Physical Computing101: Part 3

Control of Mobile Robots: Hardware Lecture #7

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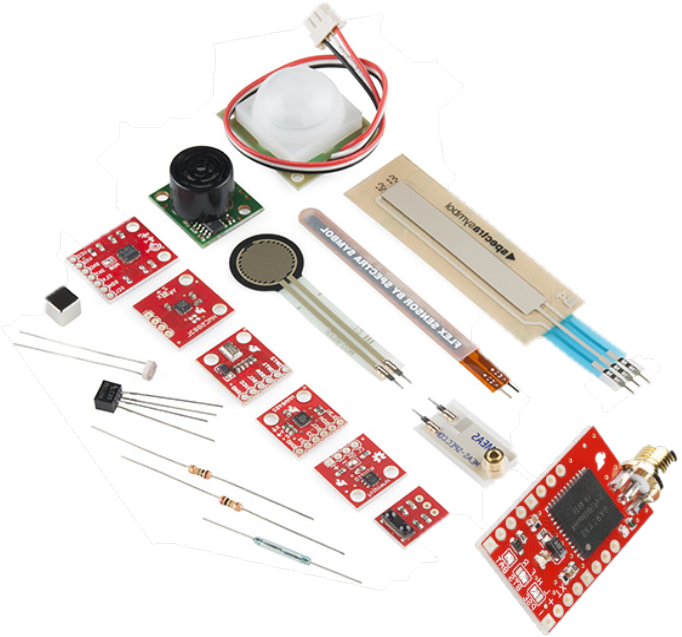
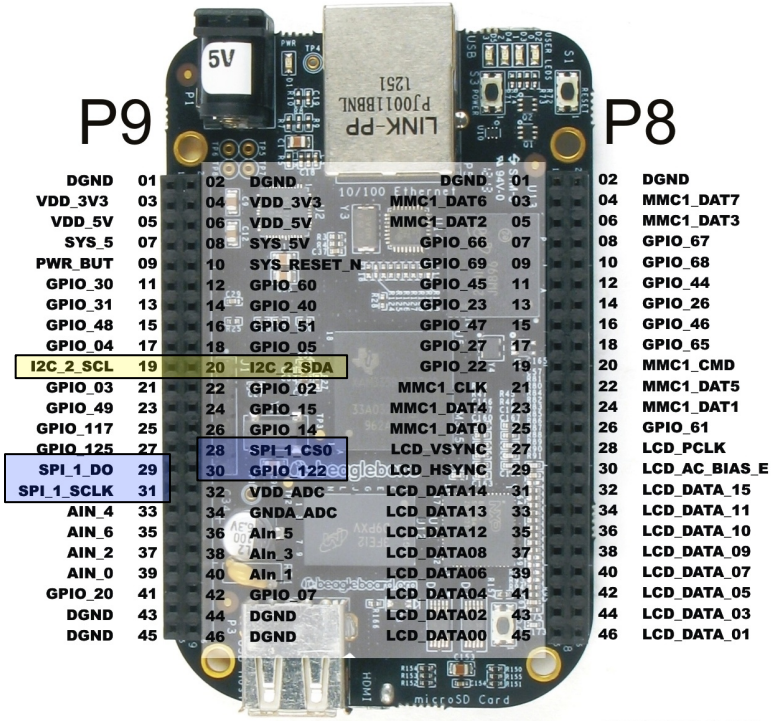
Serial Communications

- Serial (via UART)
  - 2 wires:
    - Receive (Rx)
    - Transmit (Tx)
- I^2C
  - 2 wires:
    - data (SDA)
    - clock (SCL)
- SPI Bus
  - 4 wires:
    - clock (SCLK)
    - master out slave in (MOSI)
    - master in slave out (MISO)
    - slave select (SS)



BBB Serial



www.insigntech.com

P9

GND	1	2	GND	
3.3V	3	4	3.3V	
5V Raw	5	6	5V Raw	
5V	7	8	5V	
	9	10		
Serial4 RX/GPIO0_30	11	12	GPIO1_28	
Serial4 TX/GPIO0_31	13	14	PWM1A/GPIO1_18	
GPIO1_16	15	16	PWM1B/GPIO1_19	
GPIO0_5	17	18	GPIO0_4	
GPIO0_13	19	20	GPIO0_12	
Serial2 TX/GPIO0_3	21	22	Serial2 RX/GPIO0_2	
GPIO1_17	23	24	Serial1 TX/GPIO0_15	
GPIO3_21	25	26	Serial1 RX/GPIO0_14	
GPIO3_19	27	28	GPIO3_17	
GPIO3_15	29	30	GPIO3_16	
GPIO3_14	31	32	VDD_ADC	
AIN4	33	34	GND_ADC	
AIN6	35	36	AIN5	
AIN2	37	38	AIN3	
AIN0	39	40	AIN1	
GPIO0_20	41	42	GPIO0_7	
GND	43	44	GND	
GND	45	46	GND	

P8

GND	1	2	GND	
GPIO1_6	3	4	GPIO1_7	
GPIO1_2	5	6	GPIO1_3	
GPIO2_2	7	8	GPIO2_3	
GPIO2_5	9	10	GPIO2_4	
GPIO1_13	11	12	GPIO1_12	
PWM2B/GPIO0_23	13	14	GPIO0_26	
GPIO1_15	15	16	GPIO1_14	
GPIO0_27	17	18	GPIO2_1	
PWM2A/GPIO0_22	19	20	GPIO1_31	
GPIO1_30	21	22	GPIO1_5	
GPIO1_4	23	24	GPIO1_1	
GPIO1_0	25	26	GPIO1_29	
GPIO2_22	27	28	GPIO2_24	
GPIO2_23	29	30	GPIO2_25	
GPIO0_10	31	32	GPIO0_11	
GPIO0_9	33	34	GPIO2_17	
GPIO0_8	35	36	GPIO2_16	
Serial5 TX/GPIO2_14	37	38	Serial5 RX/GPIO2_15	
GPIO2_12	39	40	GPIO2_13	
GPIO2_10	41	42	GPIO2_11	
GPIO2_8	43	44	GPIO2_9	
GPIO2_6	45	46	GPIO2_27	

Caution:
GPIO Pins operate at 3.3V

BBB Python Serial Setup

- Use Adafruit tutorial to setup BBB for serial communication

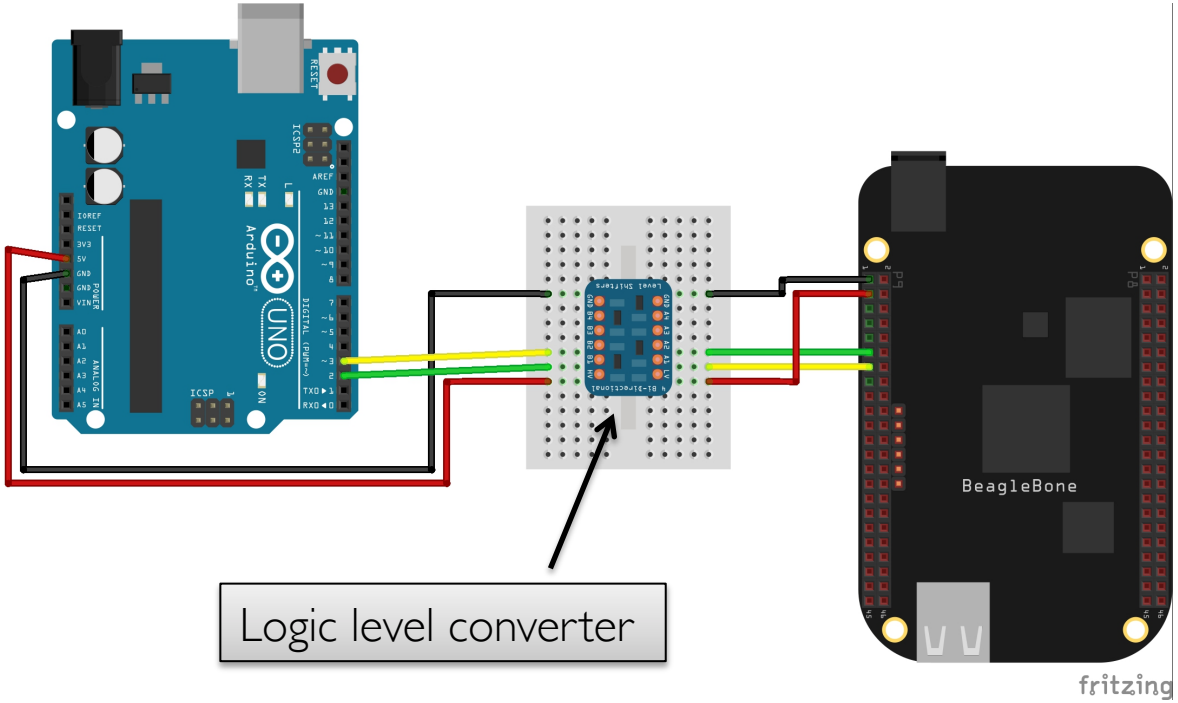
http://learn.adafruit.com/setting-up-io-python-library-on-beaglebone-black/overview

Overview

- SSH into BBB
- Install Python libraries

```
>> opkg update
>> opkg install python-pip python-setuptools python-smbus
>> pip install Adafruit_BBIO
>> pip install pyserial
```

BBB Serial Communication With Arduino

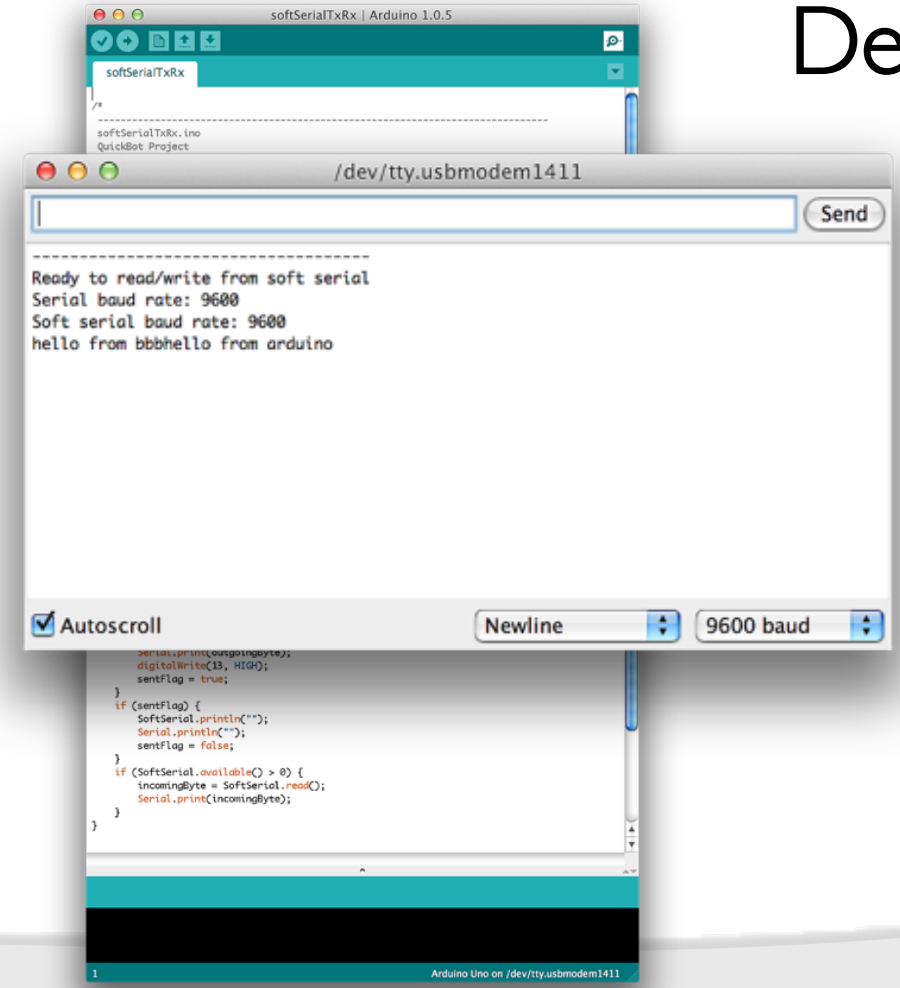


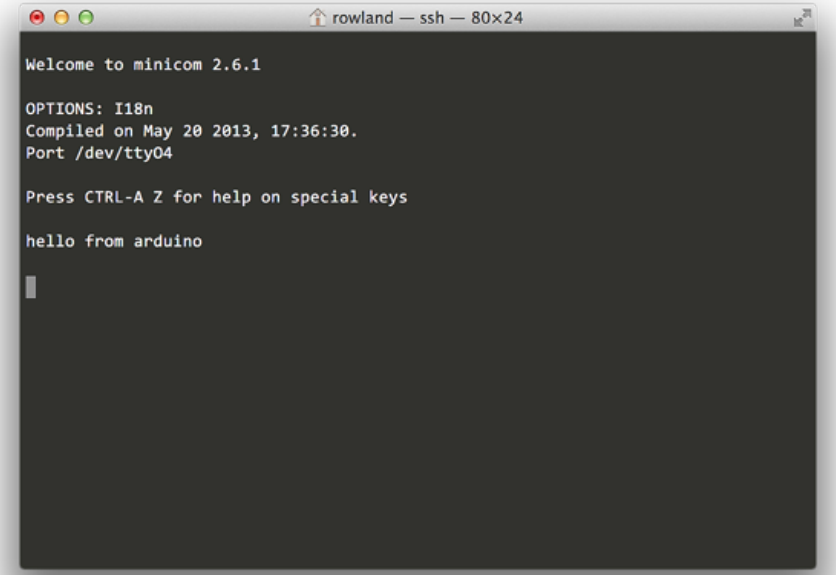
BBB Serial Code

```
#!/usr/bin/python
import Adafruit_BBIO.UART as UART
import serial

UART.setup("UART4")

ser = serial.Serial(port = "/dev/ttyO4", baudrate=9600)
ser.close()
ser.open()
if ser.isOpen():
    print "Serial is open!"
    ser.write("Hello from BBB!\n")
ser.close()
```

```
>> minicom -b 9600 -D /dev/ttyO4
```

Demo


softSerialTxRx | Arduino 1.0.5
softSerialTxRx
softSerialTxRx.ino
QuickBot Project
/dev/tty.usbmodem1411
Send
Ready to read/write from soft serial
Serial baud rate: 9600
Soft serial baud rate: 9600
hello from bbbhello from arduino
Autoscroll
Newline
9600 baud
digitalWrite(13, HIGH);
sentFlag = true;
SoftSerial.println("");
Serial.println("");
sentFlag = false;
if (SoftSerial.available() > 0) {
incomingByte = SoftSerial.read();
Serial.print(incomingByte);
Arduino Uno on /dev/tty.usbmodem1411


rowland — ssh — 80×24
Welcome to minicom 2.6.1
OPTIONS: I18n
Compiled on May 20 2013, 17:36:30.
Port /dev/tty04
Press CTRL-A Z for help on special keys
hello from arduino

Final Words

- Let's keeping the discussions going on "Open roBotics" (a.k.a O'Botics)
- New organization on GitHub: https://github.com/o-botics
- New website: http://o-botics.org