Automated Water Level Indication System in Smart Farming

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***Abstract*— One of the biggest problems that certain large cities throughout the world are currently dealing with is a lack of water supplies. In a country like India, where 70% of its population depends on agriculture, due to not having a proper water-supply, the farming is one of the main sector which is affected the most. The technology described in this study indicates and regulates the water level in overhead tanks. Sensors are employed to detect the level of the water between the predefined minimum and maximum levels. Proteous which is a graphical programming language that uses a dataflow model is used to program the microcontroller board Atmega 16 which is an interface between the software and the rest of the circuit components. Accurate findings and good performance are obtained from the measured results.**

Keywords*— *Proteous, Atmega16, AWLS, WLCC, IC555

I. INTRODUCTION

Dwindling water supplies will affect city citizens and exacerbate conflict in the cities throughout the world. Due to the lack of a continuous supply of water and the general lack of compliance with water conservation regulations, homes must consider practical solutions such building above and below-ground water storage tanks to effectively manage the issue of water scarcity and resolve emergencies. In this case, water is being pumped up from the above tank to the down water tank using water pumps.

The existing irrigation management practices in the northern part of India are not sufficient in improving water use efficiency and water productivity as they mainly depend on tank-storage water based irrigation system. Hence they face challenges like water scarcity during farming season. In order to manage water resources effectively, it may be necessary to obtain and use real-time information.

The main purpose of this research is to control the water level in an overhead tank in an automated manner and indicating the level of the water so that the water loss will be minimized.

Features:

- The Automatic water level controller ensures no overflows or dry running of pump there by saving electricity and water.
- Avoid leaking from walls and roofs caused by overflowing tanks.
- Energy-efficient, perfect for continuous operation.
- Water levels in the above tank are clearly shown.

TABLE I. LITERATURE REVIEW

Sl. No	Literature Review		
	Author	***Year***	***Methodology***
1	S. M. K. Reza et al.	2010	PIC 16F84A microcontroller which is a family of RISC microcontrollers made by Microchip Technology is used and integrated to the circuit. It is worth mentioning that throughout this literature, context of electrical conductivity of the water is used to employ copper and aluminum conductors as water-detecting sensors and only discrete levels of the water are detected.
2	E. V. Ebere and O.O. Francisca	2013	In a microcontroller based automatic water level control system using AT89C52 microcontroller is introduced.
3	S. Pudasaini, A. Pathak, S. Dhakal, and M. Paudel	2014	Authors have addressed the problem and presented a system of an automatic water level controller with SMS notification. Arduino UNO is also employed as controller system as it has an open source libraries. For the SMS circuit Motorola c261 model supports serial communication with headset plug has been employed that can support ATcommands which can

Sl. No	Literature Review		
	Author	*Year*	*Methodology*
			be used for GlobalSystem for Mobile (GSM) control system.
4	A. A. M. Eltaieb and Z. J.Min	2015	In addition, authors in [4] an automatic water level controller is developed and implemented. Arduino Uno has been chosen to automate the process of water pumping. Water level detection inboth source and overhead tanks, switch on/off the pump accordingly are the main controlling signals the circuit. Important data is shown on LCD. Moreover, a microcontroller based automated water level sensing and controlling is proposed that covers both design and implementation issues.

II. MODEL DESCRIPTION

To detect and indicate the water level in an overhead tank or any other water container, the Water Level Indicator uses a straightforward technology. The sensing is done by using a set of two waterproof limit switches which are placed at two different levels on the tank walls. The top-level limit switch represents the "tank full" condition while the low-level limit switch represents the "tank empty" condition. When the water level is below the minimum detectable level (MDL) the LCD is arranged to show the water level is empty and send a signal to the water pump to turn 'ON'. When the water reaches the low-level limit switch (but is below the top level limit switch) that time LCD indicates the water level 50%. When the water reaches the top level limit switch that time LCD indicates the water level full and turn off the water pump.

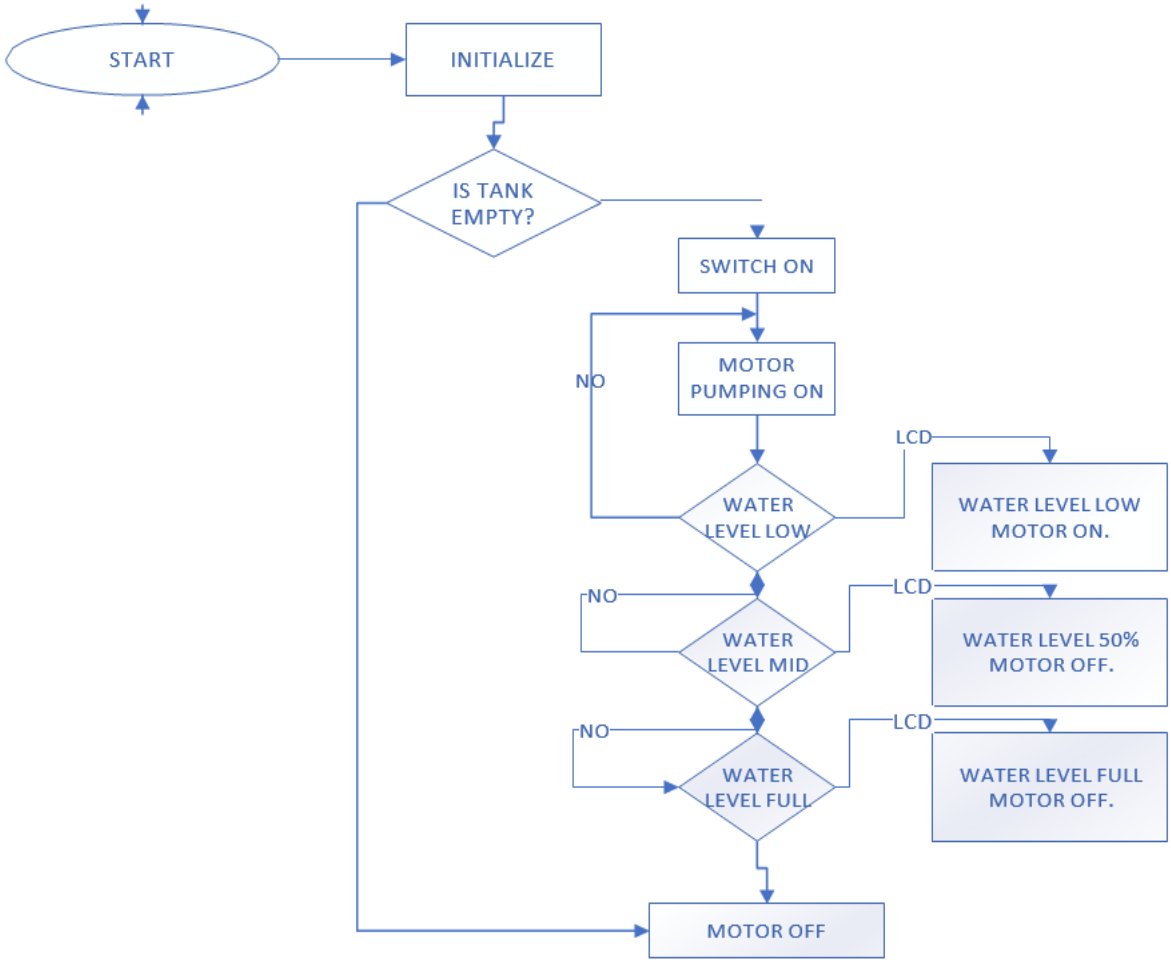

Fig. 1: Flow chart of the AWLS system

III. COMPONENTS

A. *Atmega16*

A sophisticated RISC system and high-performance microcontroller is the ATmega16. The characteristics of this 8051 microcontroller's enhanced version surpass those of the 8051 microcontroller. It has a built-in CPU, RAM, ROM, EEPROM, Timers, Counters, ADC, and the final four 8-bit ports (Ports A, B, C, and D). For added performance, each port contains 8 input and output pins.

Features

TABLE 2. MICROCONTROLLER SPECIFICATIONS

Sl. No.	*Port & Pins*	*Features*
1	Port-A (Pin 33-40)	Analog input to A/D converter functioned via this port. As an 8 bit bidirectional I/O port, Port A is usable. A pull-up resistor is built into it.
2	Port-B (Pin 1-8)	I/O bidirectional pins.
3	Port-C (Pin 22-29)	I/O bidirectional pins.
4	Port-D (Pin 14-21)	Both input and output pins are available on here. This connector is used to connect additional peripherals including PWM channels, timer/counters, and USART.
5	Pin 9	Reset Pin.
6	Pin 10	5V power supply pin.
7	Pin 12 & 13	Crystal oscillator Pin.

B. *Relay Module*

This is important because it allows you the use a microcontroller or other low-power device to control devices with much higher voltages and currents. Another relay module's purpose is to amplify the control signal so that it can switch the highercurrents using only a small out of power from a microcontroller.

C. *Float Sensor*

A float switch is a device used to sense the level of liquid within a tank, it may actuate a pump, an indicator, an alarm, or other devices. Use them with hydroponics, saltwater tank, freshwater tank, gardening, aquariums for power head control, pet bowls, fish tanks, filtration, heating, pumps, ponds, basement alarms, boats, air condition drain pans, pressure washers, carpet cleaning machine, reef aquarium, fluid control, ice machines, coffee pots, marine, automotive, automobiles, tropical fish tanks, evaporator coils, condensation line, in relays, or whatever your project may be.

IV. COMPARISON OF PROPOSED APPROACH WITH CONVENTIONAL METHOD

Automatic water level controller circuit is a simple engineering electronic project does the same with suitable logic and components. The work presented in [5] do not incorporate any Microcontroller instead use Transistors and Timer IC555. It will automatically switch ON and OFF the domestic water pump to fill the over head tank to the set level or volume of water. The main advantage of this water level controller circuit (WLCC) is that it automatically controls the water pump without any user interaction.

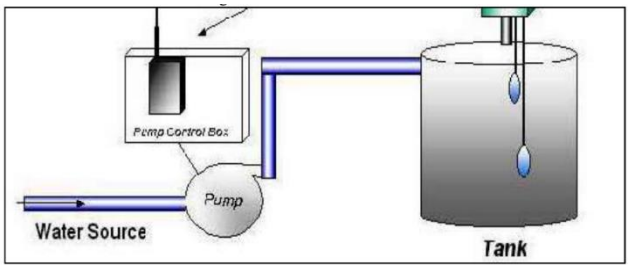

Fig.2: Conventional system of WLCC

Here the lacuna in technology is, this IC having no UART pin configuration, no flash memory and EEPROM and limited output pins. If we configure HMI, it will be not possible for the above system, which can be replace by the system proposed in this paper.

V. SIMULATION AND RESULTS

Operation:

This project's functioning is quite straightforward and is not difficult to comprehend. There are three primary requirements for our project, "water level indicator":

1. The source tank is dry and has no water.
2. Intermediate level i.e. between low level and top level.
3. There is an ample amount of water available in the source tank.

A. *Initial Condition:* When we turn on our device that time LCD indicates welcome to AWLS (Automatic water level indication system)

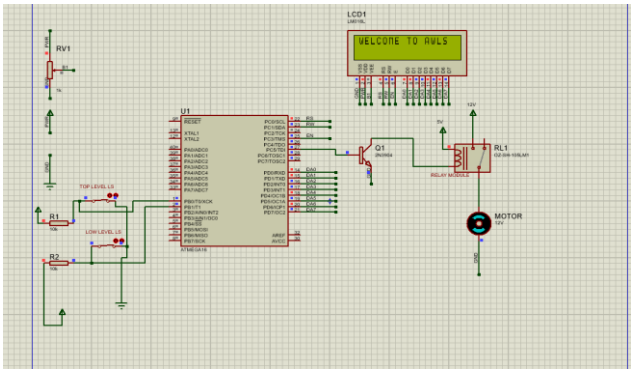

Fig.3 (a): Initial Condition

B. *Condition 1:* Water not available

When the tank is empty there is no conductive path between any of the 2 limit switches. So there is digital signal "1" sent by the booth limit switch to the microcontroller, microcontroller gets that data executed internally and sent a command to "PORTC" PINC5 for switching the relay, after switching the relay that turns on the water pump.

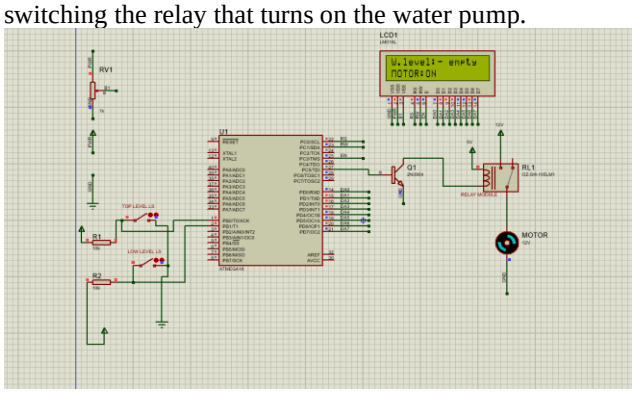

Fig.3 (b): Water is not available

C. *Condition 2:* When the water above the low-level limit switch (but is below the top-level limit switch) that time LCD indicates the water level 50%.

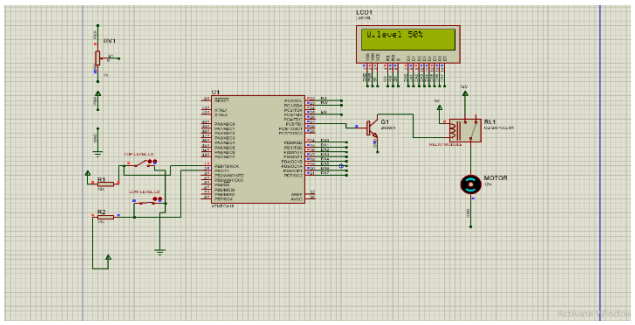

Fig.3 (c): 50% water availability

D. *Condition 3:* When the water reaches the top level limit switch that time LCD indicates the water level full and turn off the water pump.

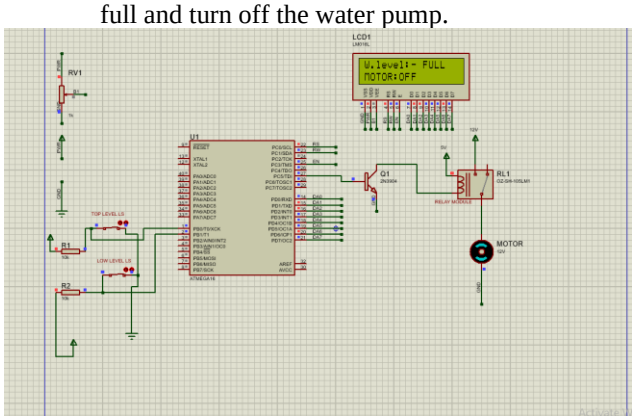

Fig.3 (c): 100% water availability

VI. CONCLUSION

Accurate and reasonably priced methods for measuring water level have become essential for farmers due to technological innovation and constantly changing weather conditions. This therefore brings about the need for a system incorporating the use of technology that will monitor water levels. The prototype will monitor water levels on a regular basis and the data captured will help farmers improve the way they manage their water resource. Water level indicator is one of the most promising applications with the implementation of microcontroller. The purpose of our project is to save water by controlling the flow of water. With the flexibility of the technique it can be used in any industry concerned with fluid.

APPENDIX

Maximum Load: 0.7kW; Minimum Voltage: 3.3 V DC; Maximum Switching Current: 0.5 A; Max Load Current: 10 A; Motor operating voltage: 180-260 V; Max Switching Voltage for Relay: 5V DC; Temp Rating: -20~ 80 degree; Cable Length: 35 cm.

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