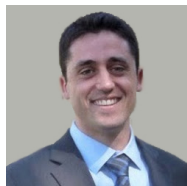


Setup BBB and Run the QuickBot

Control of Mobile Robots: Hardware Lecture #4



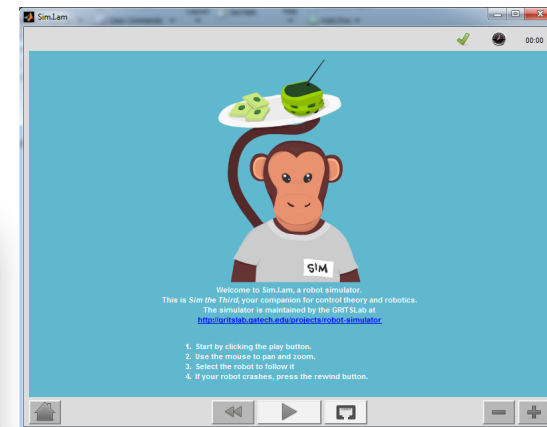
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Overview Of Steps to Run the QuickBot

1. SSH into BBB
2. Launch QuickBot code on the BBB
3. Launch Sim.I.Am simulator in Matlab

```
rowland — ssh — 70x10
Last login: Mon Jan 27 22:30:07 on ttys001
[rowland@Bender ~]> ssh root@192.168.7.2
root@192.168.7.2's password:
[root@beaglebone ~]>
```

```
rowland — ssh — 70x10
[root@beaglebone ~]> cd quickbot_bbb/
[root@beaglebone quickbot_bbb]> ./QuickBotRun.py
Running QuickBot
Running QuickBot Program
Base IP: 192.168.7.1
Robot IP: 192.168.7.2
Setting motor PWMs to: left = 0 and right = 0
```



SSH into BBB

- Adafruit has a great tutorial: “SSH to BeagleBone Black over USB”
<http://learn.adafruit.com/ssh-to-beaglebone-black-over-usb/overview>



Using the Linux Terminal I O I

Task	Command	Examples
Get current directory	<code>pwd</code>	<pre>>> pwd /home/root</pre>
Make new directory	<code>mkdir</code>	<pre>>> mkdir temp</pre>
List contents of directory	<code>ls</code>	<pre>>> ls Desktop temp</pre>
Change to a different directory	<code>cd</code>	<pre>>> cd .. >> cd /home/root/temp</pre>
Create a new file	<code>touch</code>	<pre>>> touch aFile</pre>
Copy a file or folder	<code>cp</code>	<pre>>> cp aFile aNewFile</pre>
Remove a file	<code>rm</code>	<pre>>> rm aNewFile</pre>
Display Manual	<code>man</code>	<pre>>> man ls</pre>

Google is your friend here!!!

Connect to BBB via Ethernet

- Plug Ethernet cable into BBB and router
- Power BBB with either USB cable or 5V power supply
- SSH with:

```
>> ssh root@beaglebone.local or ssh root@192.168.1.###
```

No password needed (just hit [enter])
- Check internet connectivity:

```
>> ping -o www.google.com
```

 - If output says “ping: cannot resolve www.google.com: Unknown host”
then internet is not working

Note: Windows users may be able to get internet connectivity through USB connection.

Setup Wifi

- Execute the following commands in the terminal:

```
>> opkg update
>> ln -sf /usr/share/zoneinfo/America/New_York /etc/localtime
>> ntpdate -b -s -u pool.ntp.org
>> /usr/lib/connman/test/set-global-timeservers pool.ntp.org
>> date
```

(Confirm that the date and time are correct)

(Change to your respected time zone.
Use TAB completion to get list of time zones)

- Plug in Wifi adapter into BBB and restart BBB

```
>> shutdown -r now
```

(Might have to open a new terminal window)

Setup Wifi

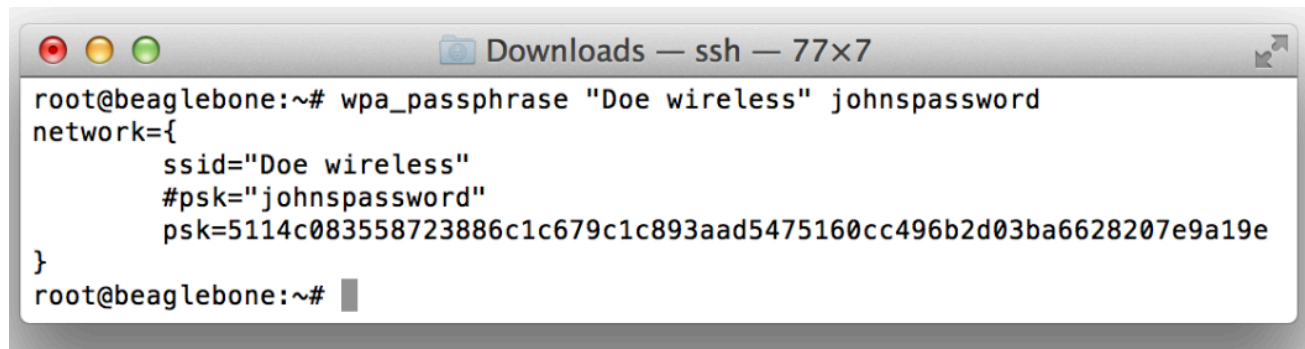
- SSH back into BBB and check that the wireless is working

```
>> ifconfig ra0
```

(If you get an error then it is not working)

- Configure network settings to connect to WPA protected network

```
>> wpa_passphrase "Your Network Name Here" 'Your password here'
```



A terminal window titled "Downloads — ssh — 77x7" showing the output of the `wpa_passphrase` command. The prompt is `root@beaglebone:~#`. The command entered is `wpa_passphrase "Doe wireless" johnspassword`. The output shows a network configuration block with `ssid="Doe wireless"`, `#psk="johnspassword"`, and a long hexadecimal `psk` value. The prompt returns to `root@beaglebone:~#`.

```
root@beaglebone:~# wpa_passphrase "Doe wireless" johnspassword
network={
    ssid="Doe wireless"
    #psk="johnspassword"
    psk=5114c083558723886c1c679c1c893aad5475160cc496b2d03ba6628207e9a19e
}
root@beaglebone:~#
```

Setup Wifi

- Edit the wifi configuration file

```
>> nano /var/lib/connman/wifi.config
```

- Type out the following in the editor:

```
[service_home]
```

```
Type = wifi
```

```
Name = Network Name
```

```
Passphrase = psk_encrypted_passphrase
```

(Press Ctrl-x, y, enter to save and exit editor)

```
GNU nano 2.2.5      File: /var/lib/wifi.config      Modified

[service_home]
Type = wifi
Name = Doe wireless
Passphrase = 5114c083558723886c1c679c1c893aad5475160cc496b2d03ba6628207e9a19e

^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
```


Setup Wifi

- Restart BBB (unplug ethernet before BBB re-boots)

```
>> shutdown -r now
```

- SSH with:

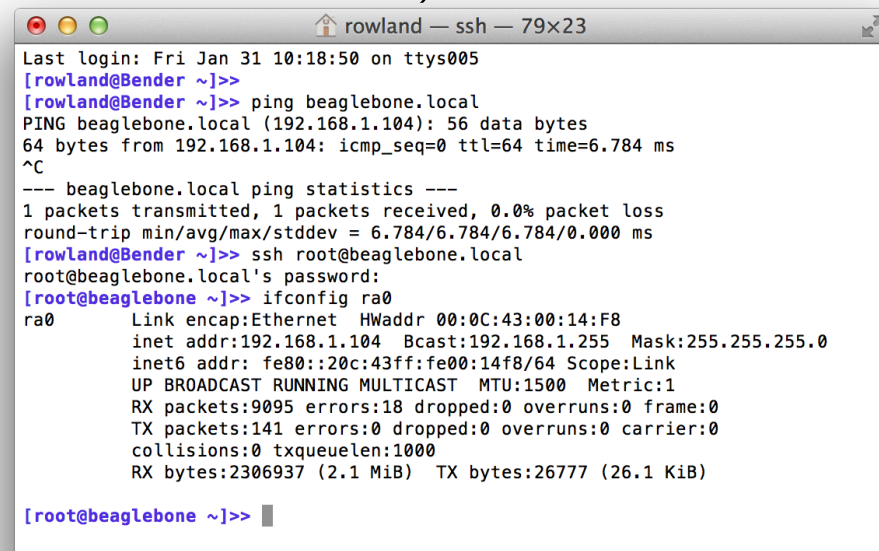
```
>> ssh root@beaglebone.local
```

- Check IP address:

```
>> ifconfig ra0
```

- Check internet connectivity:

```
>> ping -o www.google.com
```



```
rowland — ssh — 79x23
Last login: Fri Jan 31 10:18:50 on ttys005
[rowland@Bender ~]>>
[rowland@Bender ~]>> ping beaglebone.local
PING beaglebone.local (192.168.1.104): 56 data bytes
64 bytes from 192.168.1.104: icmp_seq=0 ttl=64 time=6.784 ms
^C
--- beaglebone.local ping statistics ---
1 packets transmitted, 1 packets received, 0.0% packet loss
round-trip min/avg/max/stddev = 6.784/6.784/6.784/0.000 ms
[rowland@Bender ~]>> ssh root@beaglebone.local
root@beaglebone.local's password:
[root@beaglebone ~]>> ifconfig ra0
ra0      Link encap:Ethernet  HWaddr 00:0C:43:00:14:F8
         inet addr:192.168.1.104  Bcast:192.168.1.255  Mask:255.255.255.0
         inet6 addr: fe80::20c:43ff:fe00:14f8/64 Scope:Link
         UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
         RX packets:9095 errors:18 dropped:0 overruns:0 frame:0
         TX packets:141 errors:0 dropped:0 overruns:0 carrier:0
         collisions:0 txqueuelen:1000
         RX bytes:2306937 (2.1 MiB)  TX bytes:26777 (26.1 KiB)

[root@beaglebone ~]>>
```

Get Python Libraries Onto BBB

- A few python libraries are needed:

```
>> opkg update
```

```
>> opkg install python-pip python-setuptools python-smbus
```

```
>> pip install Adafruit_BBIO
```

Clone QuickBot Repo

- Execute the following command to download the QuickBot code:

```
>> git clone https://bitbucket.org/rowoflo/quickbot_bbb.git
```

Task	Command	Examples
Clone new repository	<code>git clone</code>	<pre>>> git clone https://.../quickbot_bbb.git</pre>
Get latest updates	<code>git pull</code>	<pre>>> git pull</pre>
Get status of local files	<code>git status</code>	<pre>>> git status</pre>
Commit changes to repo	<code>git commit</code>	<pre>>> git -a -m "Commit message"</pre>
Send changes to remote	<code>git push</code>	<pre>>> git push</pre>

<https://confluence.atlassian.com/display/STASH/Basic+Git+commands>

Google is your friend here!!!

Get IP Addresses

- Check IP address:

```
>> ifconfig
```

Check Both Your PC's IP and BBB's IP

```
rowland — bash — 79x23
ssh      bash

[rowland@Bender ~]>> ifconfig
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> mtu 16384
    options=3<RXCSUM,TXCSUM>
    inet6 ::1 prefixlen 128
    inet 127.0.0.1 netmask 0xff000000
    inet6 fe80::1%lo0 prefixlen 64 scopeid 0x1
    nd6 options=1<PERFORMNUD>
gif0: flags=8010<POINTOPOINT,MULTICAST> mtu 1280
stf0: flags=0<> mtu 1280
en0: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
    ether 20:c9:d0:42:ea:6d
    inet6 fe80::22c9:d042:ea6d%en0 prefixlen 64 scopeid 0x4
    inet 192.168.1.100 netmask 0xfffff00 broadcast 192.168.1.255
    nd6 options=1<PERFORMNUD>
    media: autoselect
    status: active
en3: flags=8963<UP,BROADCAST,SMART,RUNNING,PROMISC,SIMPLEX,MULTICAST> mtu 1500
    options=60<TS04,TS06>
    ether 32:00:13:ea:c5:00
    media: autoselect <full-duplex>
    status: inactive
en4: flags=8963<UP,BROADCAST,SMART,RUNNING,PROMISC,SIMPLEX,MULTICAST> mtu 1500
    options=60<TS04,TS06>
```

```
rowland — ssh — 79x23

Last login: Fri Jan 31 10:18:50 on ttys005
[rowland@Bender ~]>>
[rowland@Bender ~]>> ping beaglebone.local
PING beaglebone.local (192.168.1.104): 56 data bytes
64 bytes from 192.168.1.104: icmp_seq=0 ttl=64 time=6.784 ms
^C
--- beaglebone.local ping statistics ---
1 packets transmitted, 1 packets received, 0.0% packet loss
round-trip min/avg/max/stddev = 6.784/6.784/6.784/0.000 ms
[rowland@Bender ~]>> ssh root@beaglebone.local
root@beaglebone.local's password:
[root@beaglebone ~]>> ifconfig ra0
ra0
    Link encap:Ethernet HWaddr 00:0C:43:00:14:F8
    inet addr:192.168.1.104 netmask:192.168.1.255 Mask:255.255.255.0
    inet6 addr: fe80::20c:4300:14f8:fe00:14f8/64 Scope:Link
    UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
    RX packets:9095 errors:18 dropped:0 overruns:0 frame:0
    TX packets:141 errors:0 dropped:0 overruns:0 carrier:0
    collisions:0 txqueuelen:1000
    RX bytes:2306937 (2.1 MiB) TX bytes:26777 (26.1 KiB)

[root@beaglebone ~]>>
```

Run QuickBot Code On BBB

- Change into QuickBot repo directory

```
>> cd ~/quickbot_bbb
```

- Check file permissions

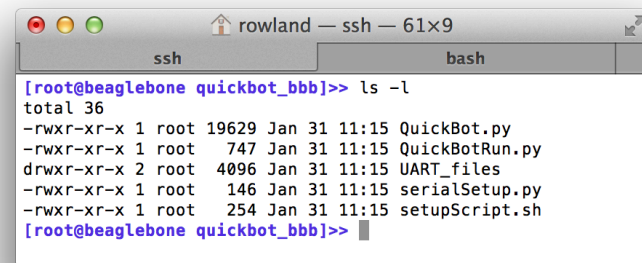
```
>> ls -l
```

- Change file permissions if necessary

```
>> chmod u+x QuickBotRun.py
```

- Run QuickBot code

```
>> ./QuickBotRun.py Your_PC_IP BBB_IP
```



A terminal window titled 'rowland - ssh - 61x9' with tabs for 'ssh' and 'bash'. The prompt is '[root@beaglebone quickbot_bbb]>'. The command 'ls -l' has been executed, showing the following output:

```
total 36
-rwxr-xr-x 1 root 19629 Jan 31 11:15 QuickBot.py
-rwxr-xr-x 1 root 747 Jan 31 11:15 QuickBotRun.py
drwxr-xr-x 2 root 4096 Jan 31 11:15 UART_files
-rwxr-xr-x 1 root 146 Jan 31 11:15 serialSetup.py
-rwxr-xr-x 1 root 254 Jan 31 11:15 setupScript.sh
[root@beaglebone quickbot_bbb]>
```

Start Matlab and Sim.I.Am Simulator

- Launch Matlab
- Startup Sim.I.Am
- Connect to QuickBot
- Press Play



Shutting Down

- Close Sim.I.Am
- Ctrl-C in BBB terminal to end QuickBotRun program
- Shutdown BBB
`>> shutdown -H now`
- Turn off QuickBot



Demo