

Water Interfacing with STM32 Using ADC

Title

Interfacing Water Sensor with STM32 and LED Indication

Objective

To interface a **water sensor** with an **STM32 microcontroller**, read the analog sensor output using **ADC**, and turn **ON an LED** when the sensor detects water (or sound above threshold).

Components Used

Component	Quantity
STM32 Board (F103 / F401 / Sourya)	1
Water / Sound Sensor Module	1
LED	1
Resistor (220Ω)	1
ST-Link V2	1
Jumper Wires	As required

Sensor Pin Description

Sensor Pin Description STM32 Connection

S	Analog Output PA0 (ADC1_IN0)
+	VCC 3.3V
–	GND GND

Working Principle

- The sensor consists of **conductive copper tracks**
- When **water touches the sensor**, conductivity increases
- Higher conductivity → **higher analog voltage**
- STM32 ADC reads this voltage
- If ADC value crosses a threshold:
 - LED turns **ON**
 - Otherwise LED remains **OFF**

Behavior:

Condition	ADC Value	LED
Dry	Low	OFF
Wet / Water detected	High	ON

Hardware Connections

Sensor to STM32

Sensor S → PA0 (ADC1)

Sensor + → 3.3V

Sensor – → GND

LED Connection

LED Anode → d1---PC8

LED Cathode → GND (via resistor)

STM32CubeMX Configuration

ADC Configuration

- Enable **ADC1**
- Channel: **IN0 (PA0)**
- Resolution: **12-bit**
- Mode: **Single Conversion**
- Sampling Time: Default

GPIO Configuration

- **PC8** → Output Push-Pull (LED)

Code Implementation

Main Loop Code

```
uint32_t water_value;
```

```
while (1)
```

```
{
```

```
    HAL_ADC_Start(&hadc1);
```

```
    HAL_ADC_PollForConversion(&hadc1, HAL_MAX_DELAY);
```

```
    water_value = HAL_ADC_GetValue(&hadc1);
```

```
    HAL_ADC_Stop(&hadc1);
```

```
    // Threshold check
```

```
    if (water_value > 1800) // Water detected
```

```
    {
```

```
        HAL_GPIO_WritePin(LED_GPIO_Port, LED_Pin, GPIO_PIN_SET);
```

```
    }
```

```

else
{
    HAL_GPIO_WritePin(LED_GPIO_Port, LED_Pin, GPIO_PIN_RESET);
}

HAL_Delay(300);
}

```

Flashing & Execution Steps

1. Connect **ST-Link V2** to the STM32 board
2. Open project in **STM32CubeIDE**
3. Click **Debug**
4. Program is flashed successfully
5. Press **RESET button** on the Sourya board
6. Place water on sensor
7. **LED glows when water is detected**

Output Observation

Condition	Result
No water	LED OFF
Water detected	LED ON

Conclusion

This project successfully demonstrates:

- ADC interfacing in STM32
- Analog sensor reading
- Threshold-based decision making
- LED indication using GPIO
- Real-time water / sound detection

Applications

- Water leakage detection
- Rain sensing
- Moisture detection
- Sound-based trigger systems
- Industrial safety monitoring