Instructions for assembling an IRobot Create with 4 sonar sensors

Before starting you will need the following (part numbers are at the end of this document):

5 female headers (5 pins)
4 male headers (5 pins)
5 sets of 2 foot long cables each containing 4 wires
4 Acroname SRF02 sonar sensors
1 Acroname USB-I2C module
1 A to B USB cable
1 USB to serial adapter
1 IRobot Create kit

1. solder the male headers in the holes of the "mode" pins. When finished it should look like fig1. Note that the shorter pins are soldered to the srf02 sensor.
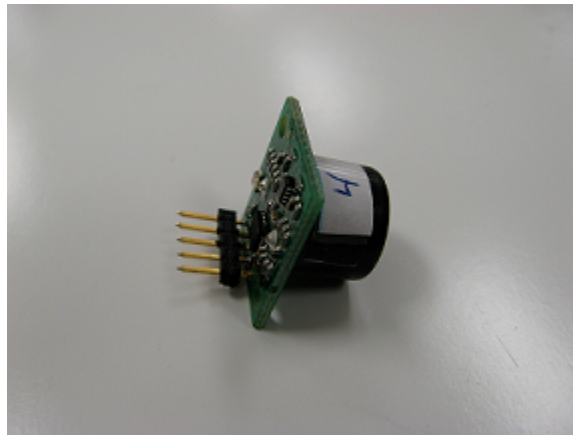

fig 1

2. take 1 female header and 1 set of wire cable. Strip both ends of the wires. Solder one wire to the 1st, 3rd, 4th and 5th pins of a female header. When finished it should look like fig 2. After soldering them all make sure to either cover the wire connections with electrical tape or with heat shrink.
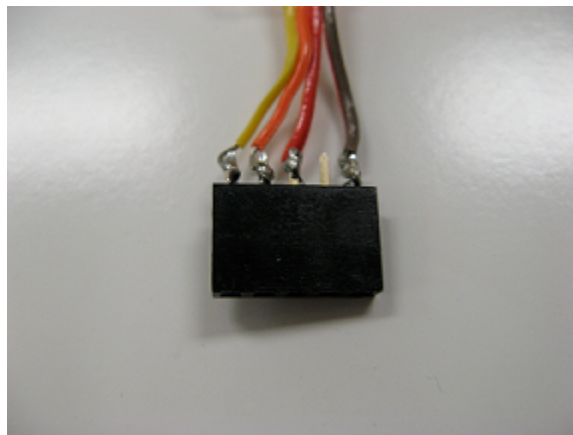

fig 2

3. repeat step 2 and make 4 more female/wire cables. Make sure that each cable is set up with the same wire order as the other. (pin 1 is brown, pin 3 is red, pin 4 is orange, pin 5 yellow … colors will vary according to the wire that you use).

4. Solder together all wires that are connected to pin 1. When finished it should look like fig 4. Either tape the open wire with electrical tape or cover with heat shrink
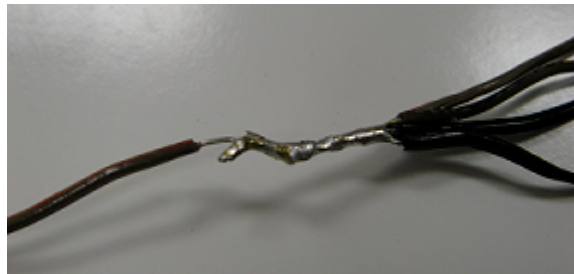

fig 4

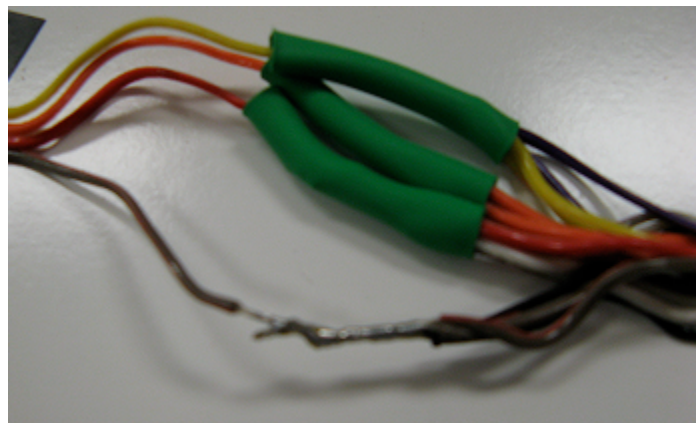5. repeat step 4 for the other 3 wires. (it should look like fig 5 when finished)

fig 5

6. Now that we have made the wiring harness, we need to assign each sensor to a different address. (Read the manual that came with the sonar sensors to explain how to set the addresses in grater detail) Initially each SRF02 has a default address of 0xE0. The address can be changed using a series of I2C write commands. To change the address from the default to 0xE4 use four successive write operations to the I2C address 0xE0: 0xA0, 0xAA, 0xA5, and 0xE4. This sequence changes and stores the new address. The LED on the back of the sensor blinks to indicate the decimal equivalent to the hex bus address when the device is powered up. The valid addresses are sequential increasing by 2. Note that when assigning the addresses, only one sonar sensor can be plugged into the wire harness. Also make sure that you mark each sensor with its assigned address. You can do this by taping a number to each sonar sensor.   Below is how the sensors readings are accessed in a C++ program.

Code Example:

```
ranger_r[0] = 0xA0;        /* 1st in sequence to change I2C address */
ranger_r[1] = 0xAA;       /* 2nd in sequence to change I2C address*/
ranger_r[2] = 0xA5;        /* 3rd in sequence to change I2C address*/
ranger_r[3] = 0xE4;        /*  New address */

#define USB_DEVICE "/dev/ttyUSB0"

port_def = open(USB_DEVICE, O_RDWR | O_NOCTTY | O_NDELAY);
writeEcho = write(port_def, ranger_r, 4);
```

7. Plug each sensor into the wiring harness. Note the ground wire when connecting. In fig 6 the left most wire (brown) is the ground wire.
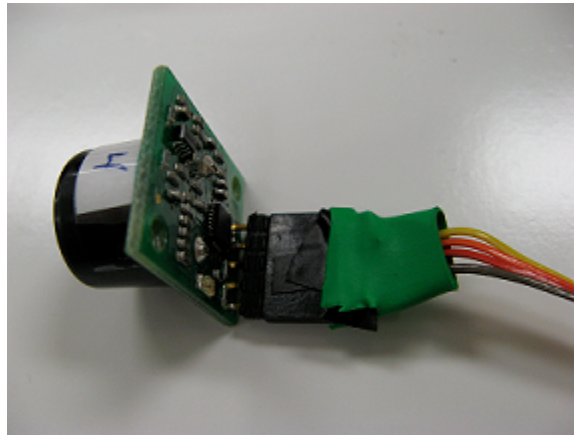

fig 6

8. Plug the I2C module into the last connector (fig 7). Again make sure that you plug the gound wire is plugged in as the west most wire.
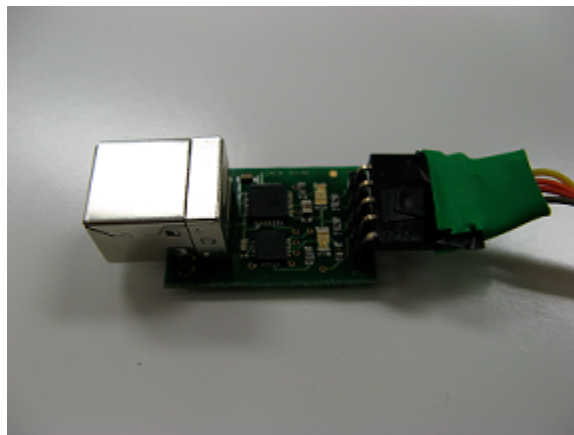

fig 7

9. Attach the sensors to the top of the ICreate at 12, 3, 6 and 9 o'clock (fig 8). Make sure you note which sensor address is in each position.
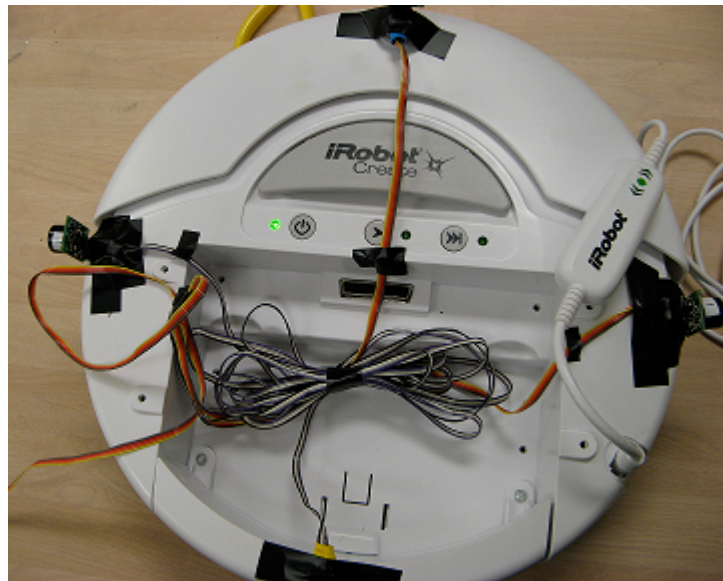

fig 8

10. Connect the USB A to B cable to the I2C module

11. Connect the Serial to USB cable to the IRobot Create cable. (fig 9)

fig 9

12. wrap the wires so that they are neat, un-tangled and make sure the end of the 2 USB cables are near together. (fig 10)
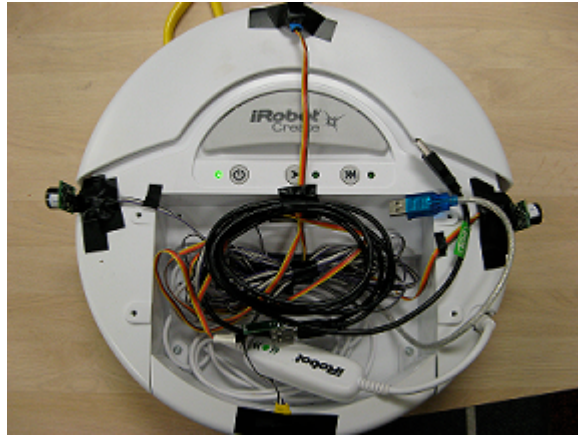

fig 10

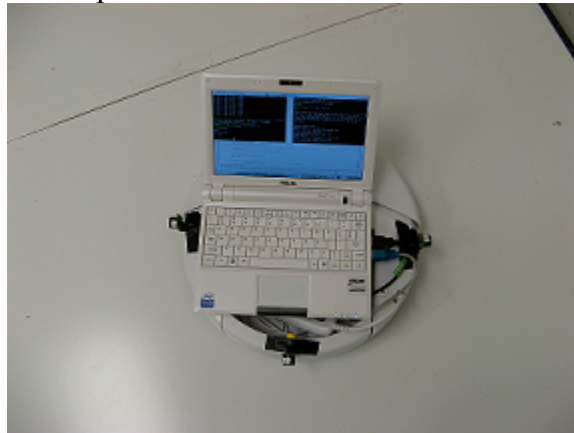13. Place a small laptop on the top of the robot and connect the USB cables (fig 11).

fig 11

Parts Information

From Acroname.com

Devantech USB-I2C
Part Number: R286-USB-I2C
Price: $41.00

SRF02 ultrasonic sensor
Part Number: R287-SRF02
Price: $26.50
Part Number: R233-USB-ADPT
Price: $16.00

Part Number: R270-USB-A-TO-B-CABLE
Price: $6.00

From Radio shack

20' 24AWG 4 Solid Conductor Intercom Wire
$6.99
Model: 278-858
Catalog #: 278-858

Multicolor Heat-Shrink Tubing (12-Pack)
$3.99
Model: 278-1610
Catalog #: 278-1610

From Digikey

CONN HEADER FEMALE 5POS .1" GOLD
Part S7038-ND
$0.46

CONN HEADER .100 DUAL STR 72POS
929665-09-36-ND
$4.93