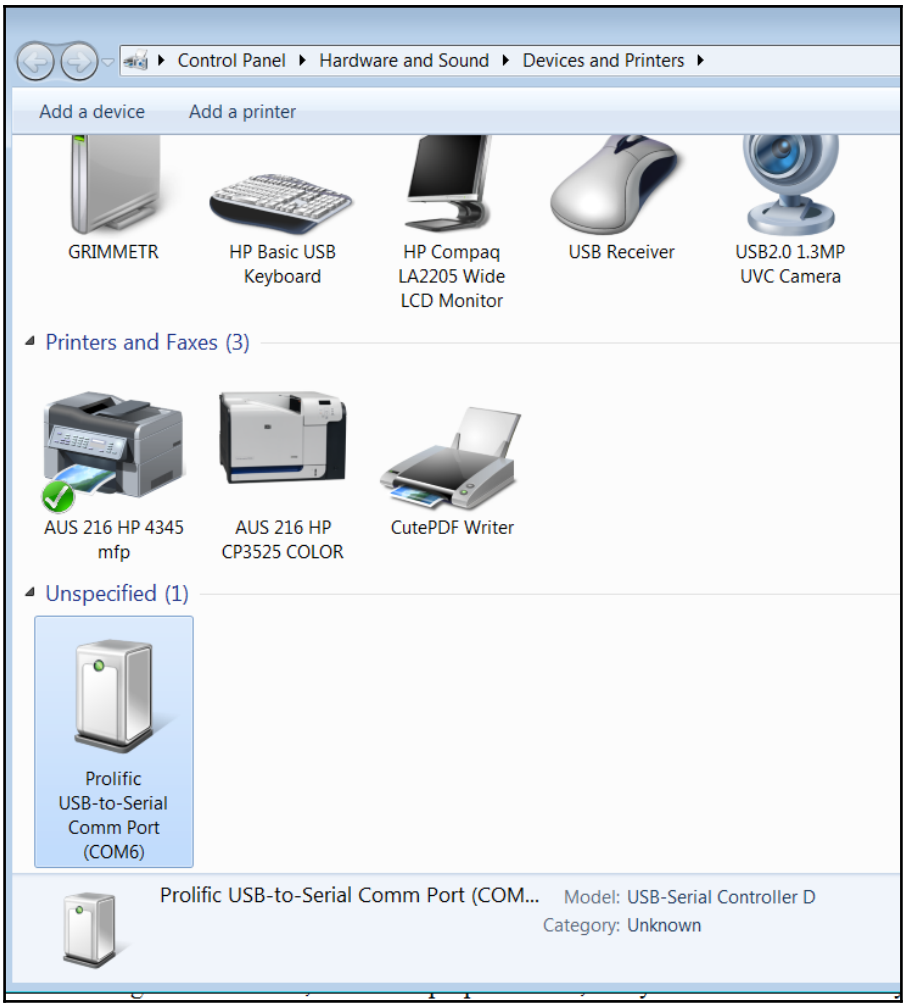



T1
T2
T3
GPS Device


T1 = distance to edge
of circle


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


AutoRun
Install Driver
User Manual
ND-100S Application
Install PDF Reader
EXIT
USB GPS
Receiver


Control Panel
Hardware and Sound
Devices and Printers
Add a device
Add a printer
GRIMMETR
HP Basic USB Keyboard
HP Compaq LA2205 Wide LCD Monitor
USB Receiver
USB2.0 1.3MP UVC Camera
Printers and Faxes (3)
AUS 216 HP 4345 mfp
AUS 216 HP CP3525 COLOR
CutePDF Writer
Unspecified (1)
Prolific USB-to-Serial Comm Port (COM6)
Prolific USB-to-Serial Comm Port (COM...
Model: USB-Serial Controller D
Category: Unknown


ND-100S
File Tools Help
ND-100S
Connect
REC
Time and Date
Time: 00:00:00
Date: 2000-Jan-01
Fix Mode
Fix: Invalid Mode: Invalid
DOP
HDOP: 0.0 VDOP: 0.0
Position
Latitude: N 0°0'0.00
Longitude: E 0°0'0.00
Velocity(km/h): 0.0
Heading(deg): 0.0
Altitude(m): 0.0
Satellite & Channel Status
CNO
PRN
ComPort: COM6
Scan Co
Baud Rate: 4800
Save
Save Files to: C:\temp
Choo
Setup
Terminal
Greenland
Iceland
Canada
United States
Mexico
Venezuela
Colombia
Peru
Brazil
Bolivia
Chile
Argentina
Finland
Sweden
Norway
United Kingdom
Poland
Germany
Ukraine
France
Spain
Italy
Turkey
Kazakhstan
Mongolia
Russia
China
South Korea
Japan
Afghanistan
Pakistan
Iraq
Iran
Saudi Arabia
India
Thailand
Algeria
Libya
Egypt
Mali
Niger
Chad
Sudan
Nigeria
Ethiopia
Kenya
DR Congo
Tanzania
Angola
Namibia
Botswana
Madagascar
South Africa
Indonesia
Australia
North Atlantic Ocean
South Atlantic Ocean
South Pacific Ocean
Indian Ocean
Google
Map data ©2013 MapLink - Terms of Use


ND-100S
File Tools Help
ND-100S
Disconnect
REC
Time and Date
Time: 17:31:31
Date: 2009-Feb-14
Fix Mode
Fix: No Fixed
Mode: Invalid
DOP
HDOP: 0.0
VDOP: 0.0
Position
Latitude: N 0°0'0.00
Longitude: E 0°0'0.00
Velocity(km/h): 0.0
Heading(deg): 0.0
Altitude(m): 0.0
Satellite & Channel Status
CNO
PRN
ComPort: COM6
Scan Co
Baud Rate: 4800
Save
Save Files to: C:\temp
Choo
Setup
Terminal
Greenland
Iceland
Finland
Sweden
Norway
Russia
Canada
United Kingdom
Poland
Germany
Ukraine
Kazakhstan
Mongolia
France
Spain
Italy
Turkey
China
South Korea
Japan
United States
North Atlantic Ocean
Afghanistan
Iran
Iraq
Pakistan
Algeria
Libya
Egypt
Saudi Arabia
India
Thailand
Mexico
Mali
Niger
Chad
Sudan
Nigeria
Ethiopia
Venezuela
Colombia
DR Congo
Kenya
Tanzania
Indonesia
Brazil
Peru
Bolivia
Angola
Namibia
Botswana
Madagascar
Chile
South Pacific Ocean
South Atlantic Ocean
Indian Ocean
Australia
South Africa
Argentina
Google
Map data ©2013 MapLink - Terms of Use


ND-100S
File Tools Help
ND-100S
Disconnect
REC
Time and Date
Time: 17:28:32
Date: 2009-Feb-14
Fix Mode
Fix: No Fixed
Mode: Invalid
DOP
HDOP: 0.0
VDOP: 0.0
Position
Latitude: N 0°0'0.00
Longitude: E 0°0'0.00
Velocity(km/h): 0.0
Heading(deg): 0.0
Altitude(m): 0.0
Satellite & Channel Status
C/NO
PRN
$GPVTG,,T,,M,,N,,K,N*2C
$GPGGA,002831.075,,,,,0,00,,,M,0.0,M,,0000*5C
$GPGLL,,,,,002831.075,V,N*70
$GPGSA,A,1,,,,,,,,,,,,,,,*1E
$GPRMC,002831.075,V,,,,,,,150209,,,N*48
$GPVTG,,T,,M,,N,,K,N*2C
$GPGGA,002832.075,,,,,0,00,,,M,0.0,M,,0000*5F
$GPGLL,,,,,002832.075,V,N*73
$GPGSA,A,1,,,,,,,,,,,,,,,*1E
Setup
Terminal
Greenland
Iceland
Finland
Sweden
Norway
Russia
Canada
United Kingdom
Poland
Germany
Ukraine
Kazakhstan
Mongolia
France
Spain
Italy
Turkey
United States
North Atlantic Ocean
Afghanistan
China
South Korea
Japan
Iraq
Iran
Pakistan
Algeria
Libya
Egypt
Saudi Arabia
India
Mexico
Mali
Niger
Chad
Sudan
Thailand
Nigeria
Ethiopia
Venezuela
Colombia
DR Congo
Kenya
Tanzania
Indonesia
Brazil
Peru
Bolivia
Angola
Namibia
Botswana
Madagascar
Chile
South Atlantic Ocean
Indian Ocean
Australia
South Africa
Argentina
Google
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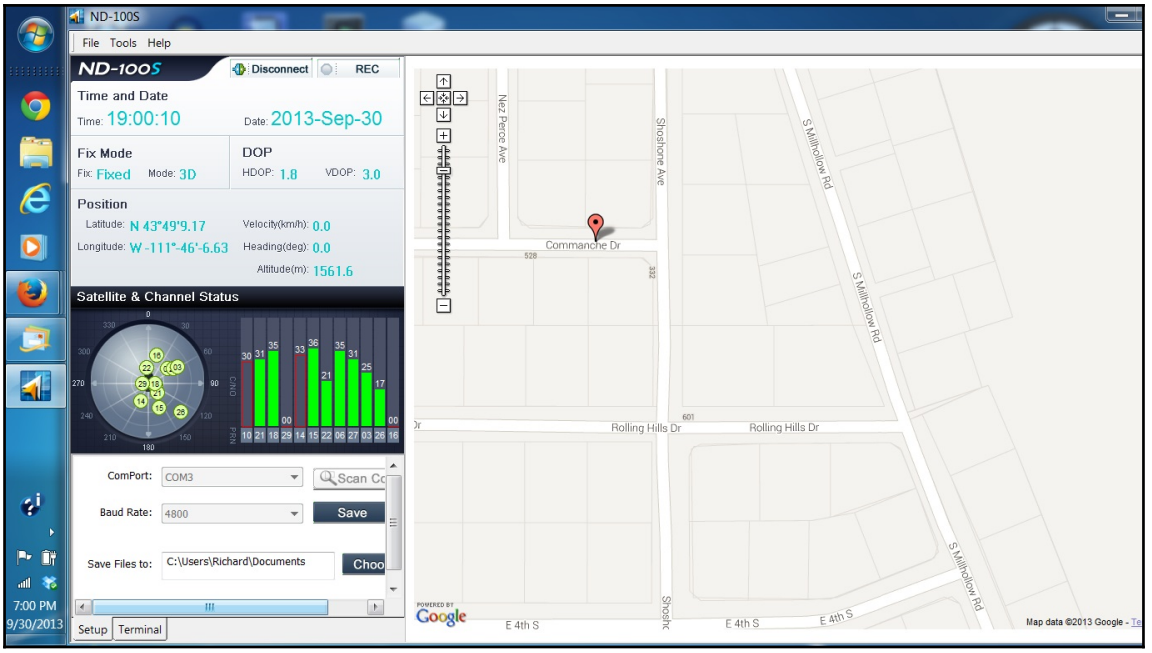
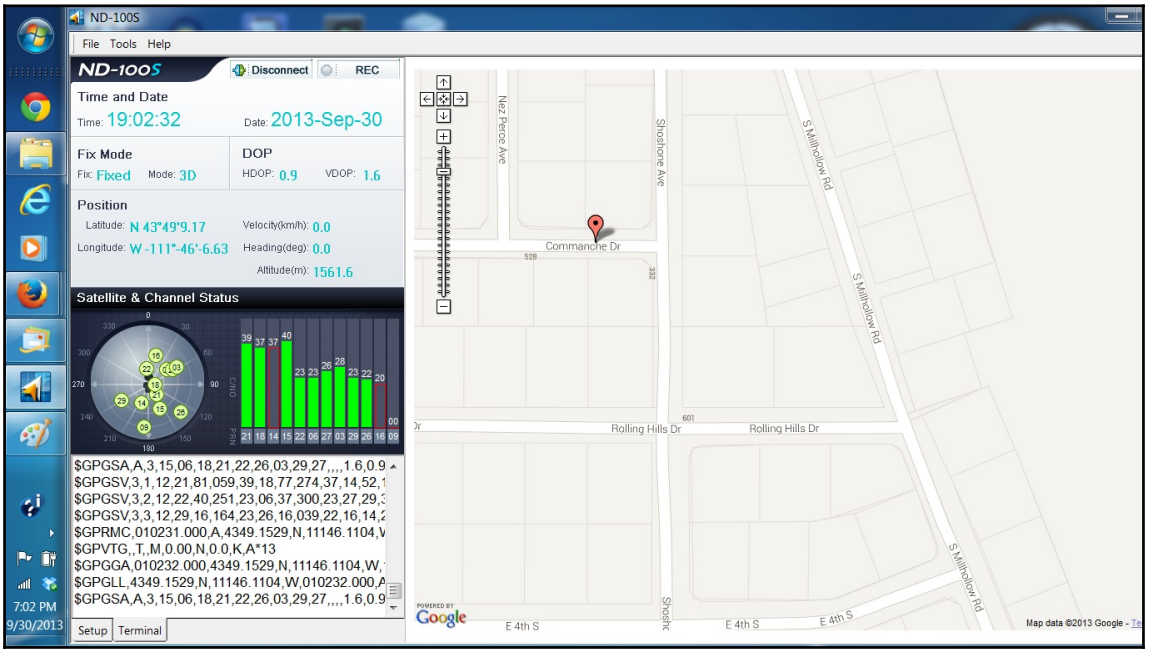
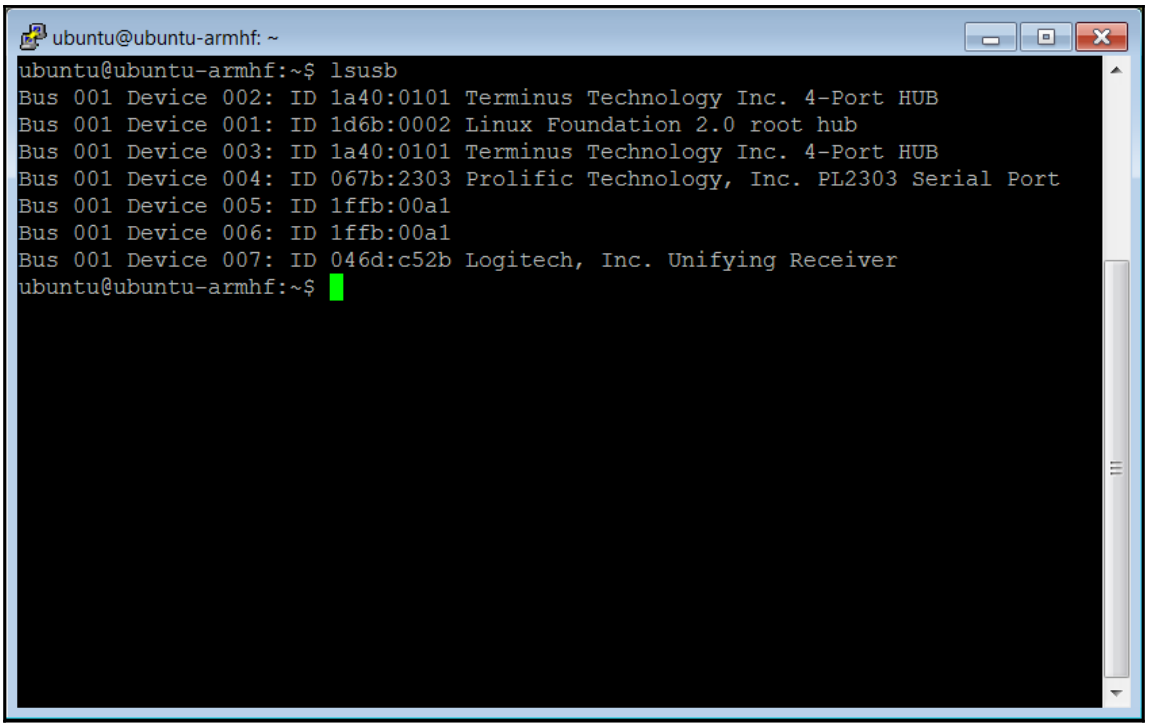
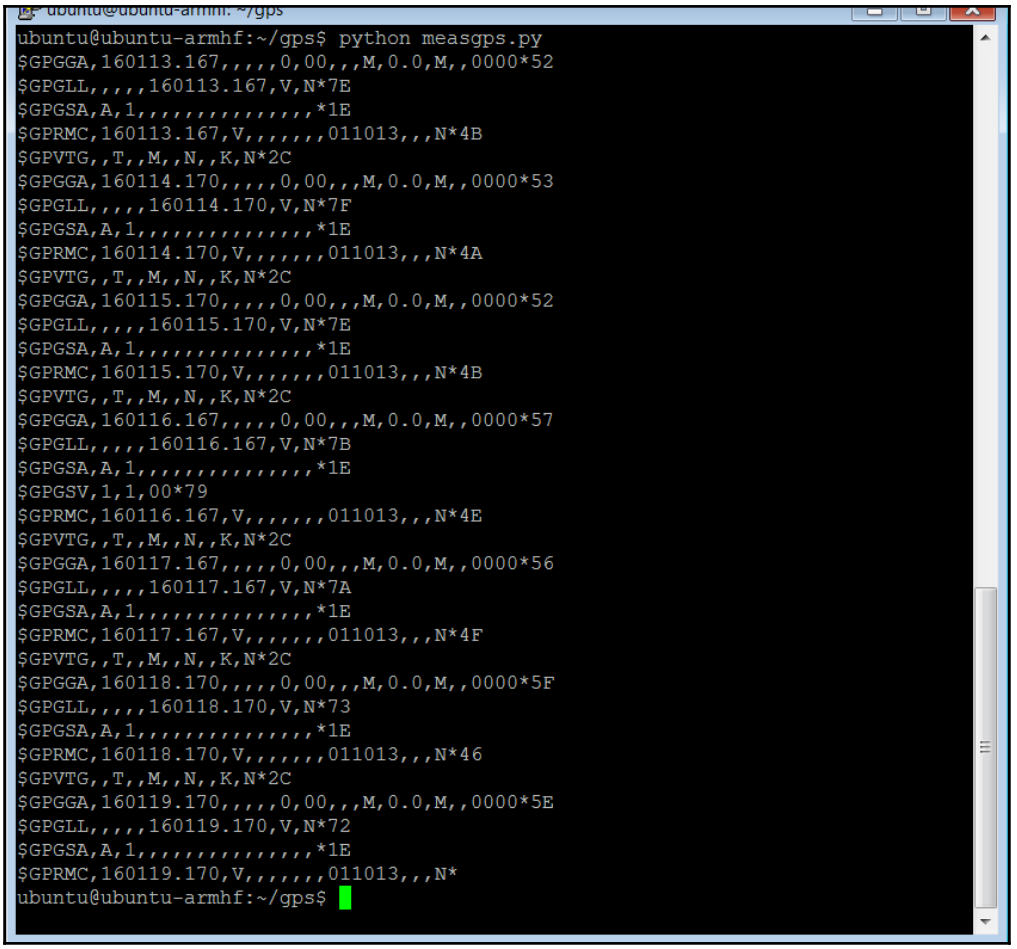
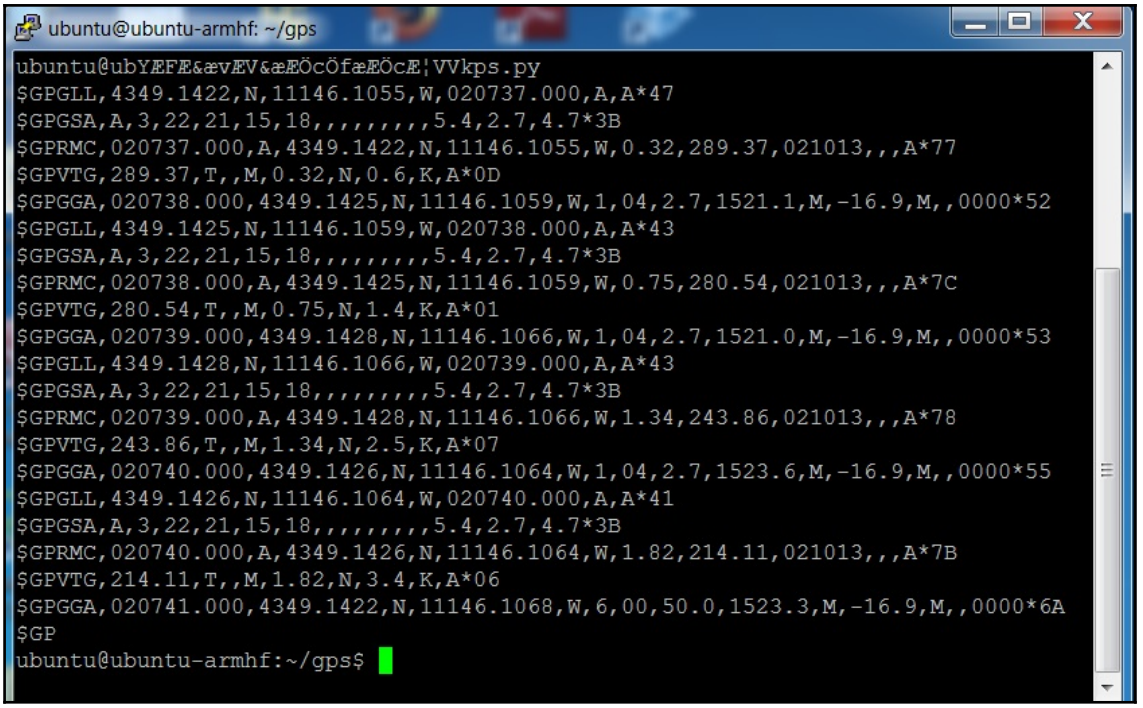
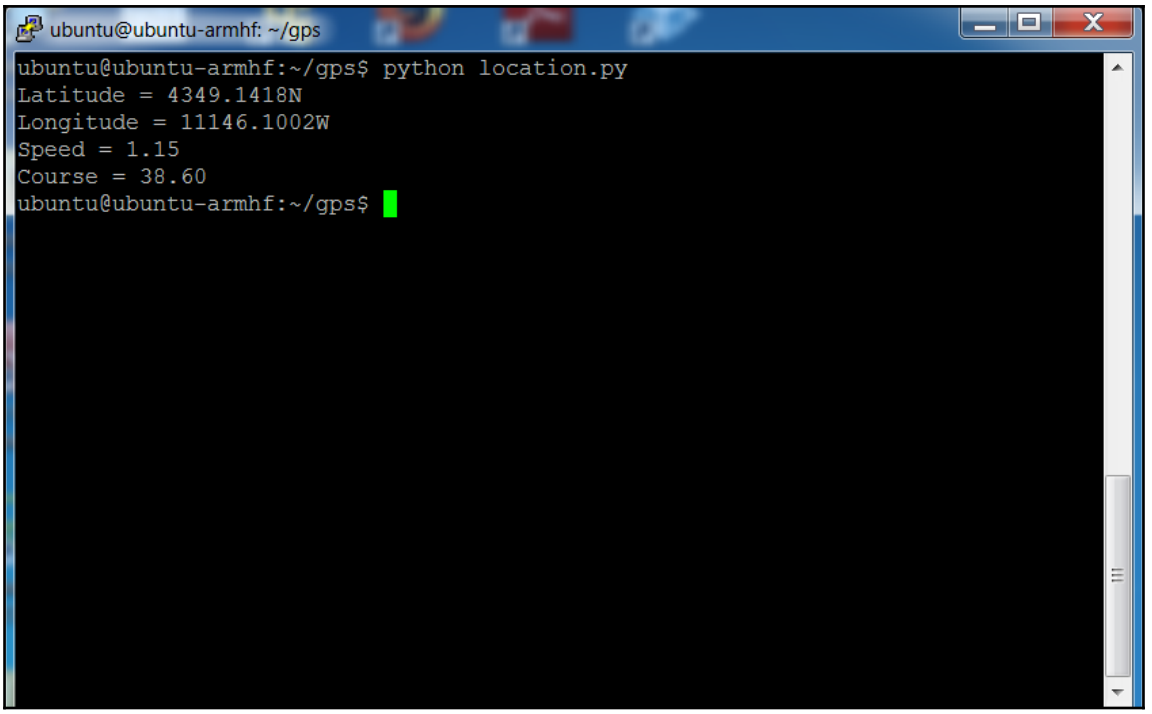

ND-100S
File Tools Help
ND-100S
Disconnect
REC
Time and Date
Time: 19:00:10
Date: 2013-Sep-30
Fix Mode
Fix: Fixed
Mode: 3D
DOP
HDOP: 1.8
VDOP: 3.0
Position
Latitude: N 43°49'9.17
Longitude: W -111°-46'-6.63
Velocity(km/h): 0.0
Heading(deg): 0.0
Altitude(m): 1561.6
Satellite & Channel Status
ComPort: COM3
Scan Co
Baud Rate: 4800
Save
Save Files to: C:\Users\Richard\Documents
Choo
Setup
Terminal
7:00 PM
9/30/2013
Nez Perce Ave
Shoshone Ave
S Millhollow Rd
Commanche Dr
Rolling Hills Dr
E 4th S
Google
Map data ©2013 Google

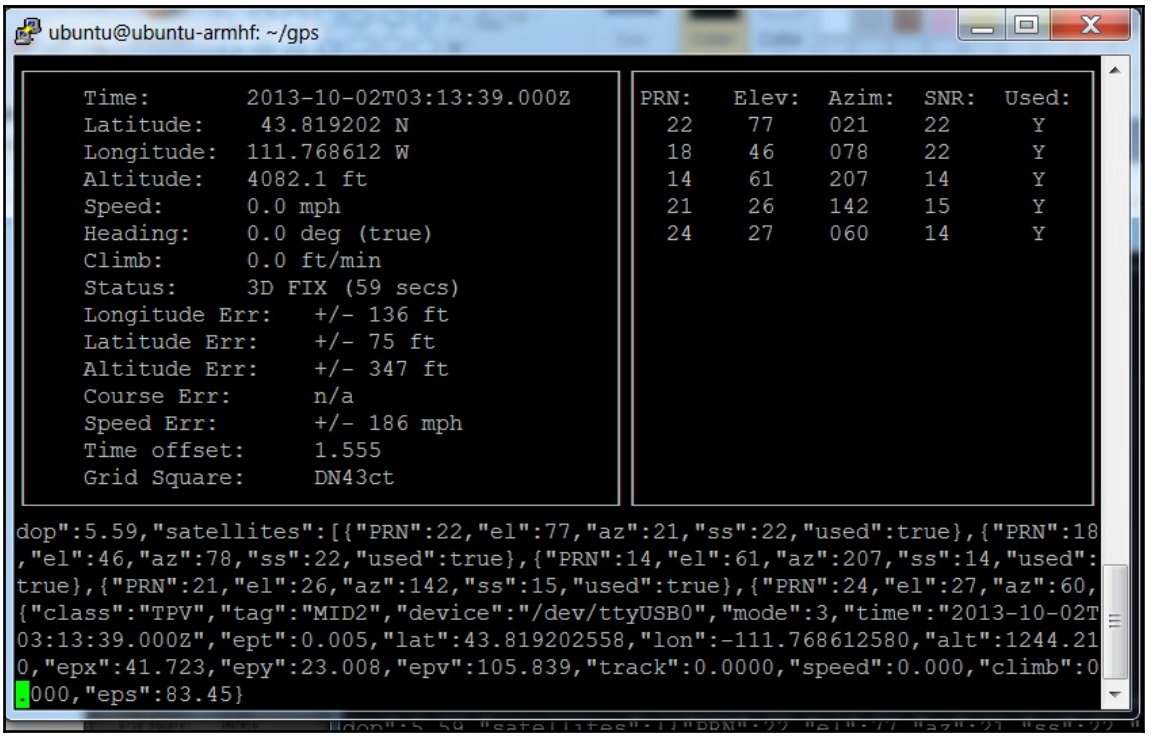

ND-100S
File Tools Help
ND-100S
Disconnect
REC
Time and Date
Time: 19:02:32
Date: 2013-Sep-30
Fix Mode
Fix: Fixed
Mode: 3D
DOP
HDOP: 0.9
VDOP: 1.6
Position
Latitude: N 43°49'9.17
Longitude: W -111°-46'-6.63
Velocity(km/h): 0.0
Heading(deg): 0.0
Altitude(m): 1561.6
Satellite & Channel Status
$GPGSA,A,3,15,06,18,21,22,26,03,29,27,,,,1.6,0.9
$GPGSV,3,1,12,21,81,059,39,18,77,274,37,14,52,1
$GPGSV,3,2,12,22,40,251,23,06,37,300,23,27,29,3
$GPGSV,3,3,12,29,16,164,23,26,16,039,22,16,14,2
$GPRMC,010231.000,A,4349.1529,N,11146.1104,V
$GPVTG,,T,,M,0.00,N,0.0,K,A*13
$GPGGA,010232.000,4349.1529,N,11146.1104,W,
$GPGLL,4349.1529,N,11146.1104,W,010232.000,A
$GPGSA,A,3,15,06,18,21,22,26,03,29,27,,,,1.6,0.9
Setup
Terminal
7:02 PM
9/30/2013
Nez Perce Ave
Shoshone Ave
S Millhollow Rd
Commanche Dr
Rolling Hills Dr
E 4th S
Google
Map data ©2013 Google


ubuntu@ubuntu-armhf: ~
ubuntu@ubuntu-armhf:~$ lsusb
Bus 001 Device 002: ID 1a40:0101 Terminus Technology Inc. 4-Port HUB
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 001 Device 003: ID 1a40:0101 Terminus Technology Inc. 4-Port HUB
Bus 001 Device 004: ID 067b:2303 Prolific Technology, Inc. PL2303 Serial Port
Bus 001 Device 005: ID 1ffb:00a1
Bus 001 Device 006: ID 1ffb:00a1
Bus 001 Device 007: ID 046d:c52b Logitech, Inc. Unifying Receiver
ubuntu@ubuntu-armhf:~$


ubuntu@ubuntu-armhf:~/gps
ubuntu@ubuntu-armhf:~/gps$ python measgps.py
$GPGGA,160113.167,,,,,0,00,,,M,0.0,M,,0000*52
$GPGLL,,,,,160113.167,V,N*7E
$GPGSA,A,1,,,,,,,,,,,,,,*1E
$GPRMC,160113.167,V,,,,,,,011013,,,N*4B
$GPVTG,,T,,M,,N,,K,N*2C
$GPGGA,160114.170,,,,,0,00,,,M,0.0,M,,0000*53
$GPGLL,,,,,160114.170,V,N*7F
$GPGSA,A,1,,,,,,,,,,,,,,*1E
$GPRMC,160114.170,V,,,,,,,011013,,,N*4A
$GPVTG,,T,,M,,N,,K,N*2C
$GPGGA,160115.170,,,,,0,00,,,M,0.0,M,,0000*52
$GPGLL,,,,,160115.170,V,N*7E
$GPGSA,A,1,,,,,,,,,,,,,,*1E
$GPRMC,160115.170,V,,,,,,,011013,,,N*4B
$GPVTG,,T,,M,,N,,K,N*2C
$GPGGA,160116.167,,,,,0,00,,,M,0.0,M,,0000*57
$GPGLL,,,,,160116.167,V,N*7B
$GPGSA,A,1,,,,,,,,,,,,,,*1E
$GPGSV,1,1,00*79
$GPRMC,160116.167,V,,,,,,,011013,,,N*4E
$GPVTG,,T,,M,,N,,K,N*2C
$GPGGA,160117.167,,,,,0,00,,,M,0.0,M,,0000*56
$GPGLL,,,,,160117.167,V,N*7A
$GPGSA,A,1,,,,,,,,,,,,,,*1E
$GPRMC,160117.167,V,,,,,,,011013,,,N*4F
$GPVTG,,T,,M,,N,,K,N*2C
$GPGGA,160118.170,,,,,0,00,,,M,0.0,M,,0000*5F
$GPGLL,,,,,160118.170,V,N*73
$GPGSA,A,1,,,,,,,,,,,,,,*1E
$GPRMC,160118.170,V,,,,,,,011013,,,N*46
$GPVTG,,T,,M,,N,,K,N*2C
$GPGGA,160119.170,,,,,0,00,,,M,0.0,M,,0000*5E
$GPGLL,,,,,160119.170,V,N*72
$GPGSA,A,1,,,,,,,,,,,,,,*1E
$GPRMC,160119.170,V,,,,,,,011013,,,N*
ubuntu@ubuntu-armhf:~/gps$


ubuntu@ubuntu-armhf: ~/gps
ubuntu@ubYÆFÆ&ævÆV&æÆÖcÖfæÆÖcÆ¦VVkps.py
$GPGLL,4349.1422,N,11146.1055,W,020737.000,A,A*47
$GPGSA,A,3,22,21,15,18,,,,,,,,,5.4,2.7,4.7*3B
$GPRMC,020737.000,A,4349.1422,N,11146.1055,W,0.32,289.37,021013,,,A*77
$GPVTG,289.37,T,,M,0.32,N,0.6,K,A*0D
$GPGGA,020738.000,4349.1425,N,11146.1059,W,1,04,2.7,1521.1,M,-16.9,M,,0000*52
$GPGLL,4349.1425,N,11146.1059,W,020738.000,A,A*43
$GPGSA,A,3,22,21,15,18,,,,,,,,,5.4,2.7,4.7*3B
$GPRMC,020738.000,A,4349.1425,N,11146.1059,W,0.75,280.54,021013,,,A*7C
$GPVTG,280.54,T,,M,0.75,N,1.4,K,A*01
$GPGGA,020739.000,4349.1428,N,11146.1066,W,1,04,2.7,1521.0,M,-16.9,M,,0000*53
$GPGLL,4349.1428,N,11146.1066,W,020739.000,A,A*43
$GPGSA,A,3,22,21,15,18,,,,,,,,,5.4,2.7,4.7*3B
$GPRMC,020739.000,A,4349.1428,N,11146.1066,W,1.34,243.86,021013,,,A*78
$GPVTG,243.86,T,,M,1.34,N,2.5,K,A*07
$GPGGA,020740.000,4349.1426,N,11146.1064,W,1,04,2.7,1523.6,M,-16.9,M,,0000*55
$GPGLL,4349.1426,N,11146.1064,W,020740.000,A,A*41
$GPGSA,A,3,22,21,15,18,,,,,,,,,5.4,2.7,4.7*3B
$GPRMC,020740.000,A,4349.1426,N,11146.1064,W,1.82,214.11,021013,,,A*7B
$GPVTG,214.11,T,,M,1.82,N,3.4,K,A*06
$GPGGA,020741.000,4349.1422,N,11146.1068,W,6,00,50.0,1523.3,M,-16.9,M,,0000*6A
$GP
ubuntu@ubuntu-armhf:~/gps$


ubuntu@ubuntu-armhf: ~/gps
ubuntu@ubuntu-armhf:~/gps$ python location.py
Latitude = 4349.1418N
Longitude = 11146.1002W
Speed = 1.15
Course = 38.60
ubuntu@ubuntu-armhf:~/gps$


ubuntu@ubuntu-armhf: ~/gps
Time: 2013-10-02T03:13:39.000Z
Latitude: 43.819202 N
Longitude: 111.768612 W
Altitude: 4082.1 ft
Speed: 0.0 mph
Heading: 0.0 deg (true)
Climb: 0.0 ft/min
Status: 3D FIX (59 secs)
Longitude Err: +/- 136 ft
Latitude Err: +/- 75 ft
Altitude Err: +/- 347 ft
Course Err: n/a
Speed Err: +/- 186 mph
Time offset: 1.555
Grid Square: DN43ct
PRN: Elev: Azim: SNR: Used:
22 77 021 22 Y
18 46 078 22 Y
14 61 207 14 Y
21 26 142 15 Y
24 27 060 14 Y
dop":5.59,"satellites":[{"PRN":22,"el":77,"az":21,"ss":22,"used":true},{"PRN":18
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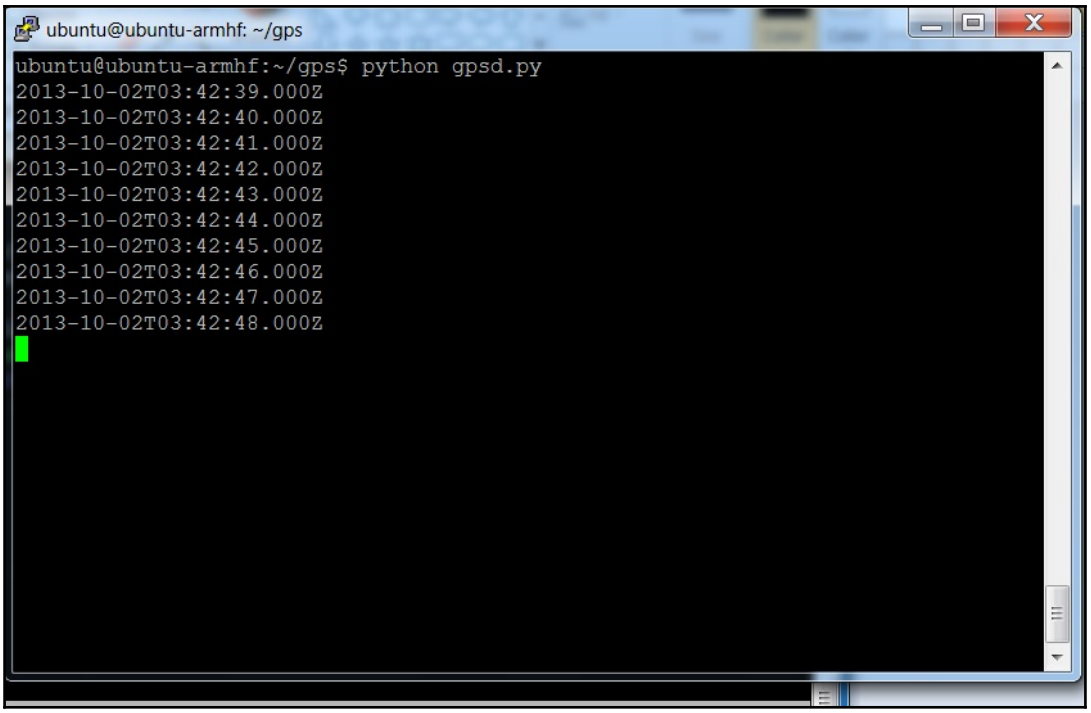
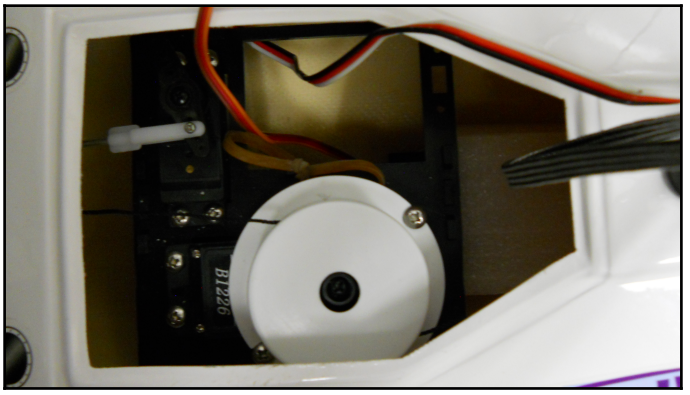
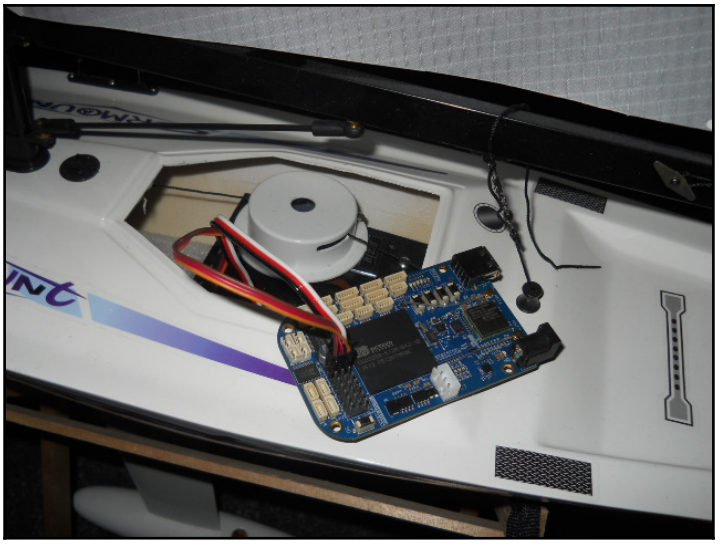
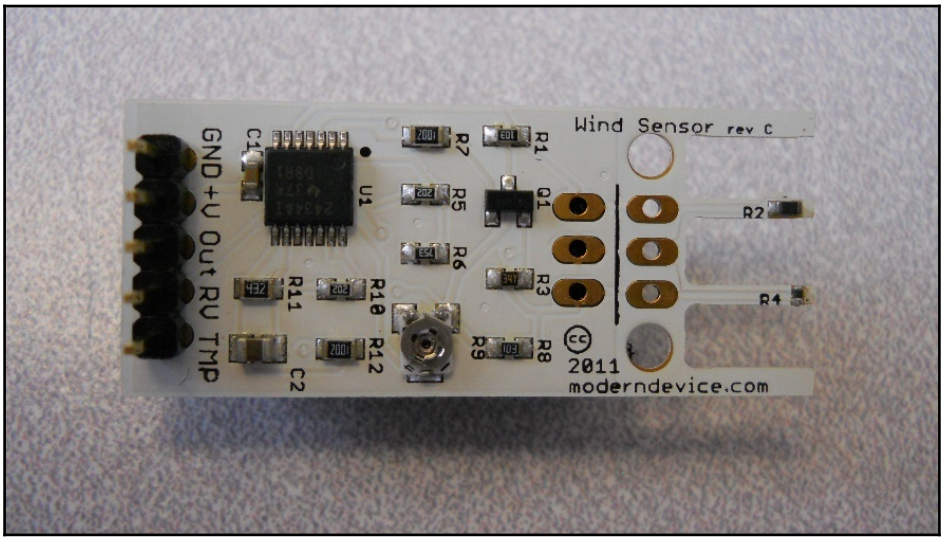
03:13:39.000Z","ept":0.005,"lat":43.819202558,"lon":-111.768612580,"alt":1244.21
0,"epx":41.723,"epy":23.008,"epv":105.839,"track":0.0000,"speed":0.000,"climb":0
.000,"eps":83.45}

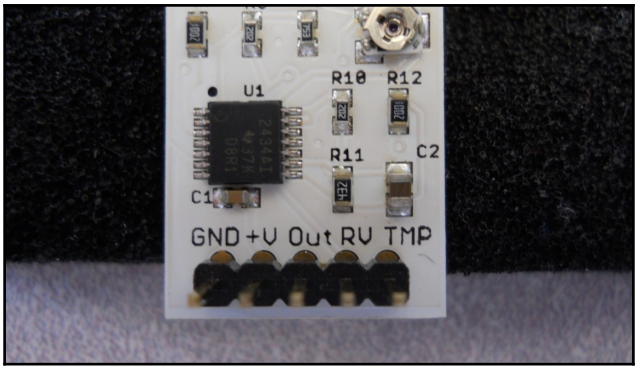

ubuntu@ubuntu-armhf: ~/gps
ubuntu@ubuntu-armhf:~/gps$ python gpsd.py
2013-10-02T03:42:39.000Z
2013-10-02T03:42:40.000Z
2013-10-02T03:42:41.000Z
2013-10-02T03:42:42.000Z
2013-10-02T03:42:43.000Z
2013-10-02T03:42:44.000Z
2013-10-02T03:42:45.000Z
2013-10-02T03:42:46.000Z
2013-10-02T03:42:47.000Z
2013-10-02T03:42:48.000Z

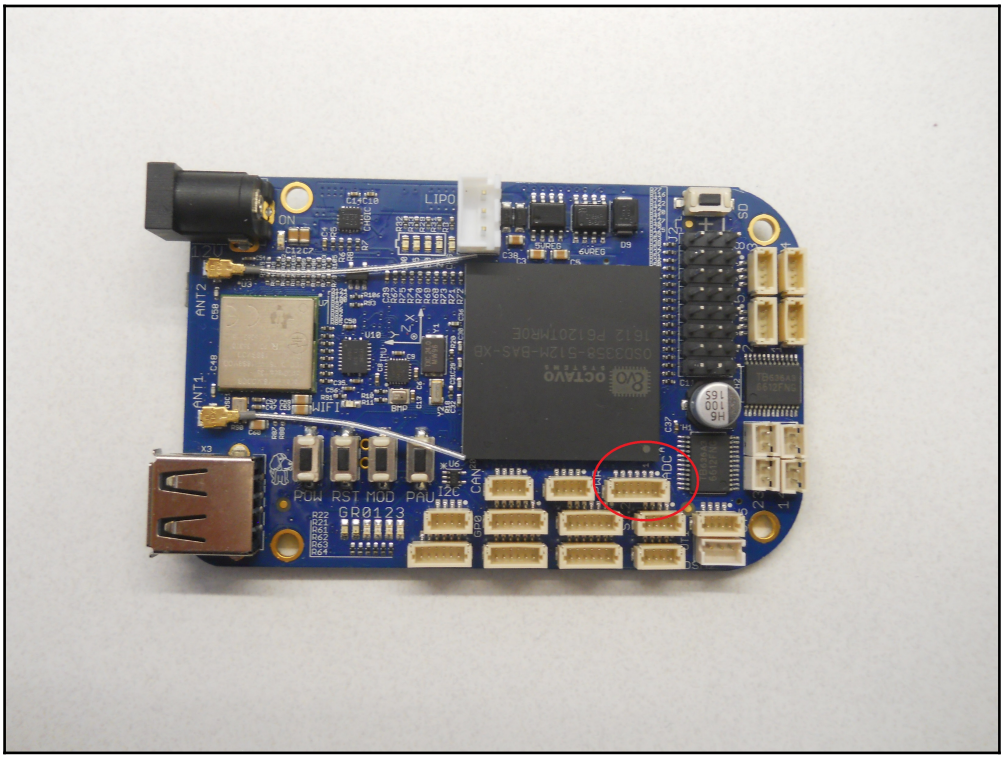
Chapter 9: By Land, By Sea, By Air



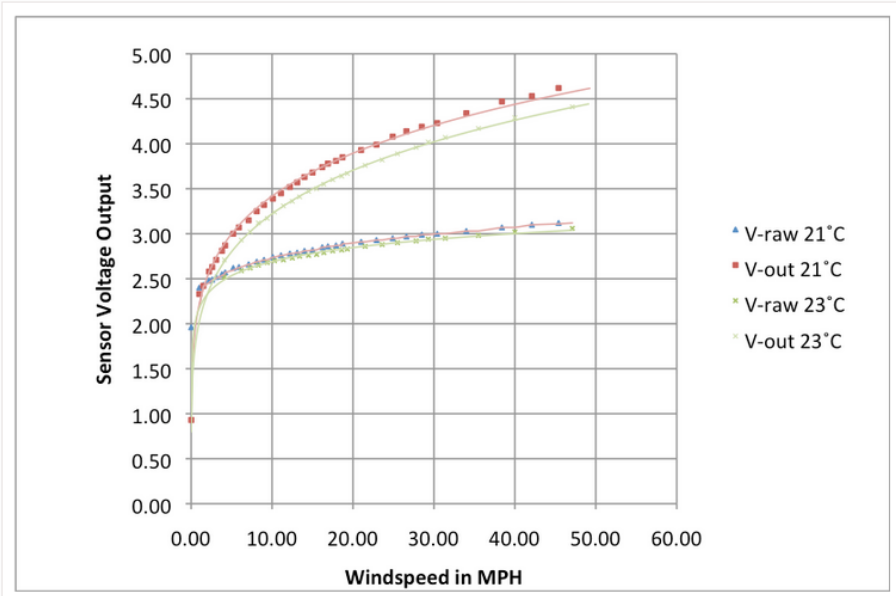


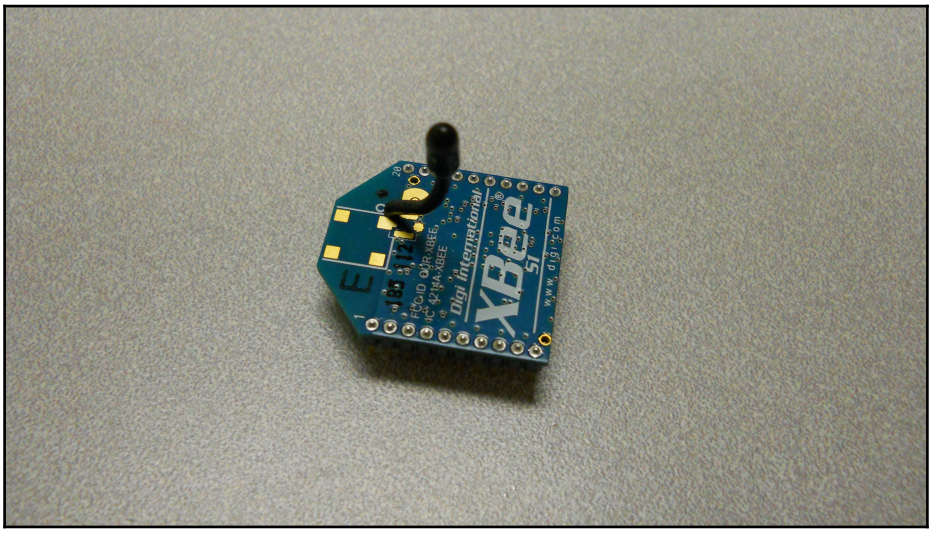

Wind Sensor rev C
GND+V Out RV TMP
U1
C1
C2
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
Q1
2011
moderndevice.com

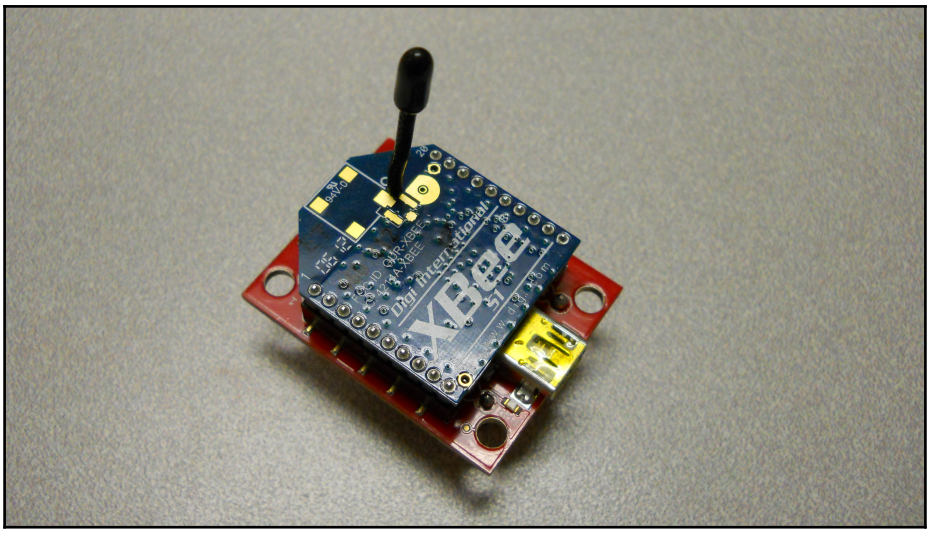

U1
R10
R12
R11
C2
C1
GND +V Out RV TMP

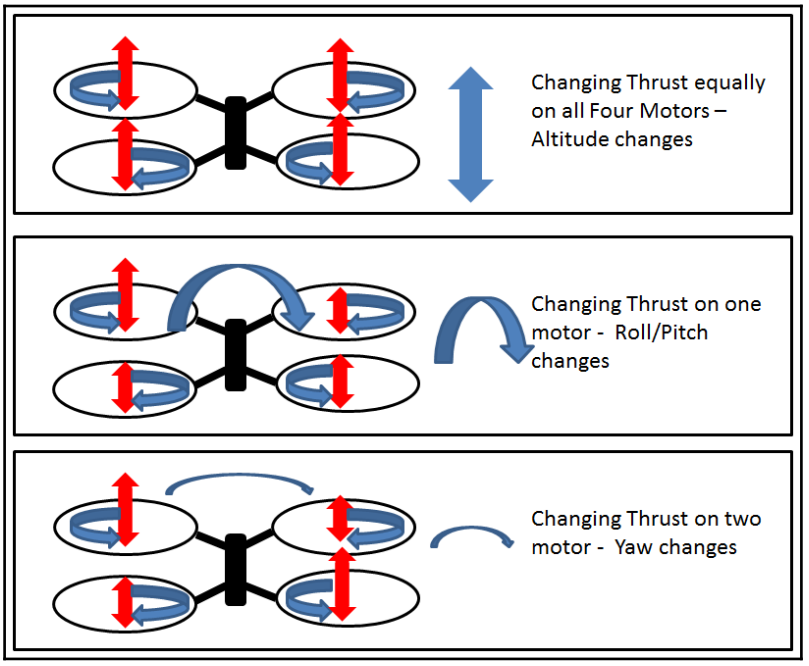

LIPO
ON
ANT2
ANT1
WIFI
POW RST MOD PAU I2C CAN
GR0123
ADC
SD
OCTAVO

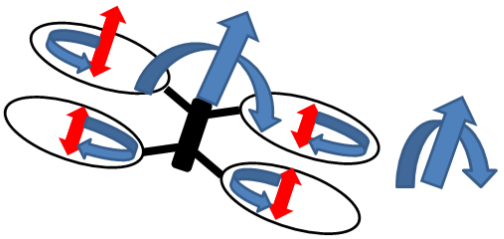
Wind Sensor Calibration and the Wind Tunnel



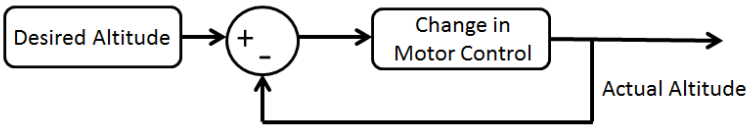



XBee


Changing Thrust equally on all Four Motors – Altitude changes
Changing Thrust on one motor - Roll/Pitch changes
Changing Thrust on two motor - Yaw changes



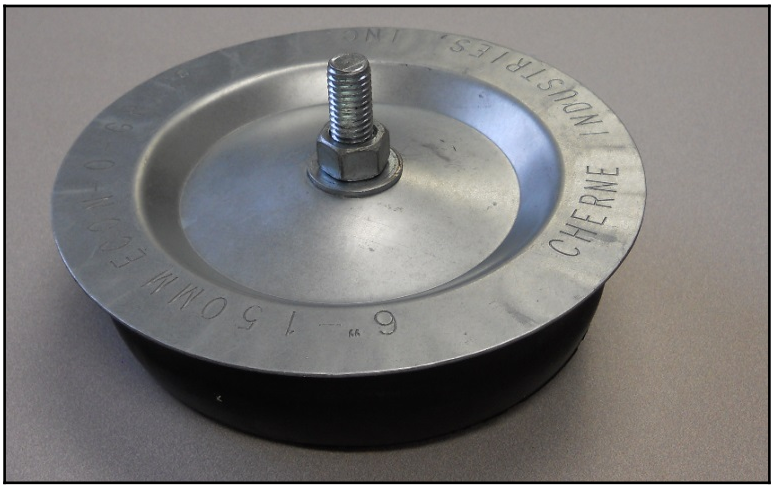
Applying Thrust to all motors, but more on one motor - Roll/Pitch changes and the platform moves forward

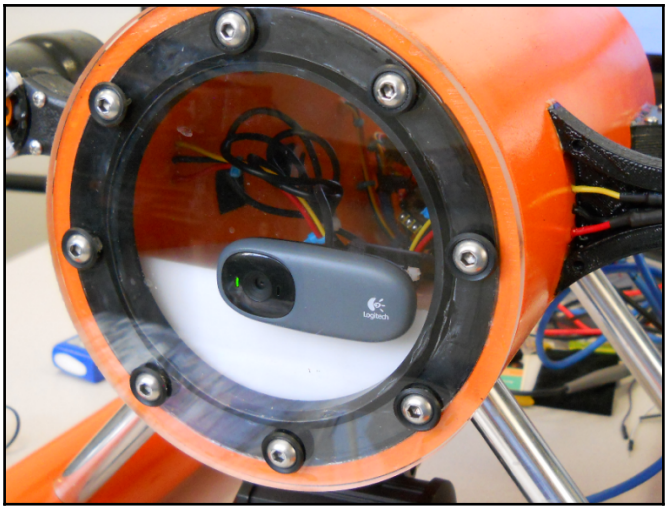


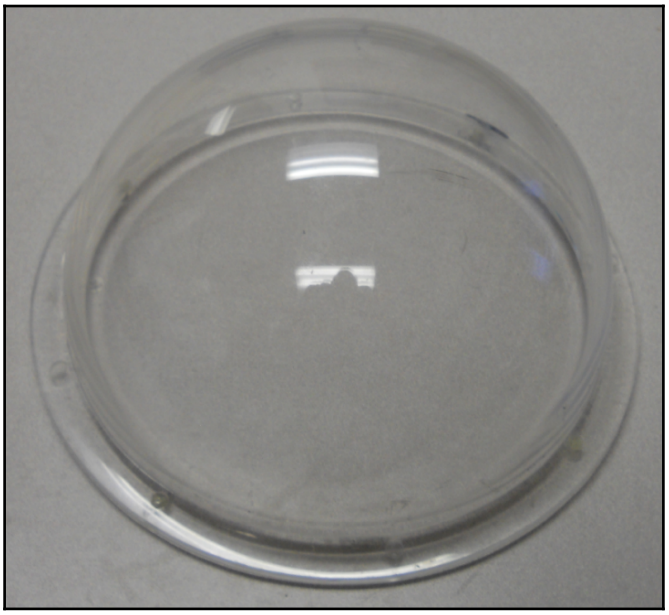
In a feedback system, the desired altitude is compared to the actual altitude and the amount of difference then drives the control signals to the motors to change the actual altitude.

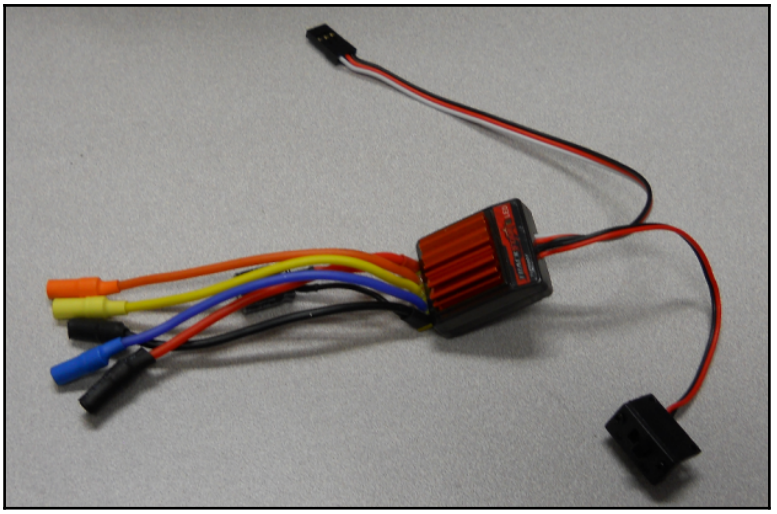

Mission Planner 1.2.83 build 1.1.5036.12264
FLIGHT DATA
FLIGHT PLAN
INITIAL SETUP
CONFIG/TUNING
SIMULATION
TERMINAL
HELP
CONNECT
DISARMED
AS 0.0
GS 0.0
Unknown
0>0
GPS: No GPS
Quick
Actions
Gauges
Status
Servo
Altitude (m)
0.00
GroundSpeed (m
0.00
Dist to WP (m)
0.00
Yaw (deg)
0.00
Dir: 0
Vel: 0
Dist to Home: 11708562
hdop: 0.0
Sats: 0
Current Heading
Direct to current WP
Target Heading
GPS Track (Black)


3G
4G
Virgin mobile

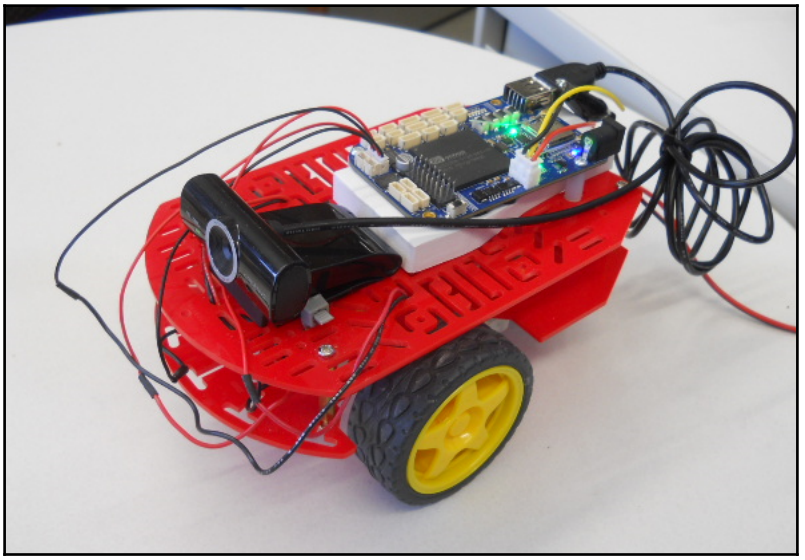

CHERNE INDUSTRIES INC.

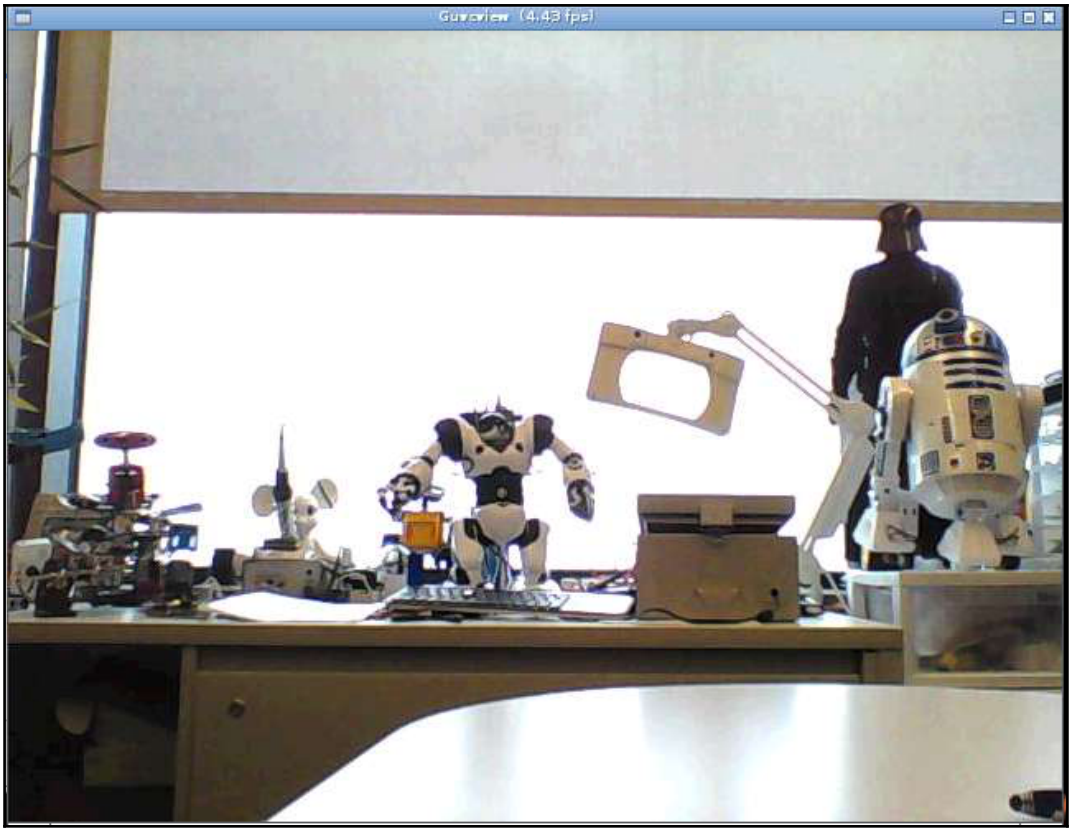

Logitech

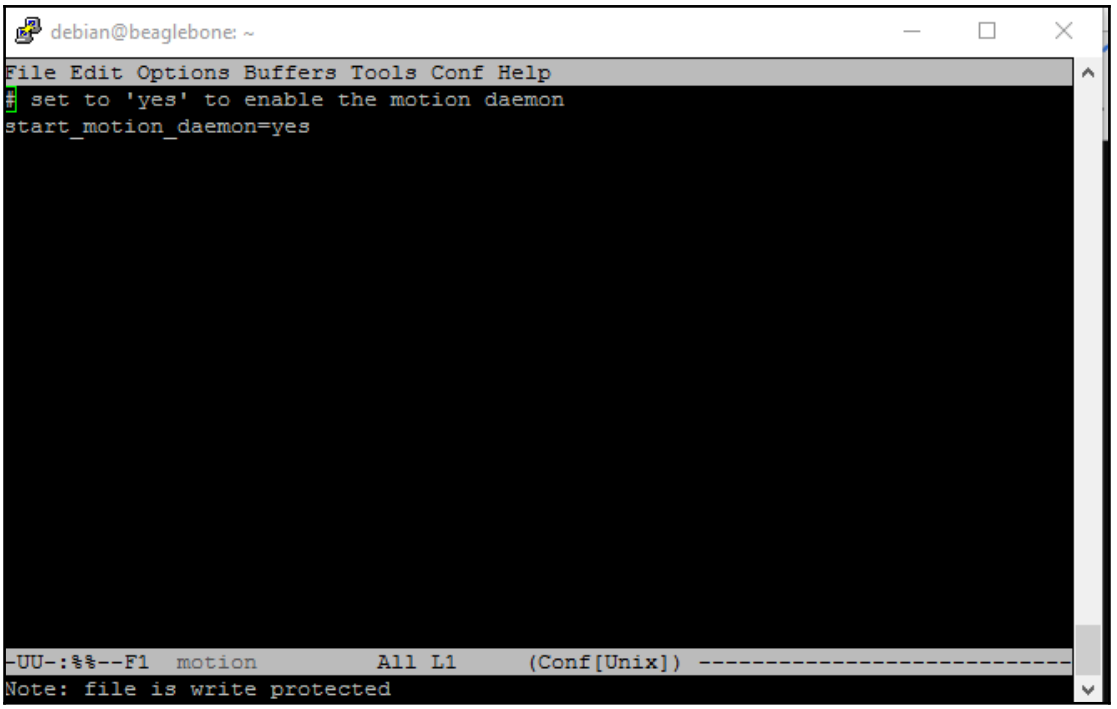


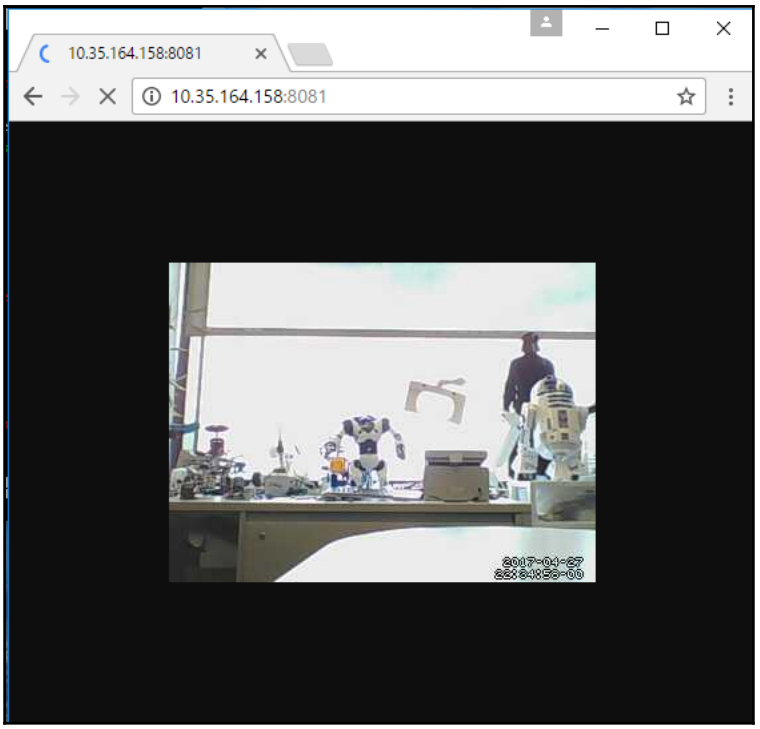


Chapter 10: System Dynamics




Guvcview (4,43 fps)


debian@beaglebone: ~
File Edit Options Buffers Tools Conf Help
# set to 'yes' to enable the motion daemon
start_motion_daemon=yes
-UU-:%%--F1 motion All L1 (Conf[Unix]) ----------
Note: file is write protected


10.35.164.158:8081
10.35.164.158:8081