Pi Way Code – Plant Pot Monitor

Guide to construction

List of items

Items required, other than the Raspberry Pi and SD Card running Raspbian.

- Full-size solderless breadboard (£4.20)
- Thirty female-to-male jumper wires (£5.40)
- Male-to-male jumper wires (various lengths) (£4.80)
- MCP3008 - 8-Channel 10-Bit A/D Converter with SPI Serial Interface (£1.80)
- Two DFRobot Soil Moisture Sensors (£9.90)
- Assorted LED Pack (£4.30)
- Solid core bell wire – 3 colours (£8.10)
- Resistors (£0.50)

Total component cost: £39.00

Instructions for making the product

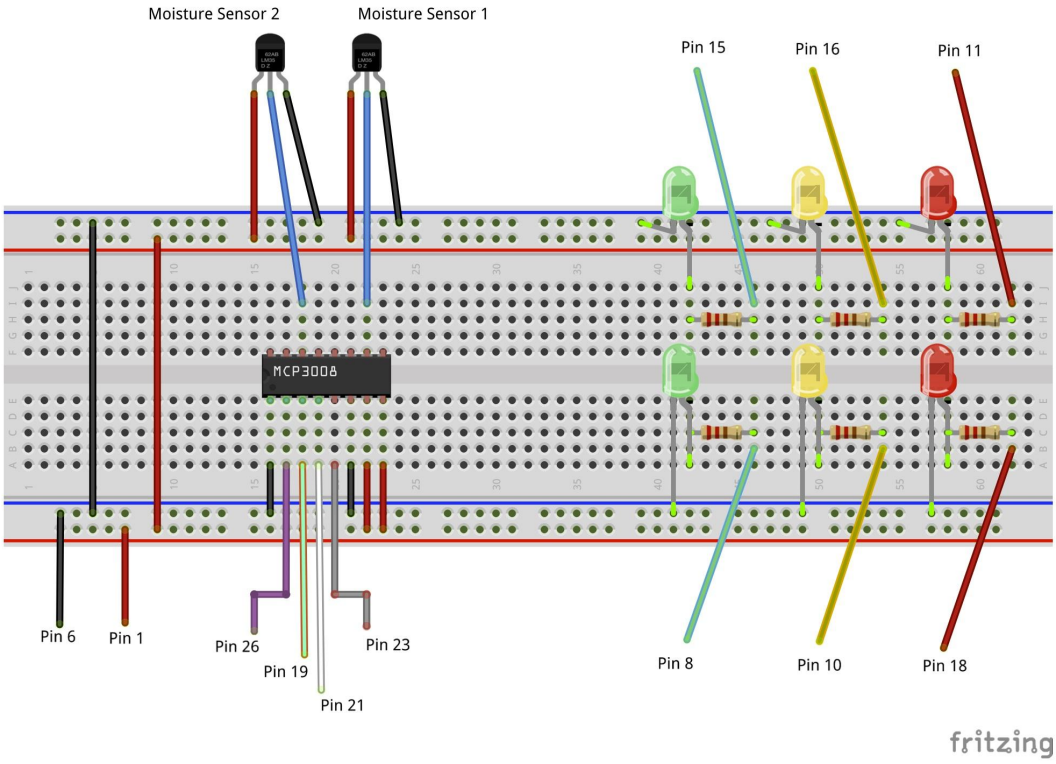
1. Start with a fresh install of the Raspbian OS.
2. Enable the SPI kernel module using raspi-config.
3. Install the Python SPI module, py-spidev, as follows:

```
sudo apt-get install python-dev

mkdir py-spidev
cd py-spidev
wget https://raw.github.com/doceme/py-spidev/master/setup.py
wget https://raw.github.com/doceme/py-spidev/master/spidev_module.c

sudo python setup.py install
```

4. Clone the Pi Way Code GitHub repository:

```
git clone https://github.com/StMarys-CofE-PrimarySchool/PiWayCode.git
```

5. Wiring the MCP3008 and sensors



Step 1: Power and Ground Rails
To help describe the connections from the header please refer to this wire colour table. Each cell in the table refers to a pin on the Raspberry Pi header.

2	4	6	8	10	12	14	16	18	20	22	24	26
1	3	5	7	9	11	13	15	17	19	21	23	25

Connect pin 1 to the positive rail and pin 6 to the ground rail of the breadboard.

Step 2: MCP3008
Important: The chip must be located over the valley in the breadboard with the pin 1 indicator, the indentation, top right.

Refer to this wire colour table when wiring up this chip:

CH7	CH6	CH5	CH4	CH3	CH2	CH1	CH0
DGND	CS	DIN	DOUT	CLK	AGND	VREF	VDD

All the connections from the rails and the header to the MCP3008 chip go neatly along the bottom row of the chip in this orientation. First connect the power and ground as show in the photo above:

Ground rail to DGND

Ground rail to AGND
Power rail to VREF
Power rail to VDD

Next, connect the Raspberry Pi SPI header pins to the chip:

Header 26 to CS
Header 19 to DIN
Header 21 to DOUT
Header 23 to CLK

Step 3: Sensors

The sensor wiring is simple; there are three connections to make:

Sensor blue to CH1
Sensor red to power rail
Sensor black to ground rail

Repeat as follows for the second sensor:

Sensor blue to CH5
Sensor red to power rail
Sensor black to ground rail

6. Wiring the LEDs
Refer to the wiring diagram and pin table above as you complete these steps.

Step 1: Resistors

Fit the 6 resistors to the breadboard. You may wish to cut them down so that they lie flush with the breadboard.

Step 2: LEDs

Fit the green, yellow and red LEDs to the breadboard. Check that the longer leg of each LED you fit is closest to the resistor.

Fit the red, yellow and green wires from the breadboard to the GPIO of the Raspberry Pi. These wires are marked as pin 8, pin 10, pin 11, pin 15, pin 16 and pin 18 on the layout diagram.

User guide

1. Power on the Raspberry Pi.
2. Run the program as follows:

```
cd PiWayCode
sudo python plantpotmonitor.py
```

3. When the red LEDS light up you are ready to begin.
4. Place the sensor/s in a plant pot of soil.
5. The code is set-up to check the moisture level every 10 seconds so you can leave the sensors in the pot.

What do the LED lights mean?

RED	The sensor is not in a pot (this is the default colour). When the sensor is in a pot, the soil needs watering.
YELLOW	The soil is near to needing a watering.
GREEN	The soil has enough moisture.
RED & GREEN	The soil has TOO MUCH moisture.