How to prepare you bath **easier**?

An Arduino Tutorial: The Smart Bathtub Solution

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Table of contents

INTRODUCTION

LIST OF MATERIALS

TUTORIAL

INSTRUCTION

Introduction

Did you ever want a hot bath when you are exhausted?

- But you forgot to turn the bathtub's tap off and it wasted a lot of water…..
- The water temperature was too high so you have to wait a few minutes…..
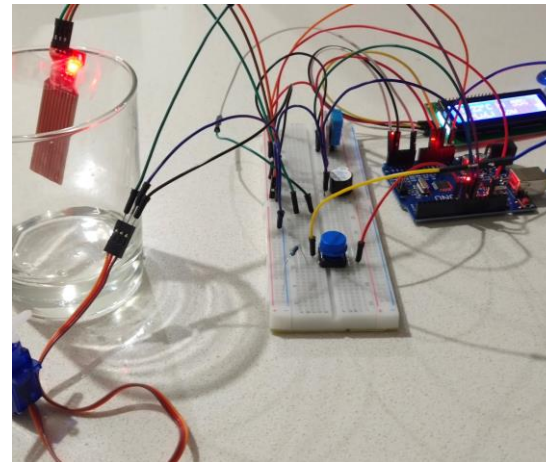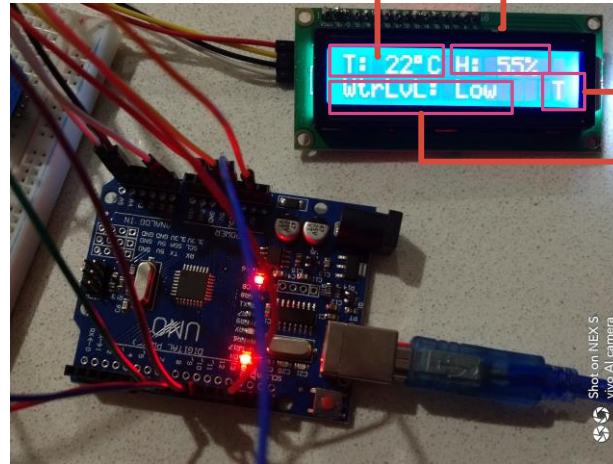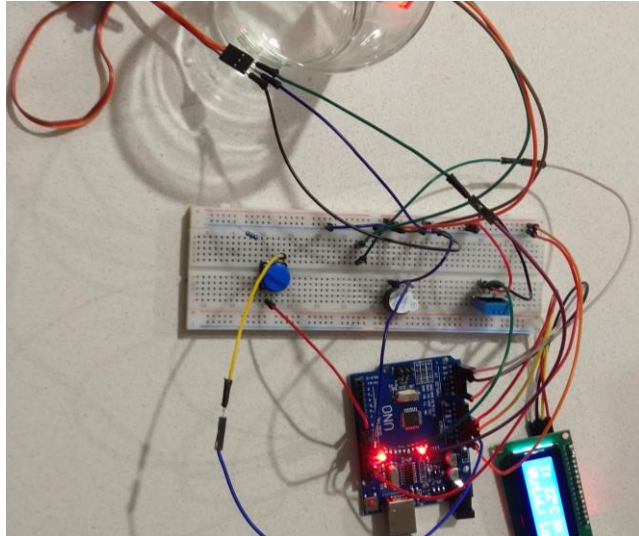
Well, This Arduino tutorial is your low-budget solution!

It is a smart device that can:

- Detect the water level and make an alarm when water is filled up.
- Display the room temperature and humidity.
- Automated tap control so you do not have to turn off the tap yourself.
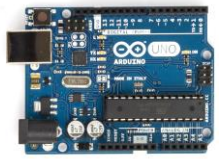- (Optional) Water temperature display.

when ur bath water is too hot and u burn urself

Temperature(in Celsius) Humidity
Water Level   Alarm status(T/F)

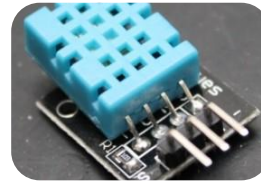The product

Arduino UNO R3 microcontroller board x 1

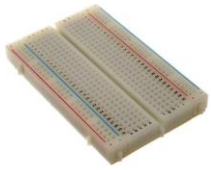1602 LCD Display with I2C modulex 1

Water level sensor x 1
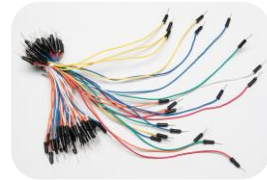
Buzzer x 1

DHT11 temperature and humidity sensor x 1

Breadboard x 1

SG90 Servo x 1

Jumper wires x 25

Male-to-Female wires x 10

USB cable for Arduino x 1

Button x 1

Water proof temperature sensor x 1(Optional)

A Computer with internet access

1k Ω Resistor x 1

What you will need:

Tutorial Overview

The tutorial contains two parts:

1. Hardware setup.(7 steps)
2. Arduino coding.
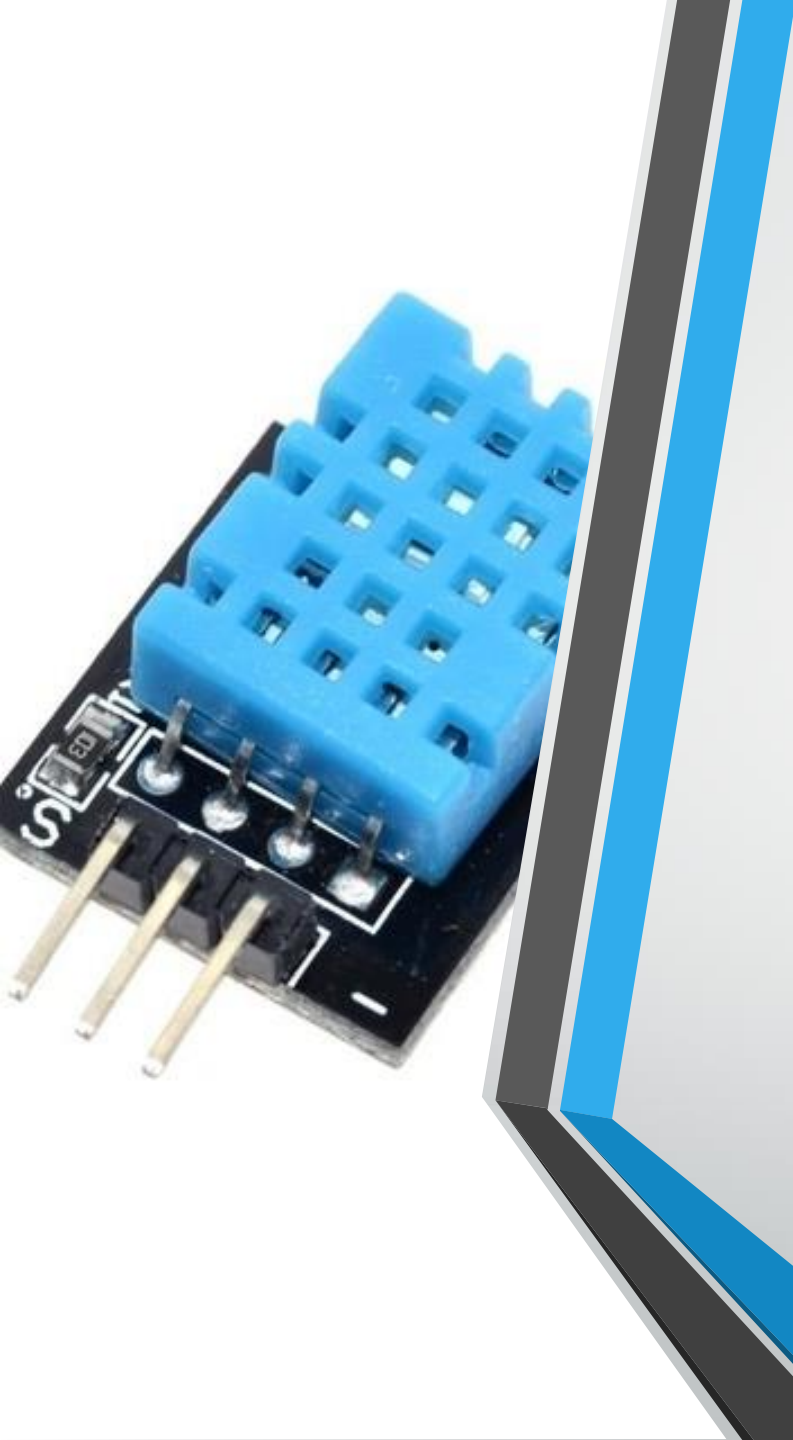
Tutorial: Hardware

- Step 1: Connect the Arduino board with your breadboard.

    - 5V output to the positive of breadboard.

    - GND to negative of breadboard.

- Step 2: Connect the water level sensor.

    - + to the positive on breadboard.

    - - to negative of breadboard.

    - S is the signal output, which should be connected to Ao in Arduino.(Analog IN)
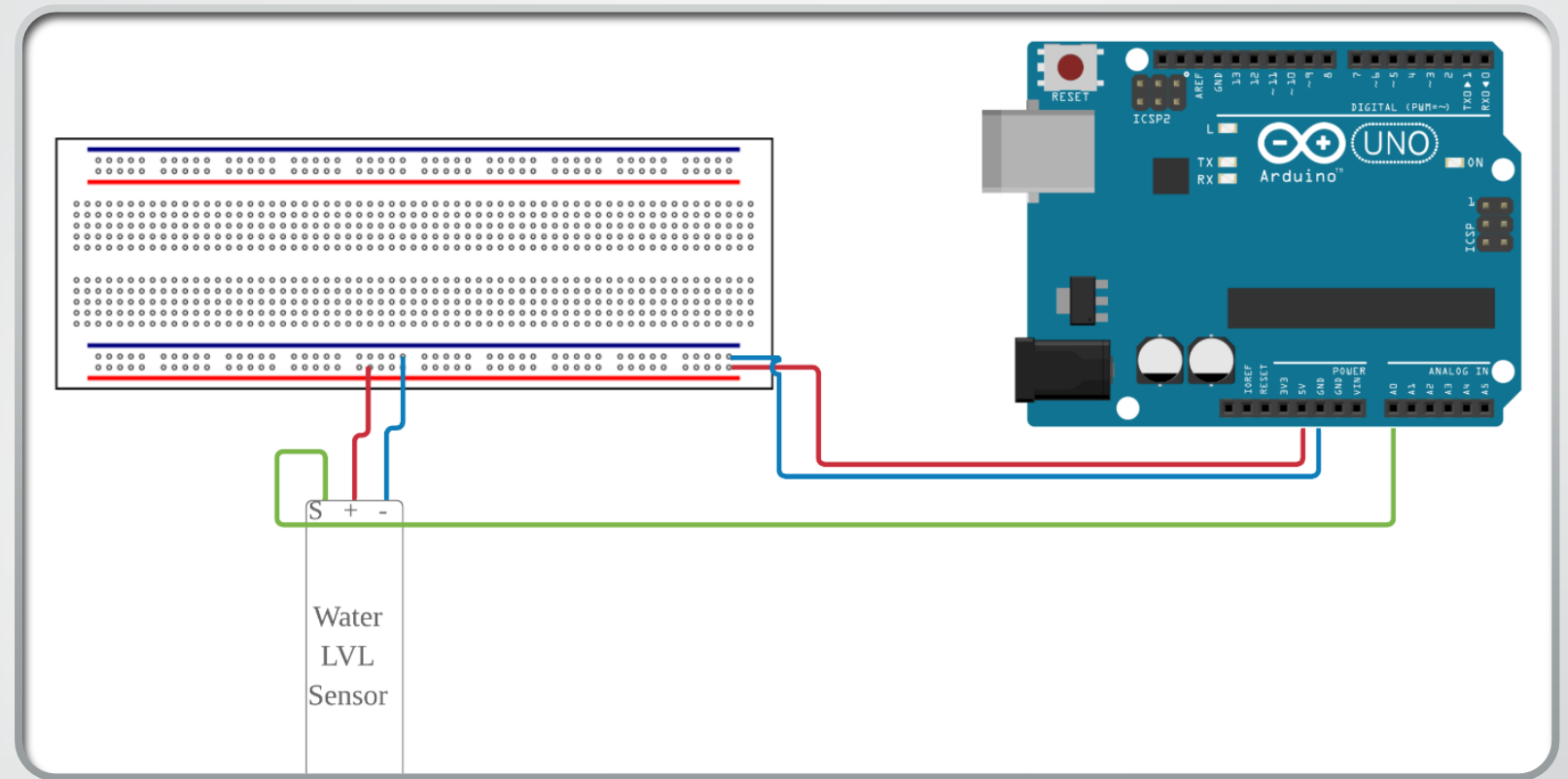
Tutorial: Hardware

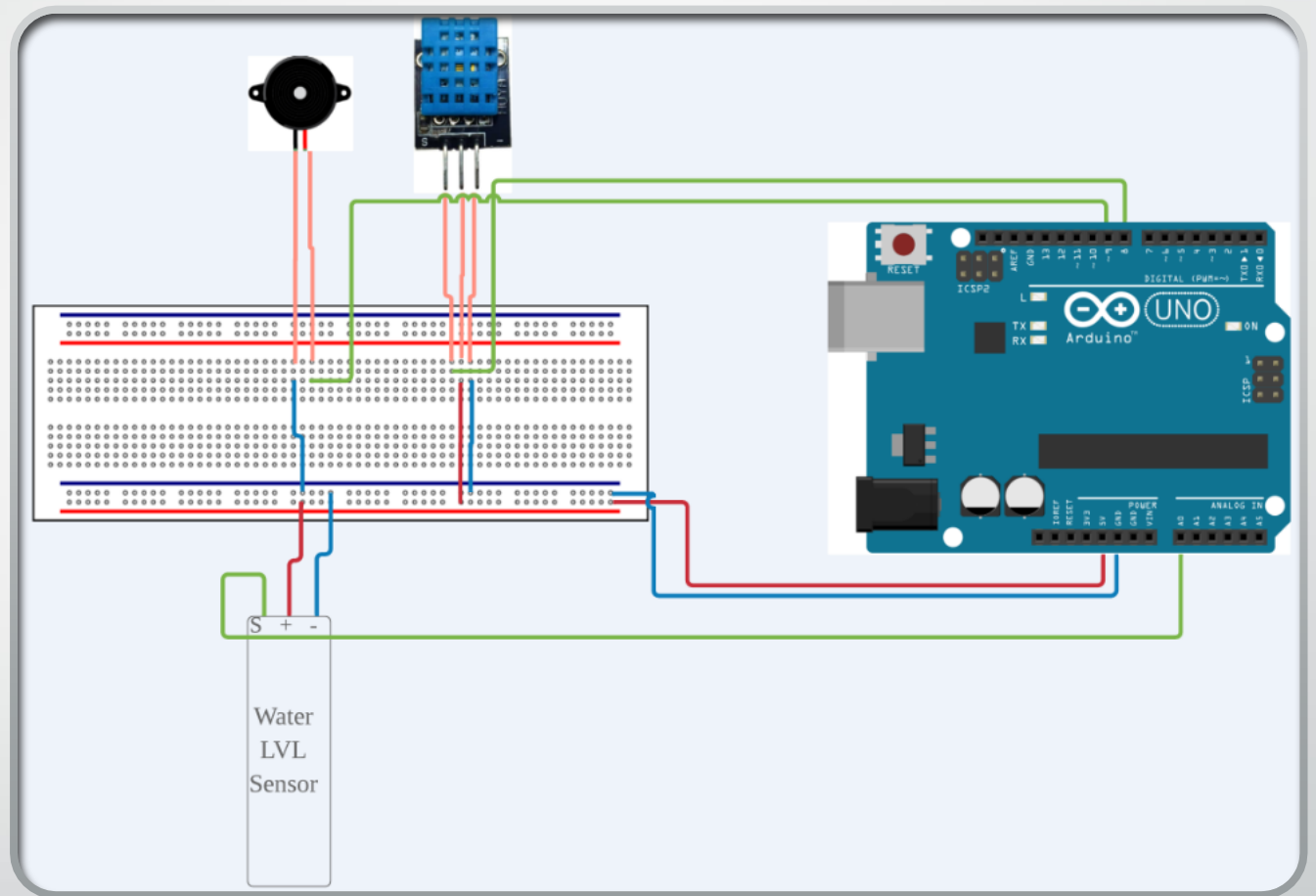# Tutorial: Hardware

- Step 3:Connect the DHT 11 temperature and humidity sensor.

  - Insert the module to breadboard.

  - Like water level sensor, connect the + and -.

  - Connect the S with PIN 8 in Arduino.

  - Note:

    - If you look at the side with 'blue block', you will see at the bottom has marked two of the pins.

    - The left one is S, right one is -. Which means the middle one is +.

Tutorial: Hardware

- Step 4: Connect the buzzer.
  - Plug it into the breadboard.
  - The longer 'leg' of the buzzer is positive. Connect it to PIN9 in Arduino
 - Connect the – on the breadboard

Tutorial: Hardware

- Step 5: Connect the SG90 Servo.
  - The SG90 servo has 3 wires.
  - The **yellow** one is signal, connect it to PIN 10 on Arduino.
  - **Red** is positive.
  - **Brown** is negative.
  - Connect the + and – on breadboard.

Tutorial: Hardware

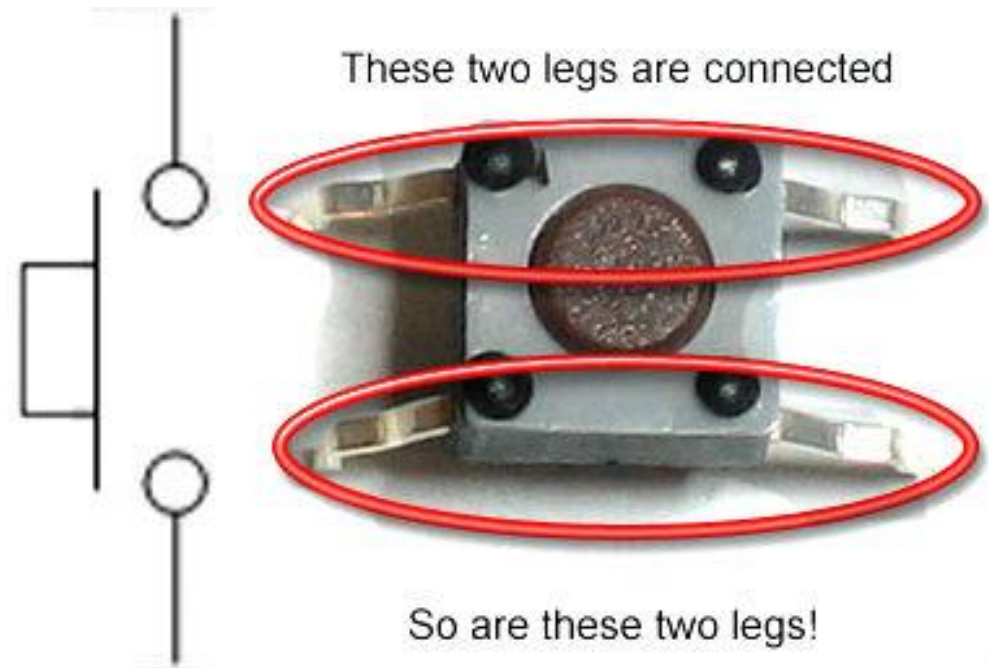- Step 6:Connect the 1602 ICD display(with I2C module)
  - The I2C board has 4 inputs.
  - Connect GND to the negative on breadboard.
  - Connect VCC to the positive on breadboard.
  - Connect SDA to A4 on Arduino.
  - Connect SCL to A5 on Arduino.
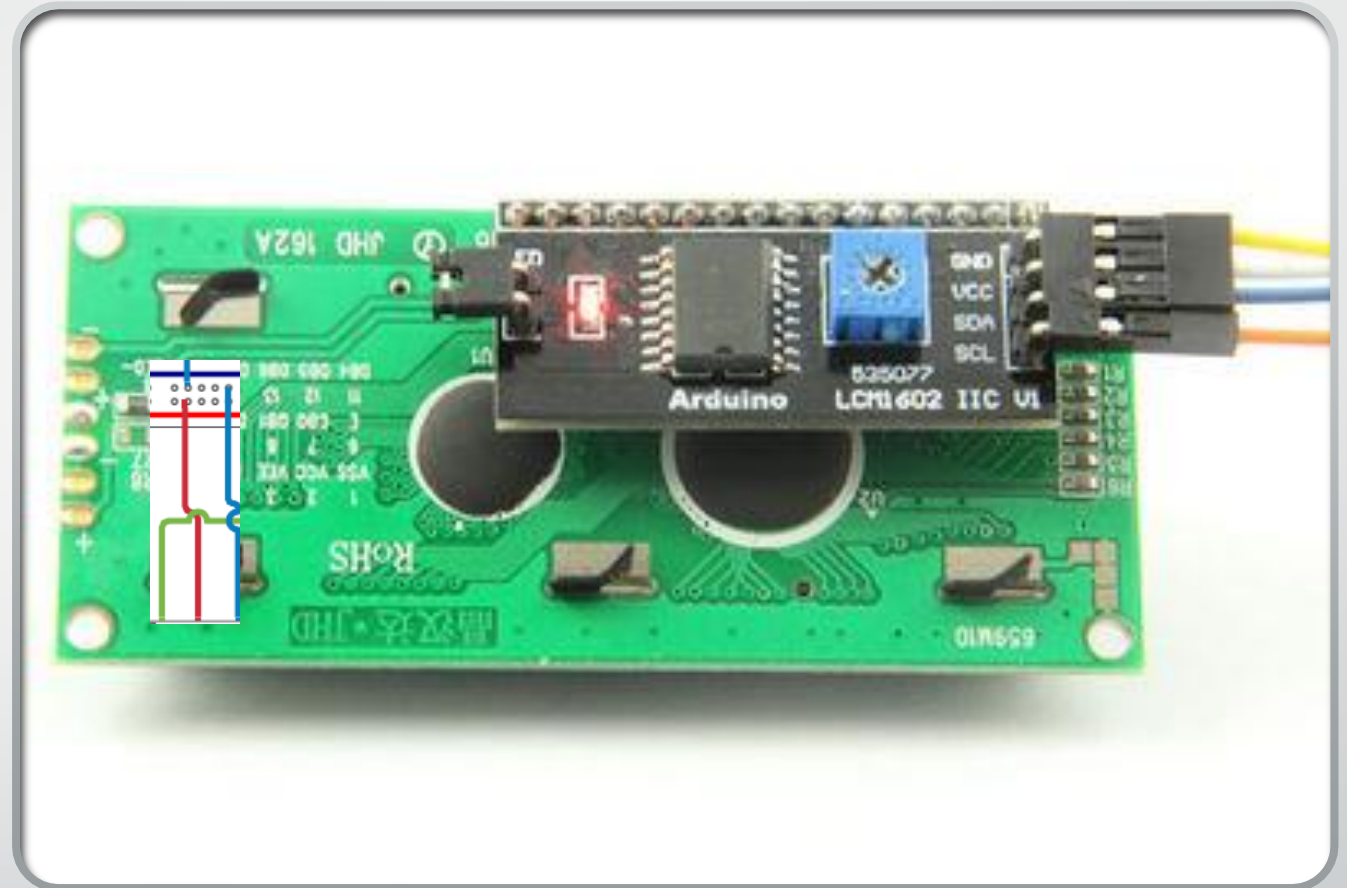
Tutorial: Hardware

- Step 7: Connect the push button

  - The push button is a I shaped circuit.

  - The top and the bottom wire is only connected when the button is pressed.

  - Thus, we can connect the top one with positive.(Note: better use 3.3v input straight from Arduino as it requires accurate input.)

  - One of the bottom leg is connected to ground by a 1k Ω resistor.

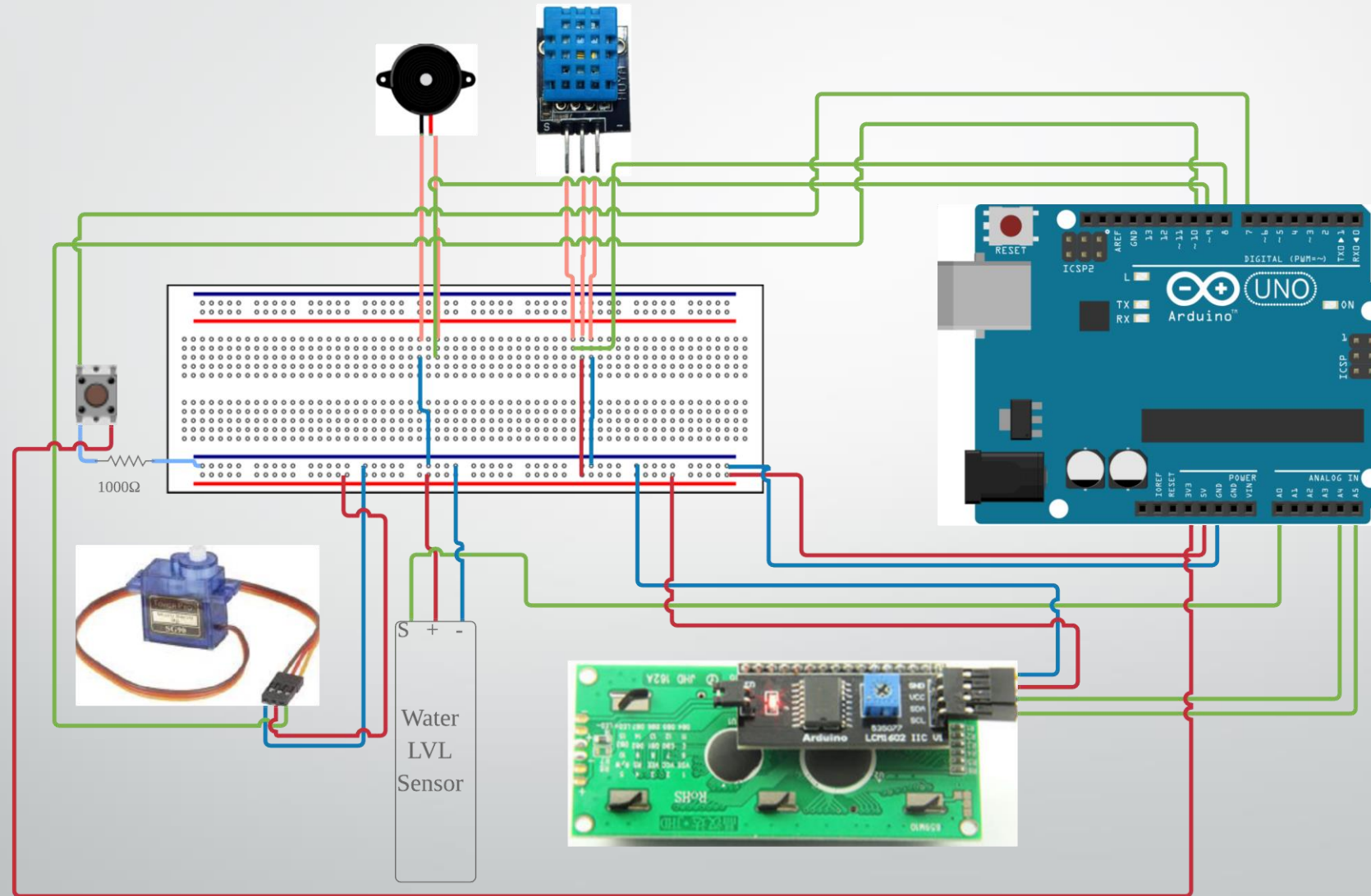 - Another bottom leg is used as signal output. It should be connected to PIN 7 in Arduino.

These two legs are connected

So are these two legs!

Picture retrieved from
http://shallowsky.com/arduino/class/button.html

Final look of hardware

Tutorial: Coding

- The coding environment is Arduino desktop version.
- Make sure you have these libraries added to Arduino:
  - Wire
  - Hd44780
  - Hd44780_I2Cexp
  - Servo
  - Dht

- The main part of this project is the reading of water level sensor.
- Thus, the actions should be determined by using if conditions to trigger the servo, buzzer and the LCD display.
- Button is used to set a flag to switch the alarm on/off.

Tutorial: Coding

- The code for the project can be downloaded from:
  https://www.dropbox.com/s/johkhehcpod9ckp/SmartBathtub.ino?dl=0

- It is recommended to test the water level sensor using serial monitor before you start by roughly splitting the water level sensor to three sections: Low, medium and high.

- As the water level rises, the reading should increase as well.

- For example, the data should look like this:

Water level	Sensor reading
Low	100 - 625
Medium	625 – 670
High	>670

- You can then assign the actions to the water level by using if conditions.

  - For example, I set the medium as 'Buzzer beep + half close tap'

Instruction

1. Attach the water level sensor to one side of your bathtub.

2. Attach the servo to your water tap.

3. Connect the power to Arduino.

4. Turn on the water tap and wait till the alarm sounds.

5. Press the button to turn off the alarm and enjoy your bath!

- Note:
  - The bottom right of LCD shows T/F
  - T means the alarm is currently working. F means the alarm is turned off.(Can be switched by pressing the press button)
  - You can also check the videos.(For simplicity, the bathtub was replaced by a cup)
    - https://youtu.be/Ayhdotvpz9g (Bathtub angle)
    - https://youtu.be/79ZgY2nlNSo (Test angle where the water level sensor was manually controlled)
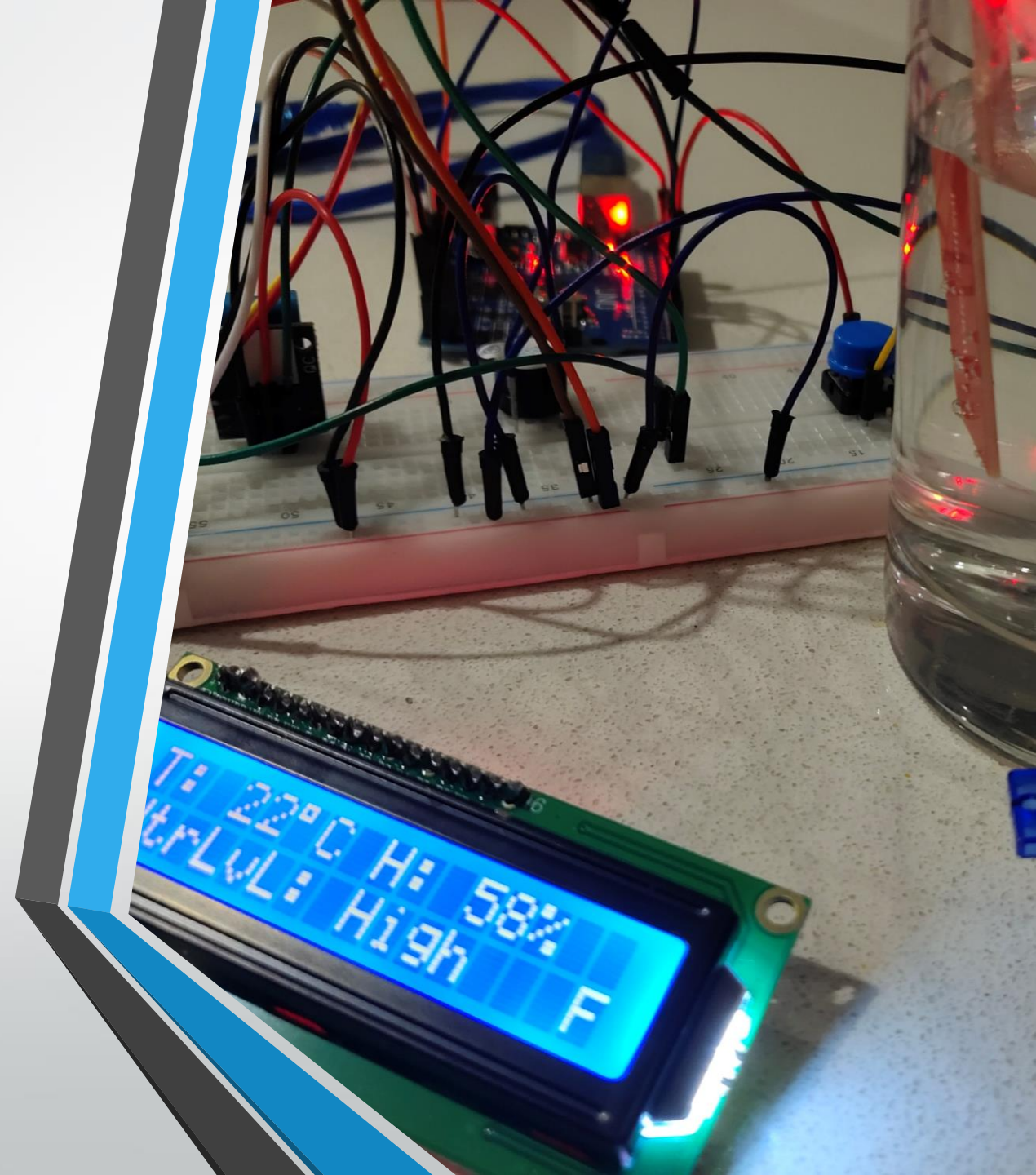
Well done!
Now you can enjoy your bath!