CamJam EduKit 2 - Sensors - Introduction

Project Setting up your Raspberry Pi

Description Set up your Raspberry Pi and run your first python program to print "Hello World" to the screen. You will not be connecting any of the contents of the CamJam EduKit to the Raspberry Pi for this short exercise.

The CamJam EduKit 2 Worksheets

The CamJam EduKit 2 – Sensors is the second kit in the CamJam EduKit series. You can download the worksheets, for free, at http://camjam.me/edukit.

The EduKits are compatible with all flavours of the Raspberry Pi – Models A, B, A+, B+, Pi2 and PiZero.

Equipment Required

For this worksheet you will require:

- A Raspberry Pi
- An SD card to fit your version of the Pi (8GB recommended)
- Monitor & cable to connect to the HDMI or composite output of your Pi
- A keyboard and mouse
- A Raspberry Pi power supply

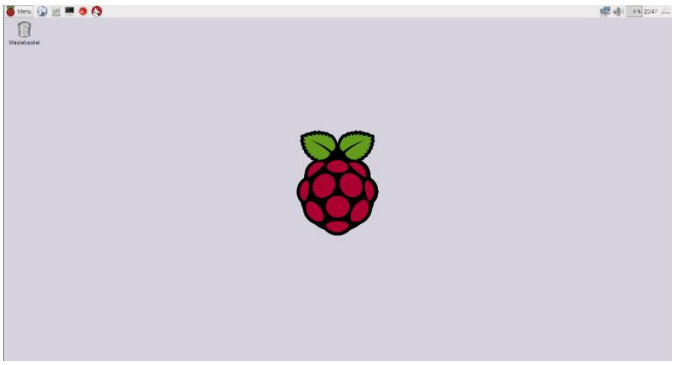
Setting up your Raspberry Pi

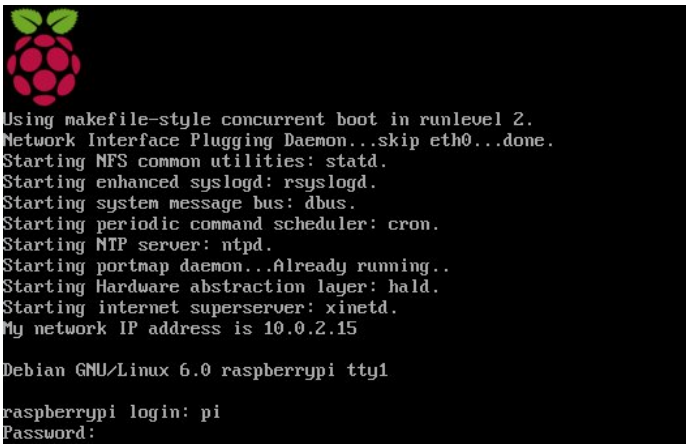
Find your Raspberry Pi.

- Plug in the SD card (or Micro SD on the A+/B+/Pi2/PiZero) with the Raspbian operating system on it.
- Plug the HDMI/video cable into the Pi and the monitor.
- Plug the keyboard and mouse into the USB ports. You may need a USB hub if you are using a Model A or A+.
- Plug in the power cable.

When all wired up it should look like the one on the right.
The A+, B+, Pi2 and PiZero will look slightly different.

After the Raspberry Pi has finished starting up, you will see either the Graphical User Interface (as in the image below left) or the 'terminal' (as in the image below right).

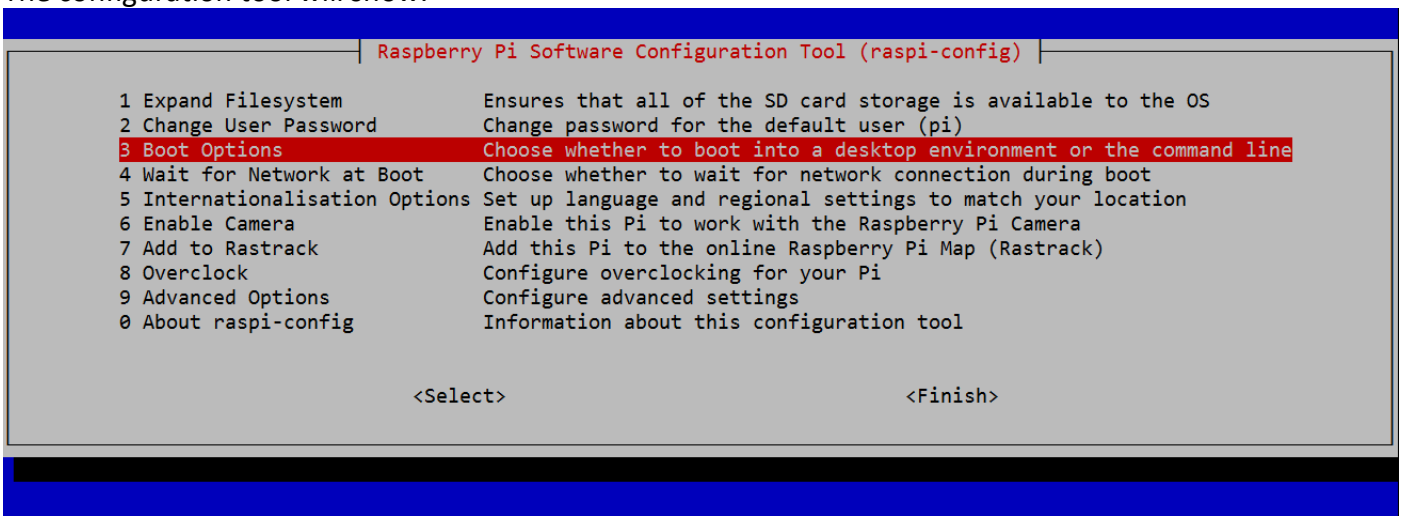




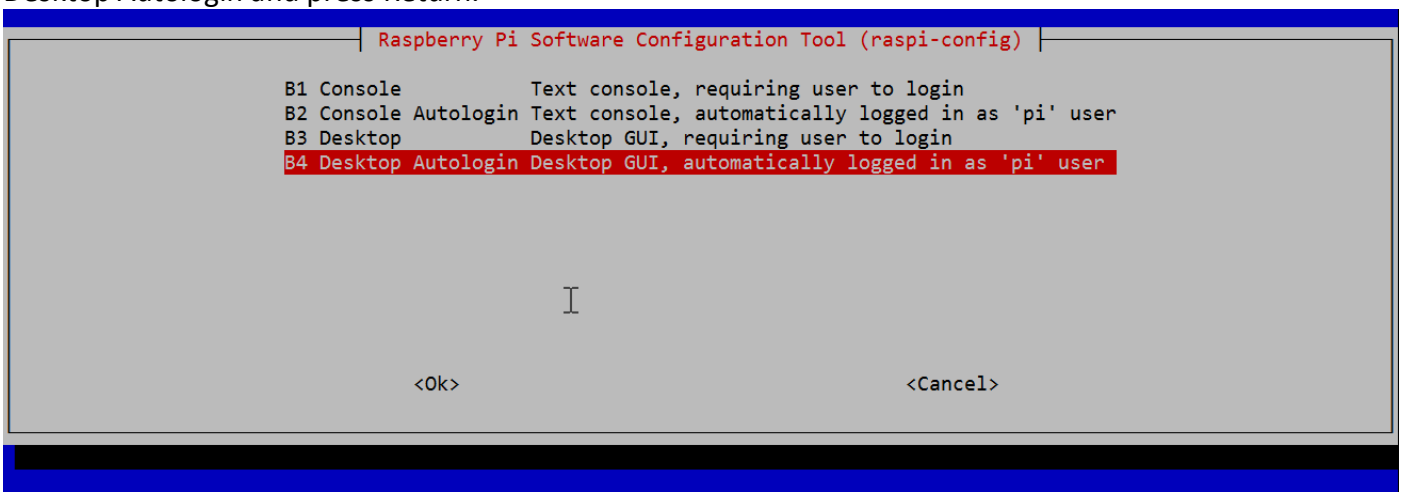
If you find yourself in Terminal mode, you are strongly advised to change to GUI mode. To get the Pi to boot straight to the GUI, type the following:

```
sudo raspi-config
```

The configuration tool will show.



Use the cursor down arrow to move down to Boot Options, and press Return. Choose the option B4 Desktop Autologin and press Return.



Use the right cursor arrow to highlight Finish to exit the tool. The next time you boot, you will be in GUI mode.

It is good to keep your Raspberry Pi's operating system up to date with the latest fixes and improvements. You can only do this if your Raspberry Pi is connected to the internet. It may take some time (perhaps up to an hour), so you should only do this when you have time. Open a terminal and type in the two commands below, one after the other, leaving each command to complete before starting the next.

```
sudo apt-get update
sudo apt-get upgrade
```

Identifying your Version of Raspbian

These worksheets have been written to be used with the Raspbian operating system, as supplied by the Raspberry Pi Foundation from their website: https://www.raspberrypi.org/downloads/raspbian/. There are two 'versions' of Raspbian available at present – called **Wheezy** and **Jessie**.

Jessie is the latest version, so the code has been written on a Raspberry Pi using that version of the operating system. You can identify which version of the OS you currently have using the command:

```
lsb_release -a
```

in a terminal window. This will return either Jessie (new) or Wheezy (old).

The Raspberry Pi comes with two versions of Python:

- Python 2.7, run using the `python` command
- Python 3.2, run using the `python3` command

When the Raspberry Pi was first released, some of the important Python 'libraries' (that provide additional functions in Python) were only available for Python 2.7. However, almost every library, and all the ones used in these worksheets, are available for Python 3.2. It has been decided that all code for this EduKit will be developed for Python 3.2.

All code will work on all versions of the operating system, but there is one difference that you need to be aware of:

- **Jessie** is able to access the GPIO pins in Python as a standard user. Therefore, to run Python code that includes GPIO, you only need to type the following into a terminal window:
  ```
  python3 yourcode.py
  ```
- **Wheezy** requires Python to be run as the privileged 'Super User' if the code accesses the GPIO pins. Therefore, to run Python code that includes GPIO you only need to type the following into a terminal window:
  ```
  sudo python3 yourcode.py
  ```

Setting up your Raspberry Pi for the EduKit

If you have updated your operating syetem with the above commands, or if you think you have the latest version of Raspbian (the OS) then you need to do the following to update the configuration and allow you to use the temperature sensor.

Open up a terminal window.

You need to edit the 'boot configuration' file using the 'nano' editor:

```
sudo nano /boot/config.txt
```

add the following line to the bottom:

```
dtoverlay=w1-gpio,gpiopin=4
```

To save the file in the file, type “Ctrl + x” then “y” then “enter”.

For the changes to take effect you will need to reboot using:

```
sudo reboot
```

Writing Code

You are now going to create your first small piece of Python code that will simply print “Hello World” to the screen.

First, you are going to create a directory where the code for the EduKit worksheets will be stored. If you are in GUI mode, open a Terminal window by choosing XTerminal from the Menu (under Accessories).

Type in the following commands, pressing the ‘return’ key at the end of each line.

`cd ~` - Changes to your home directory.

`mkdir EduKitSensors` - Makes a new directory called ‘EduKitSensors’.

`cd EduKitSensors` - Changes to the ‘EduKitSensors’ directory.

If you are in Terminal mode, or if you prefer to use ‘nano’ as your editor, then type the following into the terminal:

`nano 1-helloworld.py` - Opens the ‘nano’ editor with the name ‘1-helloworld.py’

If you prefer to use IDLE as your editor, open ‘Python 3 (IDLE)’ from the Menu (under Programming), and create a file using the IDLE menu item ‘New file’ in the File menu (or use Ctrl+N).

Type in the following code exactly as seen into your preferred editor:

```
#Print Hello World!
print("Hello World!")
```

Everything on the same line after a ‘#’ is a comment and will be ignored by Python.

To save the code in in nano, type “Ctrl + x” then “y” then “enter”.

“Ctrl + x” tells nano that you want to exit. It will ask you whether you want to save the file, to which you answer ‘y’ for ‘yes’.

It will then prompt for the name of the file, which was set when you opened the file. Just press the “enter” key to take the default.

If you’re using IDLE, save the file in the EduKitSensors directory.

Running the Code

Running the code will depend on whether you are running in Terminal or GUI mode.

	Make sure you are in the EduKitSensors directory using the following command:
	`cd ~/EduKitSensors`
	To run this code type:
	`python3 1-helloworld.py`
	You will see it print "Hello World!" to the terminal window.

	In IDLE, select the menu option Run > Run Module, or press F5. You will see "Hello World!" printed to the Python Shell.

Conventions used in these Worksheets

Throughout these worksheets it is assumed that you are using Raspbian (Jessie), and you are editing your code with the Python 3 IDLE editor. If you use the same, then you can follow the instructions exactly as they appear. If not, then remember the following:

- If you have Raspbian (Wheezy), then you need to open the IDLE editor as the 'super-user' so that you are able to run the code from within the editor. Open a terminal window by choosing XTerminal from the Menu (under Accessories) and type:
  `sudo idle3 &`
  You can now close the terminal window.
- If you are using Raspbian (Jessie) and prefer to use the XTerminal 'nano' editor to edit your code, then follow the example in the section above.

Notes

If you are viewing these worksheets on your Raspberry Pi, you should not copy and paste any of the code from the worksheets as the spacing will not necessarily be pasted and the code will not always work. Instead, type it in or download the code from GitHub with the instructions below.

The indentation at the beginning of Python code is important – it is Python's way of recognising how code should be grouped in 'conditions', 'loops' and 'functions'.

Downloading the EduKit Code from GitHub

The code written for the CamJam EduKit, and listed in the worksheets, is also stored on GitHub. Follow these instructions to download any or all of the EduKits' code.

GitHub Repository

The EduKit repository can be found online at https://github.com/CamJam-EduKit. You may download the individual files or the whole repositories from there.

Installing Git

Before you can 'clone' the code from GitHub, you must first install the GIT tool on your Raspberry Pi. To do this your Raspberry Pi must be connected to the internet. Open a terminal window and first update the Pi repository using:

```
sudo apt-get update
```

Then install GIT using:

```
sudo apt-get install git-core
```

Downloading to the Raspberry Pi

The EduKit code directory can be downloaded using the following command:

```
cd ~
git clone git://github.com/CamJam-EduKit/EduKit2.git
```

The code will be stored in the `Code` subdirectory under the `EduKit2` directory.