1   Introduction

⭕ Objective:

★ Bonus:

2   Requirements

water proof ruler

3   Water Level Sensor

Much of the information and the images for this sensor can be found on this Last Minute Engineer page[**LME˙water˙sensor**].

1. Introduce water level sensor
2. Discuss how they work using electrical conductivity
3. Build circuit
4. Program **

   Use serial comm to return and plot values
5. Experiment

   Create a chart for sensor outputs based on water level

   Is the relationship linear?
6. Introduce if-statements

   Can you use if-statements to make LEDs turn on/off as the water level changes?
7. Use different salinity of water to mess with their systems
8. Experiment

3.1   How it works

Water is electrically conductive

   This sensor uses an electrical signal to indicate a water level. As the water in the jar rises, more and more of the sensor is going to be covered. As the sensor gets covered,

it is able to output a high voltage signal. We can measure this analog voltage signal to calculate the amount of water in the jar.
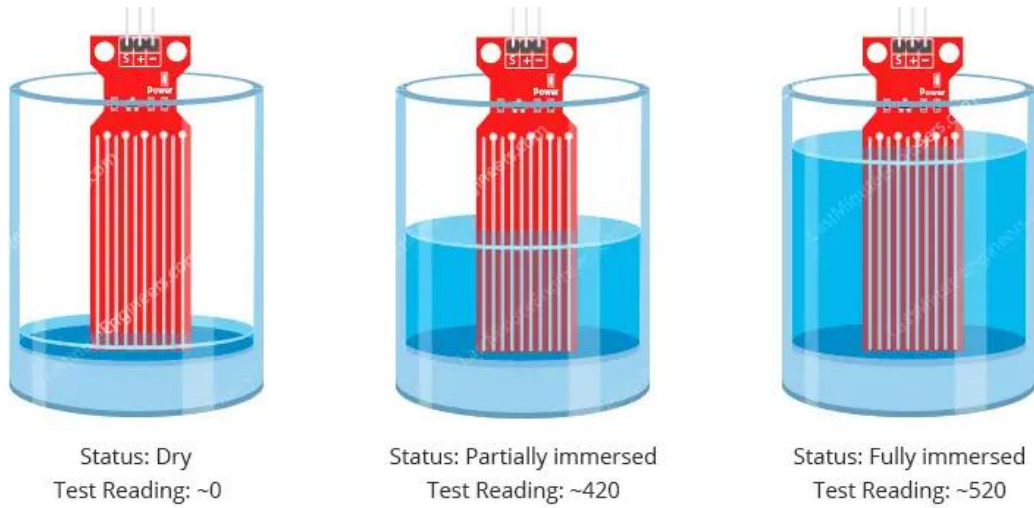

Figure 1: Sensor response to different water levels.

3.2   Circuit

The circuit for this sensor is fairly simple. All we need to do is provide a ground and power source to make it work, and then a connect a wire from the sense pin on the sensor to an analog pin on the Arduino.
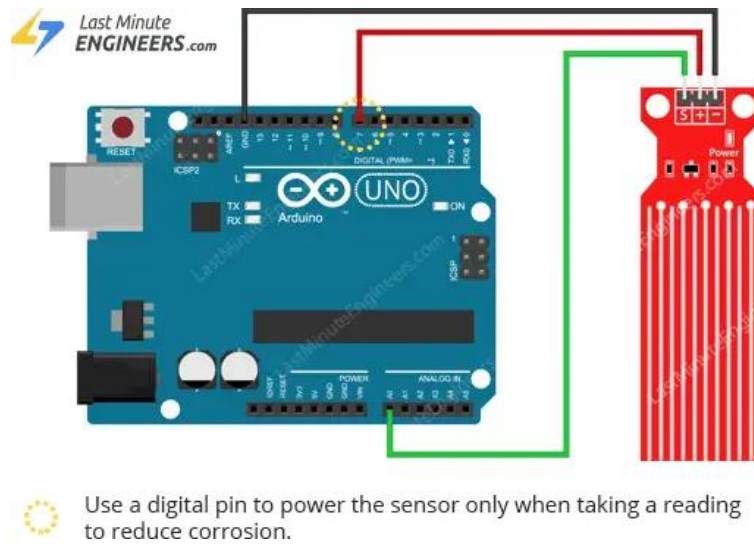
Use a digital pin to power the sensor only when taking a reading to reduce corrosion.

Figure 2: Sensor response to different water levels.

3.3 Program

3.4 Experiment

We are going to perform an experiment with this sensor.

◯ Objective: Create a chart of the sensors output for a range of different water levels in the cup. You can use Google Spreadsheets to record your results.

★ Bonus:

3.5 If Statements

◯ Objective: Add 3 LEDs to your circuit: a green, yellow and red one. Make the LEDs turn on only when:

1. Green - the cup is 1/4 full or more
2. Yellow - the cup is 1/2 full or more
3. Red - the cup is 3/4 full or more

Use pins 9, 10 and 11 to control your 3 LEDs.

★ Bonus (A big challenge!): Can you make the LEDs progressively light over their ranges? You will need to use the map function and PWM output to make this work. For example, the yellow LED should remain fully off until the green LED is at full brightness when the cup is 1/4 full. Then, as the cup fills up from 1/4 → 1/2, the yellow LED should progressively get brighter and brighter.

1.

4   Ultra-Sonic Range Finder

4.1   How it works

The ultrasonic sensor is capable of measuring distances between 2 cm and 400 cm (4 meters). It does this by emitting a short sound wave and listening for an echo. The duration of time between the initial sound pulse and the echo can be used to determine how far away the object is.

4.2   Circuit

4.3   Program

4.4   Experiment

5   Line Detector

5.1   How it works

5.2   Circuit

5.3   Program

5.4   Experiment