



Soil Moisture Meter

Graphs and a bit of maths

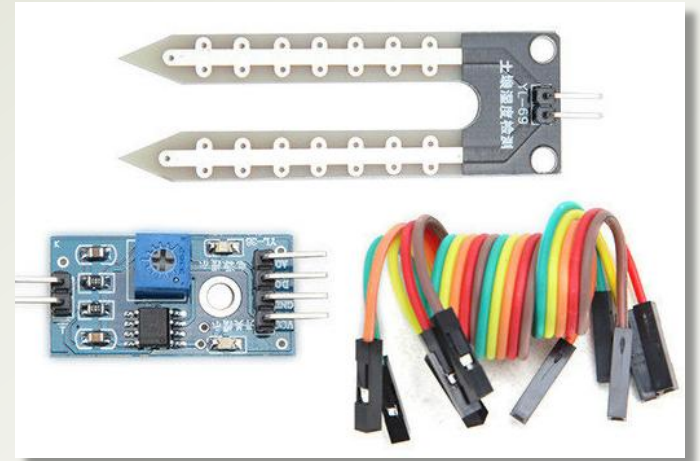


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Our situation and the problem

- Our sensor reads:
 - 0 when very wet
 - 500 when moist
 - 1000 when very dry



- Amazon sensor indicates:
 - 10 when very wet
 - 5 when moist
 - 0 when very dry

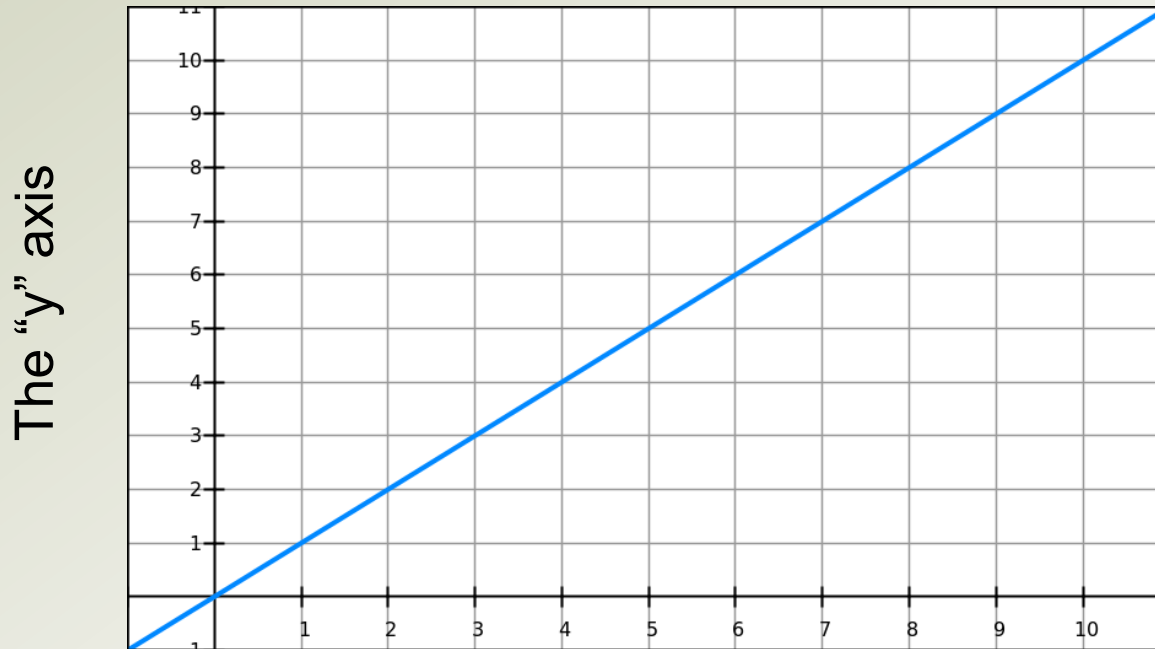


Our situation and the problem

- Our sensor readings range from 0 to 1000
- They need to be scaled to give 10 to 0
- i.e. 1000 becomes 0
500 becomes 5
100 becomes 9
0 becomes 10

Back to basics with graphs

- A straight-line or linear graph

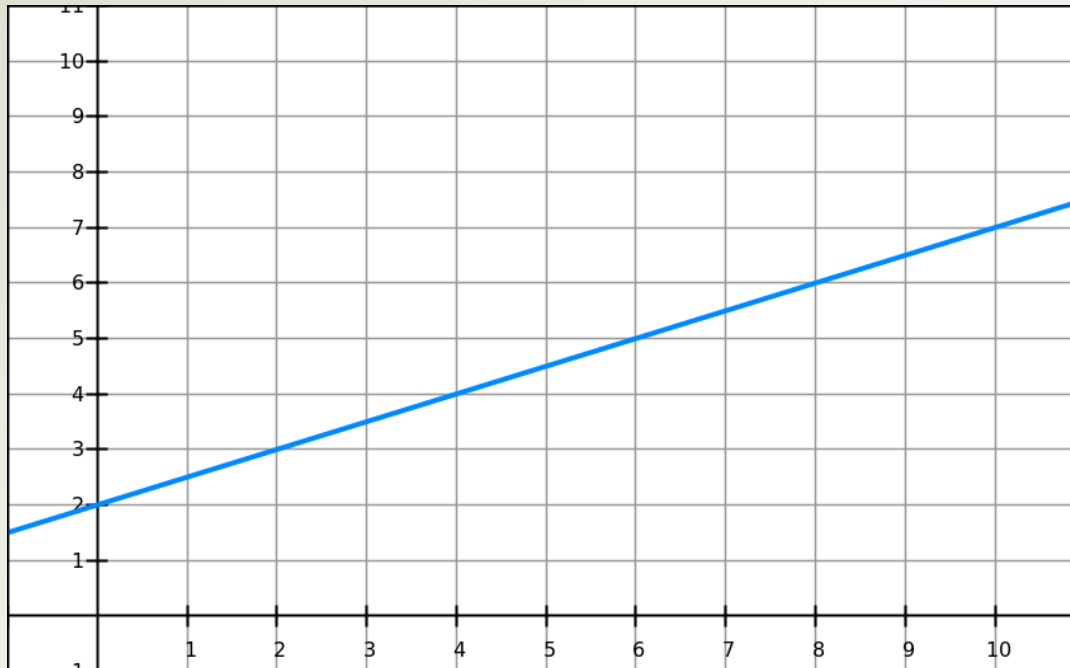


This is the “x” axis (independent variable)

- Formula is: $y = x$

Back to basics with graphs

- General formula is: $y = mx + c$
 - *'m' is the scaling factor*
 - *'c' is the offset*



- This graph plots: $y = 0.5x + 2$

Scaling factor

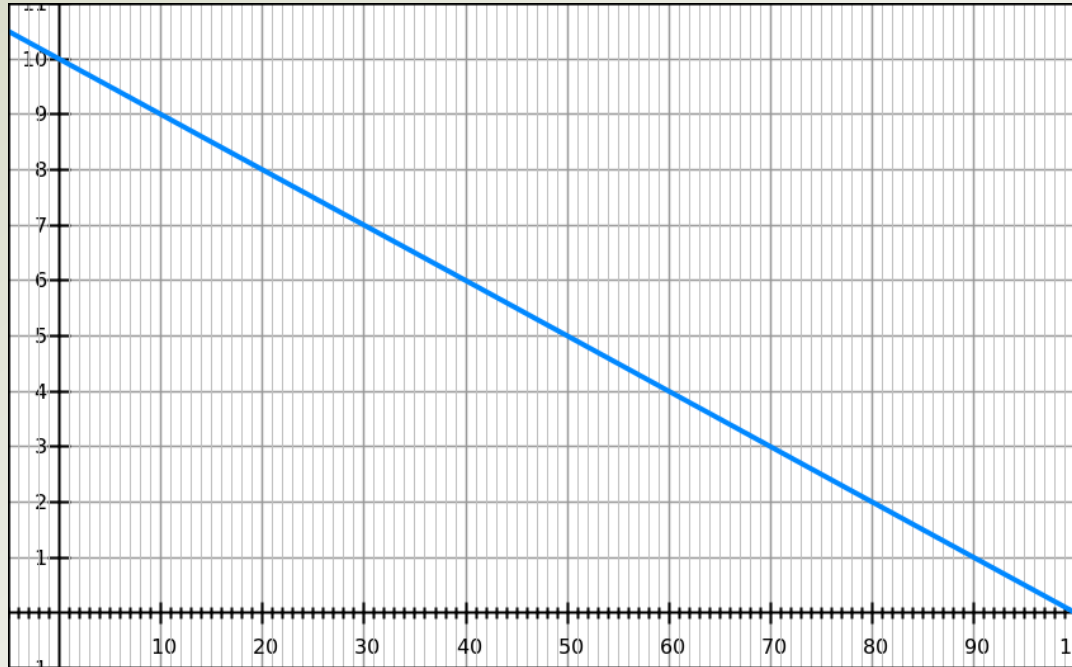
- Input range is 0 to 1000
- Output range is 0 to 10
- So the scaling factor is $1/100$
(i.e. 1 divided by 100)
- So the formula is something like:

$$y = x/100$$

(i.e. x divided by 100)

The number range is reversed

- This indicates a graph with a negative slope



Note: Values on the “x” axis should be multiplied by 10

- Some fixed number minus the value of ‘x’

Mathematical solution

- The solution can be expressed in two ways
- $Y = 10 - (x/100)$
- $Y = (1000 - x) / 100$
- Try it out
Enter a value for 'x' between 0 and 1000
and see what value you get for 'y'

Using firmware to do the maths

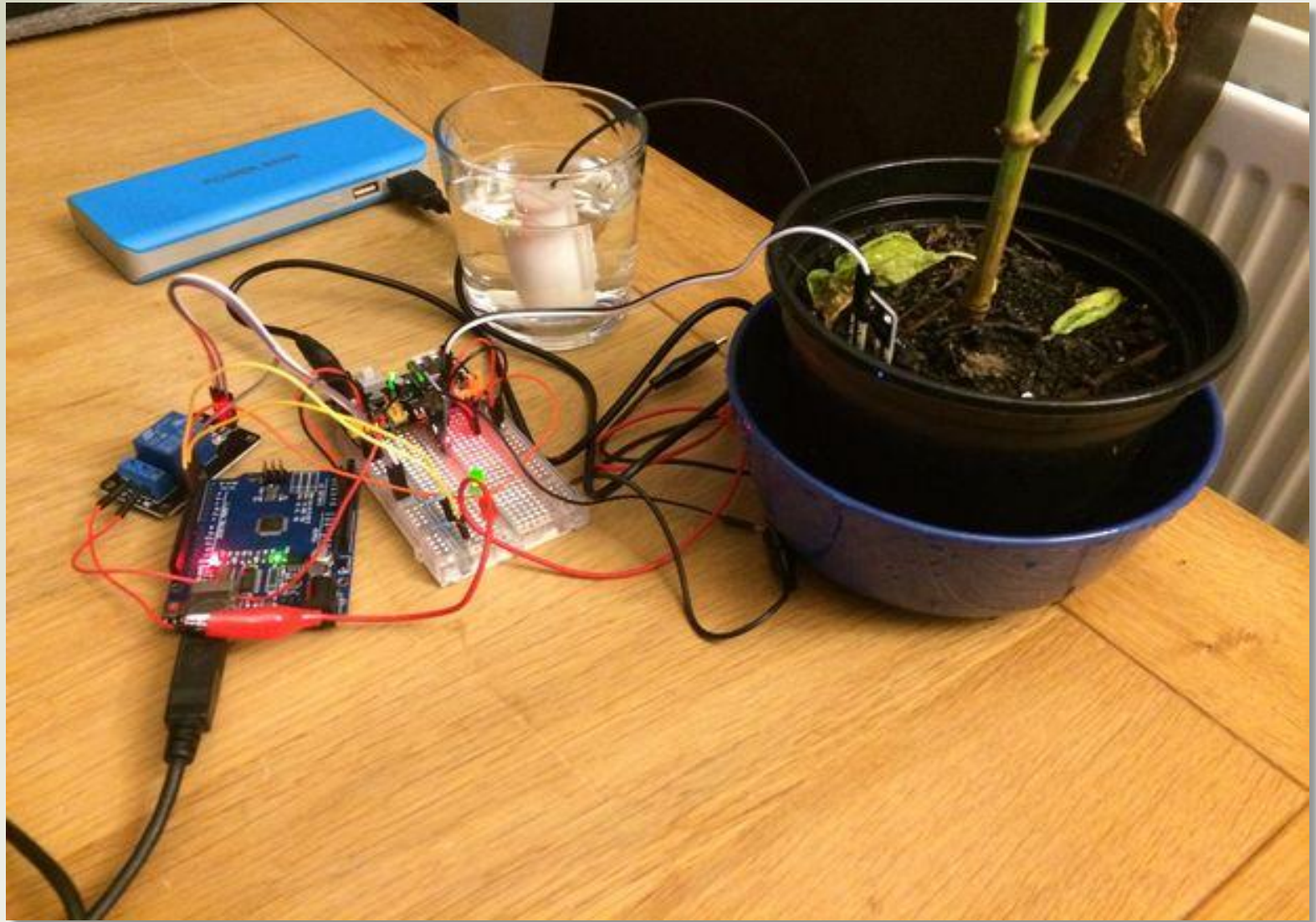
- Devices connected to 'wemos'
 - ▣ Soil moisture sensor (analogue to digital)
 - ▣ Organic LED panel (to show readings/messages)

| < | > | Task | Enabled | Device | Name | Port | Ctr (IDX) | GPIO | Values |
|------|---|------|---------|------------------------|------|------|-----------|------------------|---------|
| Edit | | 1 | ✓ | Analog input | soil | | 1 | ADC (TOUT) | paw: 10 |
| Edit | | 2 | ✓ | Display - OLED SSD1306 | oled | | | GPIO-4 GPIO-5 | |

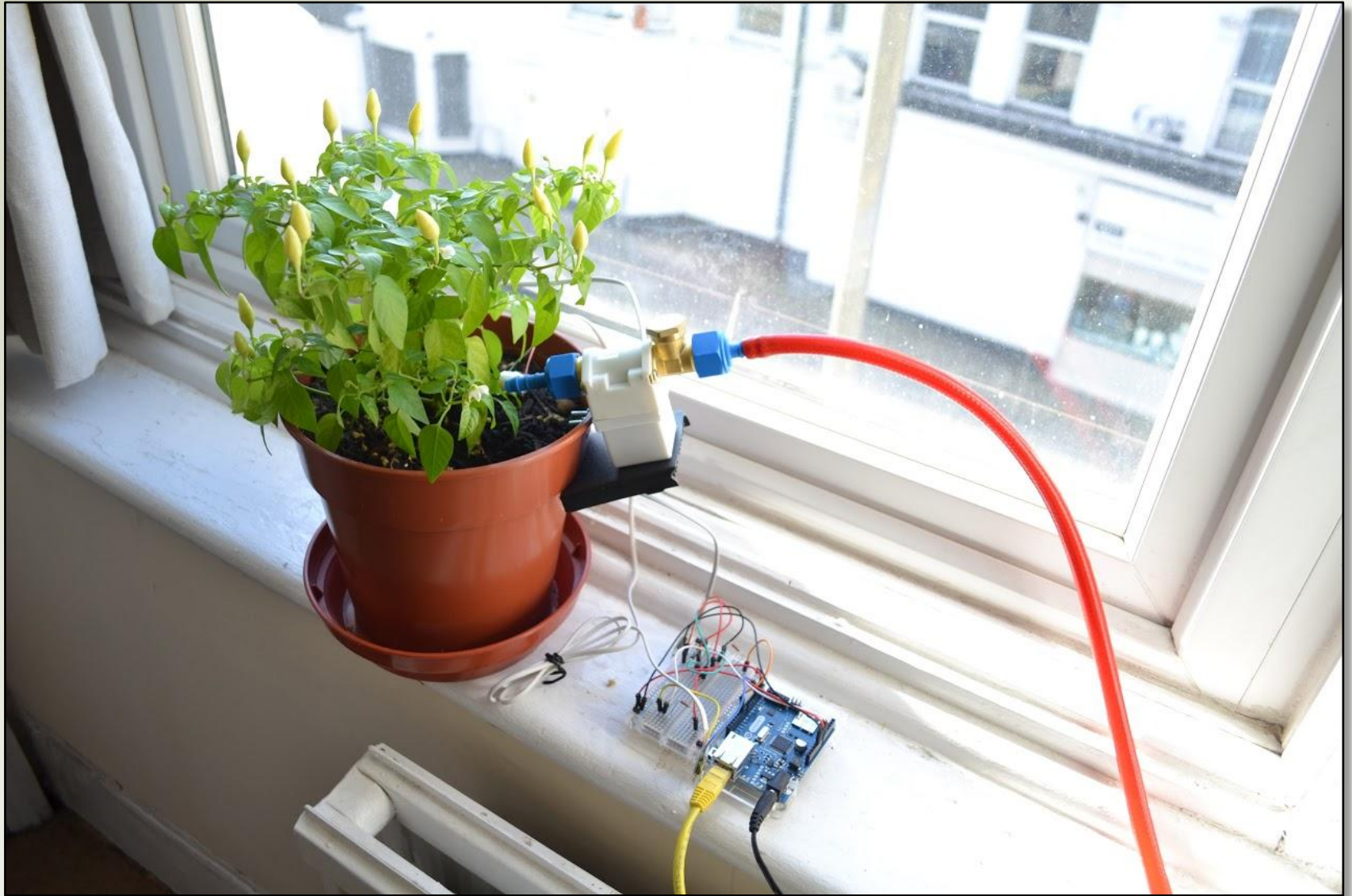
- Getting the 'wemos' device to do the work

| Values | | | |
|--------|------|--------------------------|----------|
| Value | Name | Formula ? | Decimals |
| 1 | paw | $(1000 - \%value\%)/100$ | 0 |

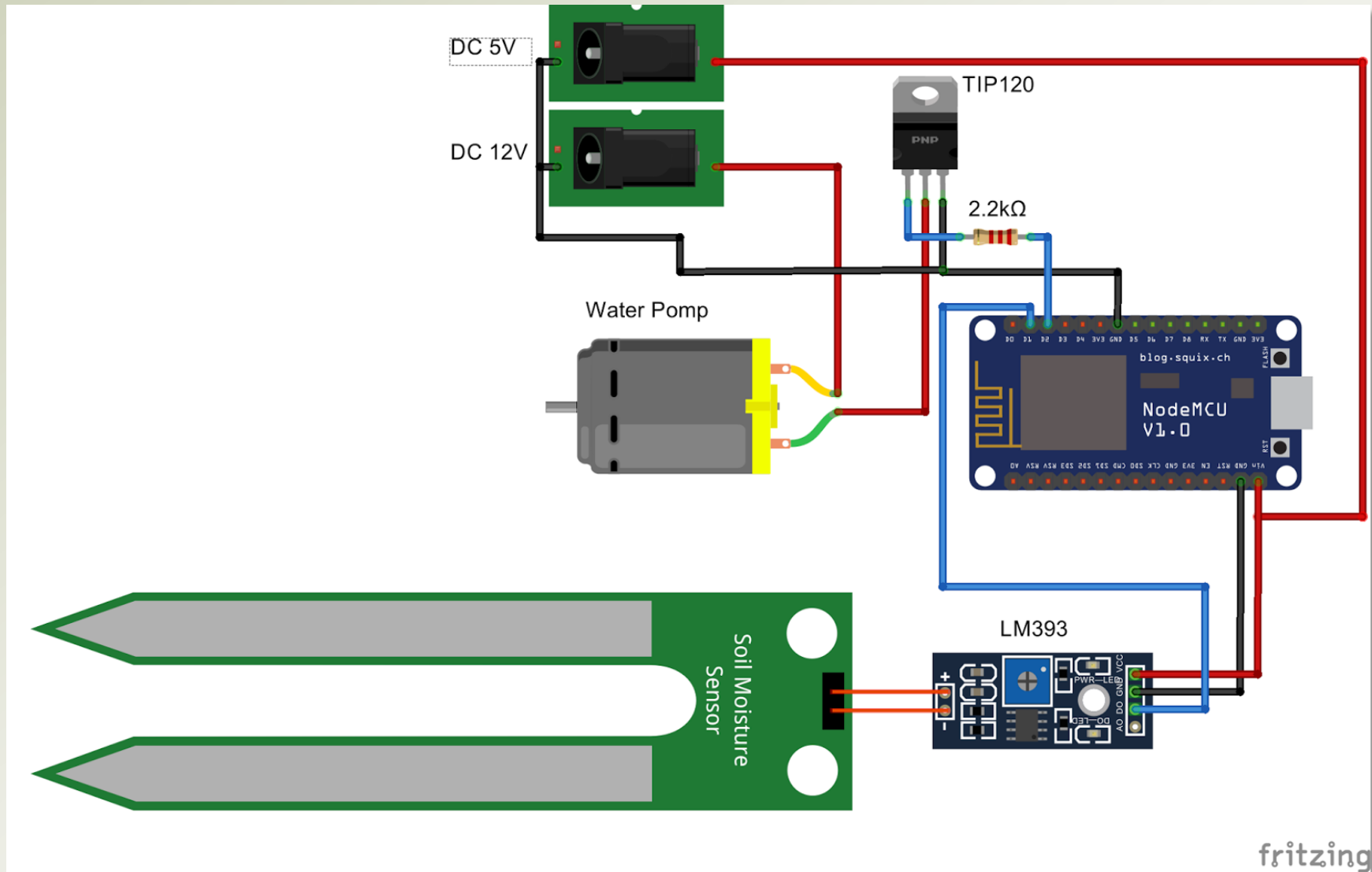
A possible future Node-Red project



A possible future Node-Red project



A possible future Node-Red project



Conclusion

- Graphs are very useful to visualise information
- A formula can be expressed mathematically
- Computers love dealing with numbers & maths

