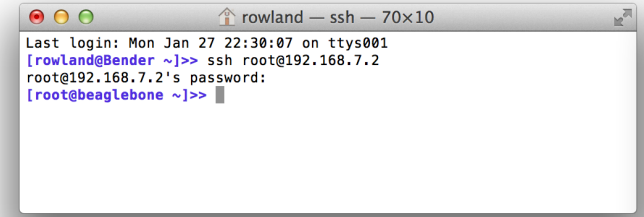
Setup BBB and Run the QuickBot

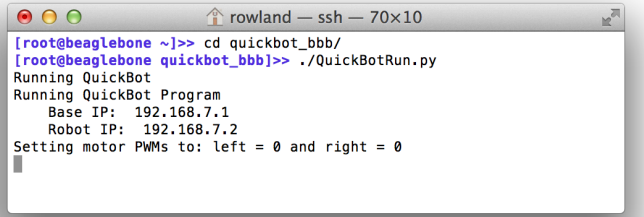
Control of Mobile Robots: Hardware Lecture #4

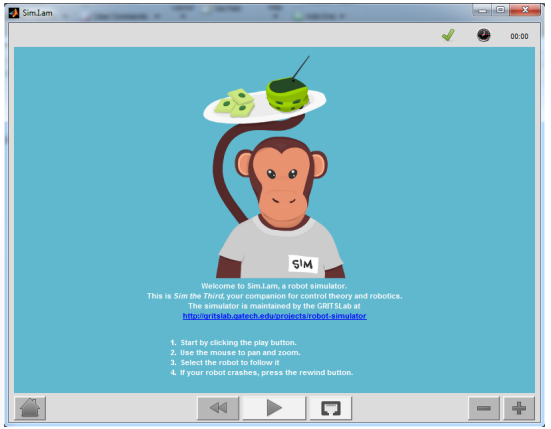
Rowland O'Flaherty
Robotics Ph.D. Candidate
Georgia Tech

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

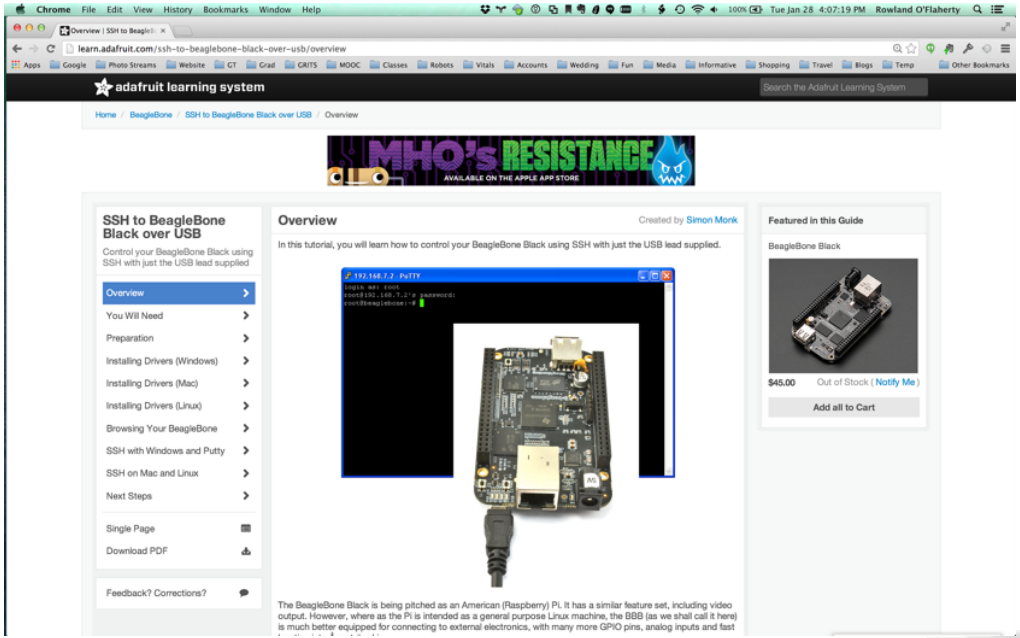






SSH into BBB

- 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 101

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

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
```

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

(Confirm that the date and time are correct)

- 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'
```

Setup Wifi

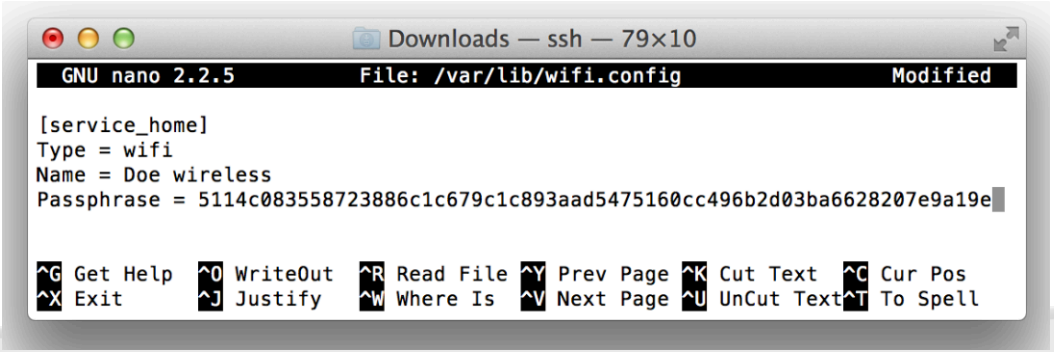
- Edit the wifi configuration file

```
>> 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)



Setup Wifi

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

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

- SSH with:

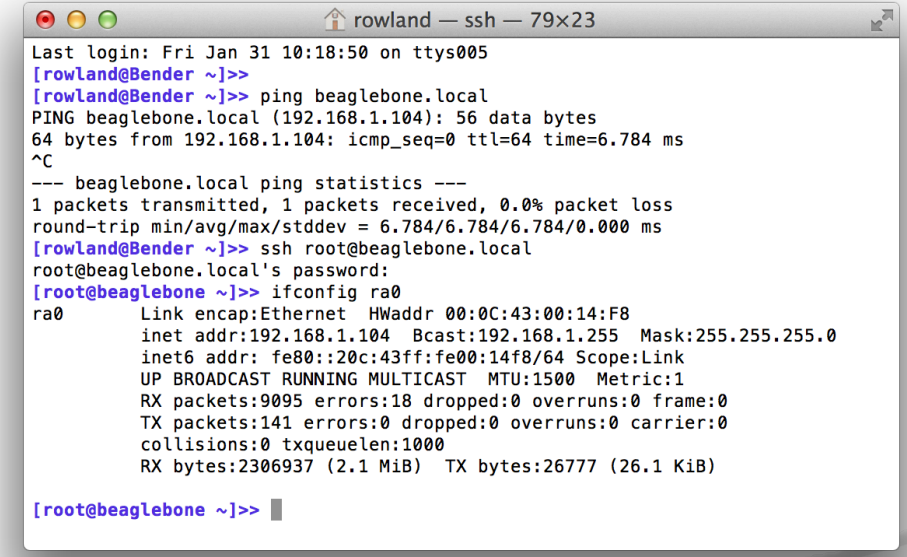
```
>> ssh root@beaglebone.local
```

- Check IP address:

```
>> ifconfig ra0
```

- Check internet connectivity:

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



Get Python Libraries Onto BBB

- A few python libraries are needed:

```
>> opkg update
>> opkg install python-pip python-setuptools
>> 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	`git clone`	`>> git clone https://…/quickbot_bbb.git`
Get latest updates	`git pull`	`>> git pull`
Get status of local files	`git status`	`>> git status`
Commit changes to repo	`git commit`	`>> git -a -m "Commit message"`
Send changes to remote	`git push`	`>> git push`

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 — 79×23

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:d0ff:fe42:ea6d%en0 prefixlen 64 scopeid 0x4
        inet 192.168.1.100 netmask 0xffffff00 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<TSO4,TSO6>
        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<TSO4,TSO6>
```

rowland — ssh — 79×23

```
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 ~]>>
```

Run QuickBot Code On BBB

- Change into QuickBot repo directory

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

- Check file permissions

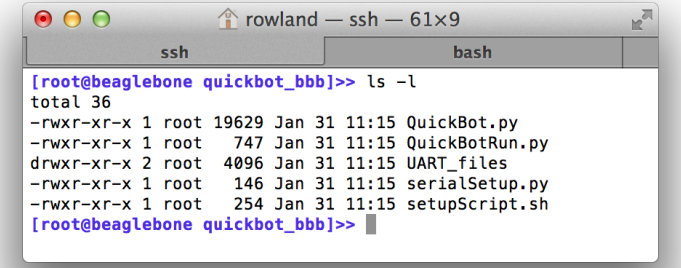
```
>> ls -l
```

- Change file permissions if necessary

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

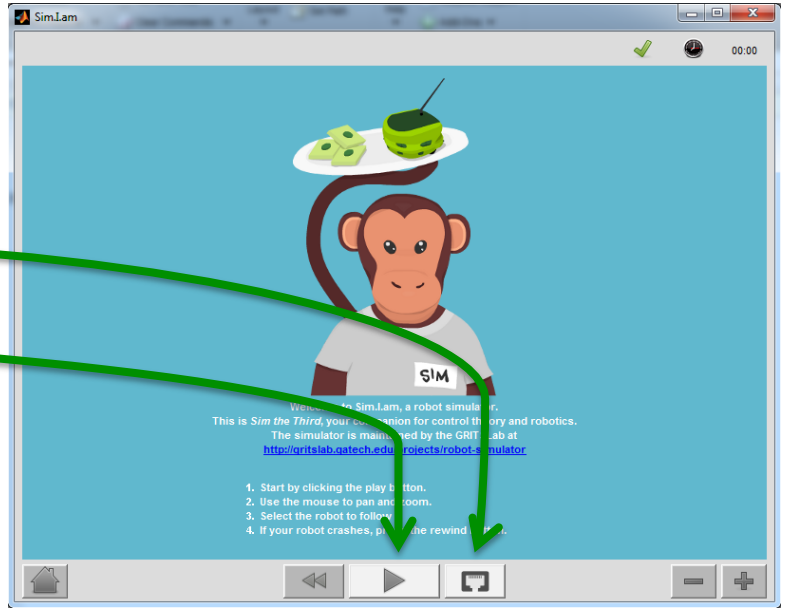
- Run QuickBot code

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



Start Matlab and Sim.I.Am Simulator

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



Shutting Down

- Close Sim.I.Am
- CtrI-C in BBB terminal to end QuickBotRun program
- Shutdown BBB

```
>> shutdown -H now
```

- Turn off QuickBot

Demo