Water level indicator

Under supervision of:

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Introduction

Efficient water management is a critical need in both residential and industrial uses. One essential aspect of water conservation and resource management is the ability to monitor and control water levels in storage tanks to prevent overflow or dry running.

This project focuses on the design and implementation of a **Water Level Indicator system using combinational logic circuits**.

The core objective of this project is to develop a simple, effective, and reliable circuit that indicates different water levels (Low, Medium, Full) using basic digital logic components such as logic gates. The design is based entirely on **combinational logic principles**, ensuring a purely hardware-based approach suitable for foundational learning in logic design.

This project not only ensures the understanding of logic gate behavior and circuit analysis but also offers a practical application that addresses a real-world problem.

Project Objectives:

- Monitor three water levels: Low, Medium, and Full.
- Use LEDs to visually display water levels.
- Activate a buzzer alarm when the tank is completely full.
- Apply basic combinational logic circuits.
- Provide practical experience with AND gate applications

Working Principle:

The project uses three level sensors placed at different heights inside the tank:

- L1: Low level sensor
- L2: Medium level sensor
- L3: High level sensor (Full)

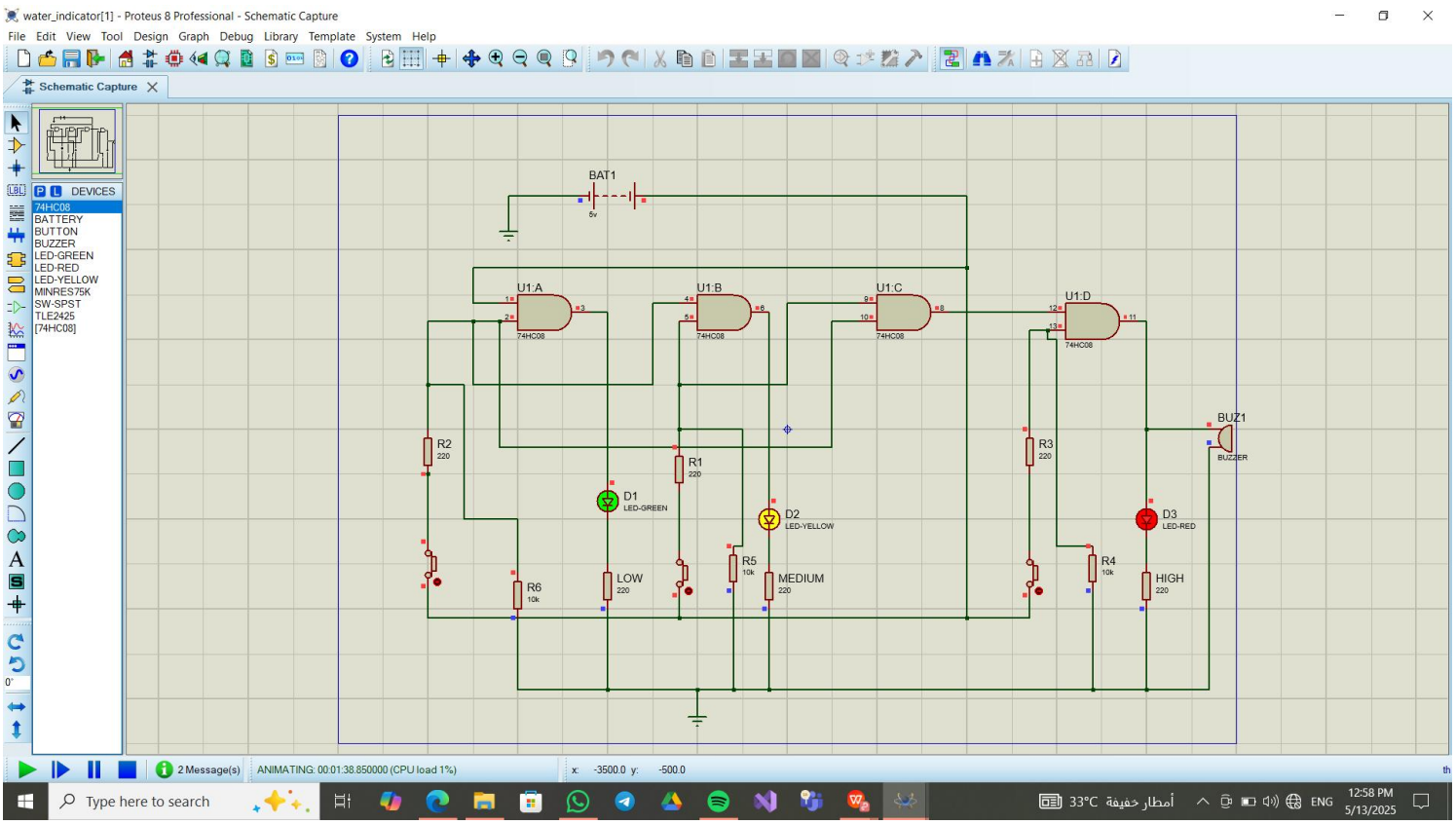
Each sensor is connected to inputs of AND gates in the IC 7408 chip. The output logic works as follows:

- Y1 = L1 → Turns on a green LED
- Y2 = L1 AND L2 → Turns on a yellow LED
- Y3 = L1 AND L2 AND L3 → Turns on a red LED and activates the buzzer

Components used

- Ic 74HC08
- 3 resistors (220Ω)
- 3 resistors (10kΩ)
- Voltage regulator (to get 5 volt)
- 3 LEDs
- Battery 9v
- Buzzer

Simulation



Truth table

Vcc	L_1	L_2	L_3	Y_1	Y_2	Y_3
1	0	0	0	0	0	0
1	0	0	1	0	0	0
1	0	1	0	0	0	0
1	0	1	1	0	0	0
1	1	0	0	1	0	0
1	1	0	1	1	0	0
1	1	1	0	1	1	0
1	1	1	1	1	1	1

K- map

L1 \ L2, L3				
0	0	0	0	0
1	1	1	1	1

$Y_1 = L_1$

L1 \ L2, L3				
0	0	0	0	0
0	0	1	1	1

$Y2 = L_1 L_2$

L1 \ L2, L3				
0	0	0	0	0
0	0	1	0	1

$Y_3 = L_1 L_2 L_3$

Circuit Operation:

When power is applied:

- If only L1 is active → green LED turns on
- If L1 and L2 are active → green and yellow LEDs turn on
- If L1, L2, and L3 are active → all LEDs turn on and buzzer activates

Outputs Explanation:

- Y1 (L1): Activates green LED
- Y2 (L1 AND L2): Activates yellow LED
- Y3 (L1 AND L2 AND L3): Activates red LED and buzzer

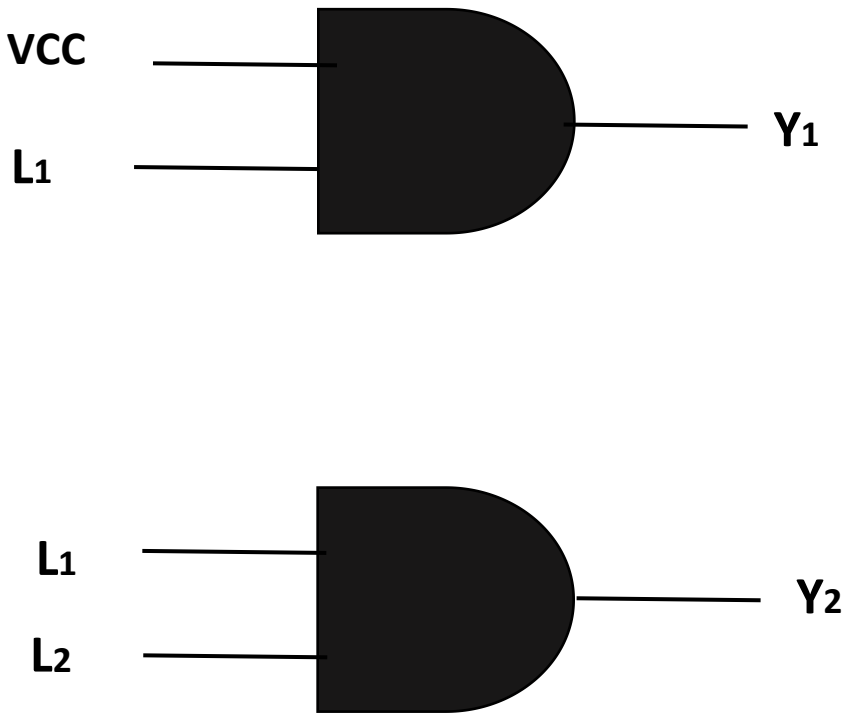
Advantages:

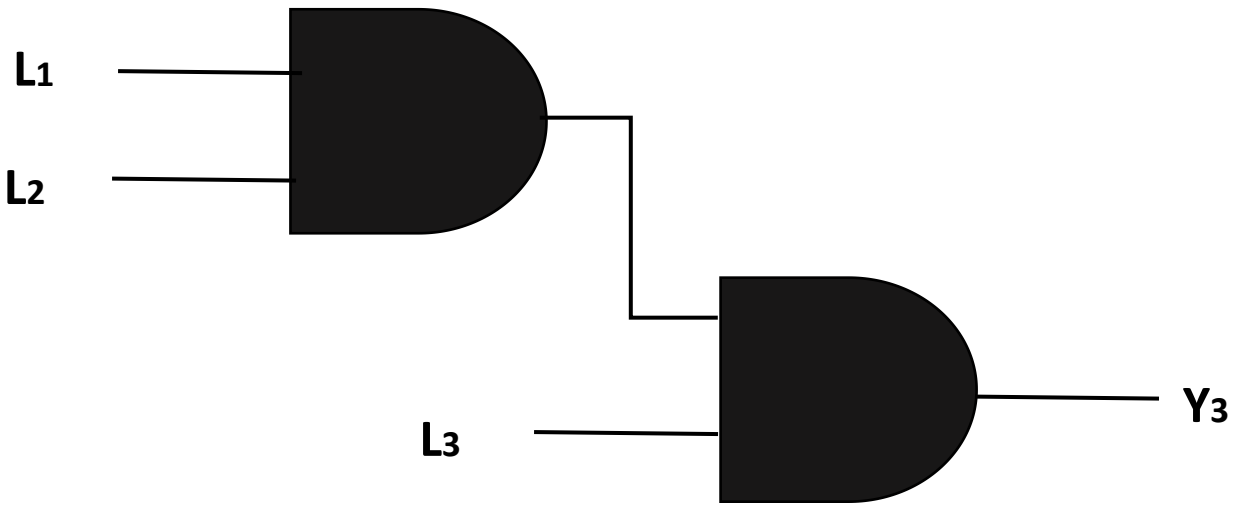
- Simple and easy to build
- Low cost and useful in real applications
- No programming needed
- Easily expandable to more levels

Suggested Improvements:

- Add a digital display to show water percentage
- Control a water pump automatically
- Send alert messages to mobile device

Implementation




L1
L2
L3
Y3