Brighton Science Festival 2014
Raspberry Pi Workshop
Project Worksheet

Ultrasonic sensor with LED indicator lights (and a little bit of Minecraft!).

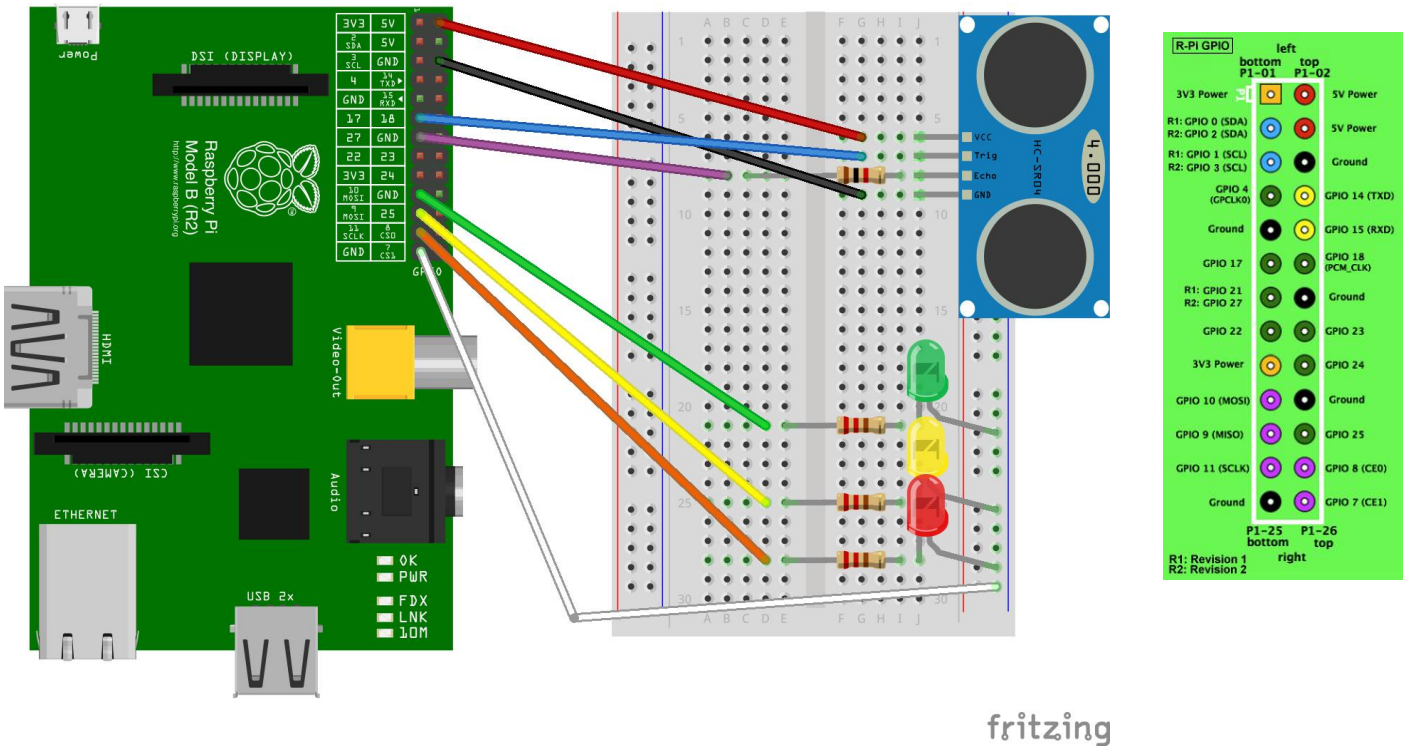
Parts List

In order to build this project at home you will need the following parts:

Solderless 400 Point Breadboard	HCPROT0025
Ultrasonic Module HC-SR04 Distance Sensor	HCARDU0047
100pcs LED 3MM and 5MM led light emitting diode in red, green and yellow	HCOPTO0009
20cm Male to Female Solderless Jumper Breadboard Wires (40 cable pack)	HCPROT0010
1K Resistors (Pack of 50)	HCREWE0011
220ohm Resistors (Pack of 50)	HCREWE0004

These can be purchased from Hobby Components (hobbycomponents.com) for a cost of about £13 plus shipping.

Circuit Diagram

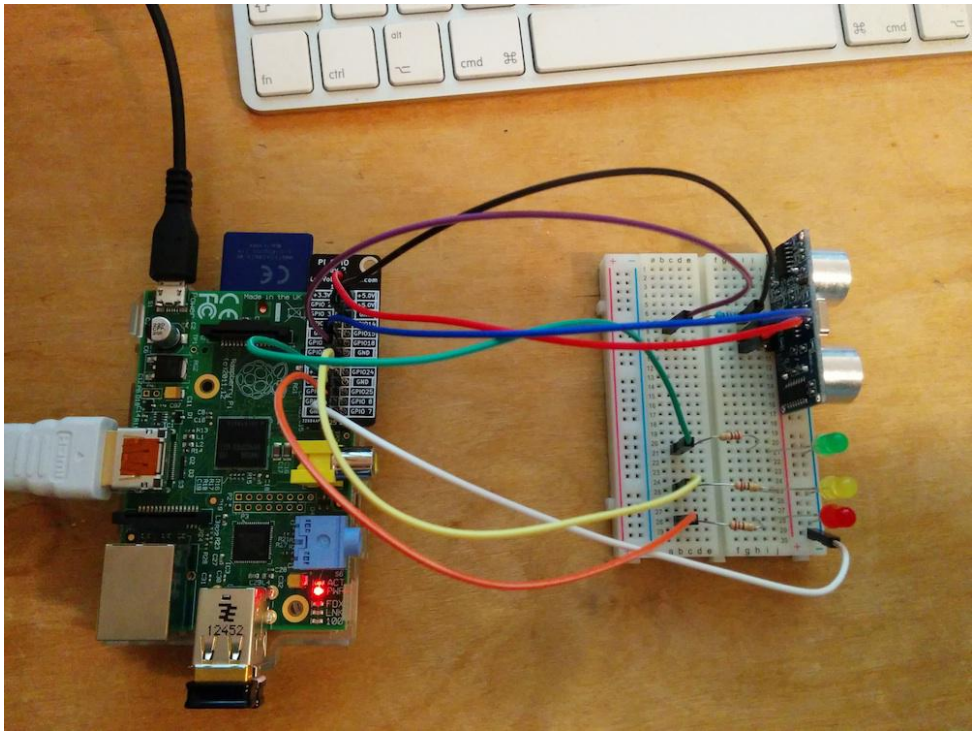


Note: You will most likely want to mount the Ultrasonic sensor the other way round and wire accordingly.

Wiring Instructions

A quick word about the electronics involved. LEDs are Light Emitting Diodes and the diode part is important for us – they only pass electricity one way, so we need to make sure we put them in the right way round. They have a long leg and a slightly shorter leg. The long leg goes to the plus side and the shorter leg to the negative (or 0v) side. In this case that is the ground rail running along the side of the breadboard.

Breadboard	Wire Colour	Raspberry Pi
Ultrasonic Sensor VCC	Red	5v (pin 2)
Ultrasonic Sensor Trig	Blue	GPIO 17 (pin 11)
Ultrasonic Sensor Echo	Purple	GPIO 27 (pin 13)
Ultrasonic Sensor GND	Black	GND (pin 6)
Green LED	Green	GPIO 10 (pin 19)
Yellow LED	Yellow	GPIO 9 (pin 21)
Red LED	Orange	GPIO 11 (pin 23)
Ground Rail	White	GND (pin 25)



Getting the Code

All the code used in this workshop can be downloaded from:
https://github.com/NeilCFord/BrightonScienceFestival/archive/master.zip

Unzipping the file will create a directory called BrightonScienceFestival-master, inside which will be two further directories, ultrasonic and minecraft, which contain the Python code. Each directory contains a file, README.md, that explains what all the files are.

Running the Code

Ultrasonic Sensor

Open a Terminal window and change directory in to the ultrasonic directory.
Run the appropriate program with sudo python *filename*.py
eg.: sudo python blink3.py

The Ultrasonic Sensor programs need to be run using the sudo command because accessing the GPIO pins requires root privileges.

Minecraft

Download and install the Minecraft-Pi files by following the instructions at http://pi.minecraft.net/
Start Minecraft-Pi following the instructions at the above link.
Open a Terminal window and change directory in to the minecraft directory.
Run the appropriate program with python *filename*.py
eg.: python clear.py

Recommended Reading

Adventures in Raspberry Pi by Carrie Anne Philbin (ISBN: 1118751256)
Raspberry Pi User Guide (Second Edition) by Eben Upton and Gareth Halfacree (ISBN: 1118795482)
The MagPi Magazine - http://www.themagpi.com/

Further Resources

Raspberry Pi Foundation (http://raspberrypi.org) - the best place to start.
Dave Akerman (http://www.daveakerman.com) - Pis in Space and so much more.
Sonic Pi (http://www.cl.cam.ac.uk/projects/raspberrypi/sonicpi/) - Making Computer Science Audible.
AirPi (http://airpi.es) - The Raspberry Pi Powered Weather Station.
Stuff About Code (http://www.stuffaboutcode.com) - Minecraft, Python and a whole heap of (good) craziness.
Raspberry Jams (http://raspberryjam.org.uk) - the global community of events for enthusiasts of the Raspberry Pi.
Pi Weekly (http://piweekly.net/) - A free weekly newsletter for Raspberry Pi news and projects – out every Friday.