Smart Water Tank

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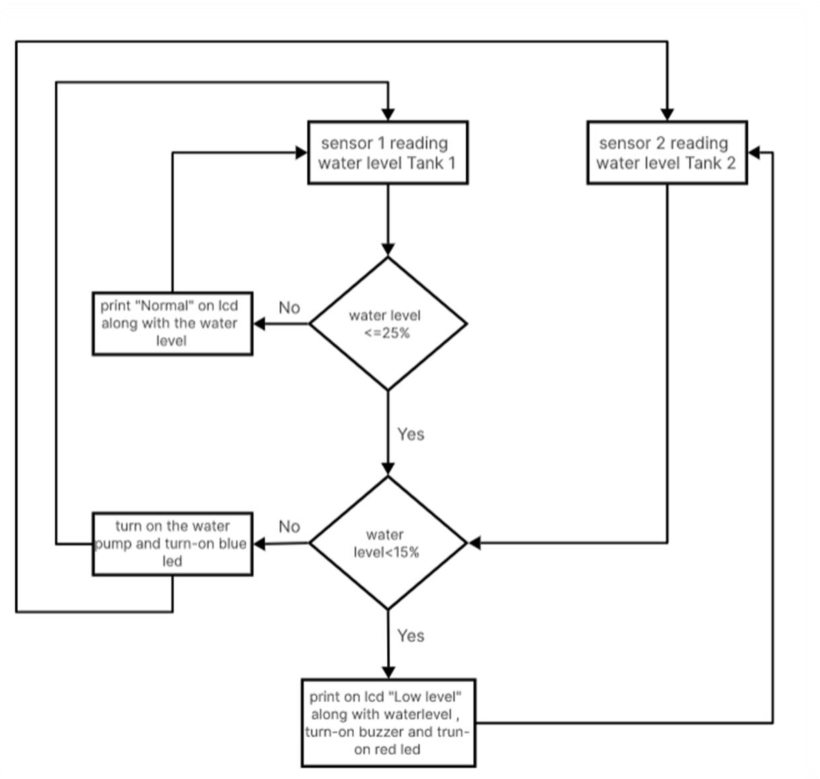
Introduction

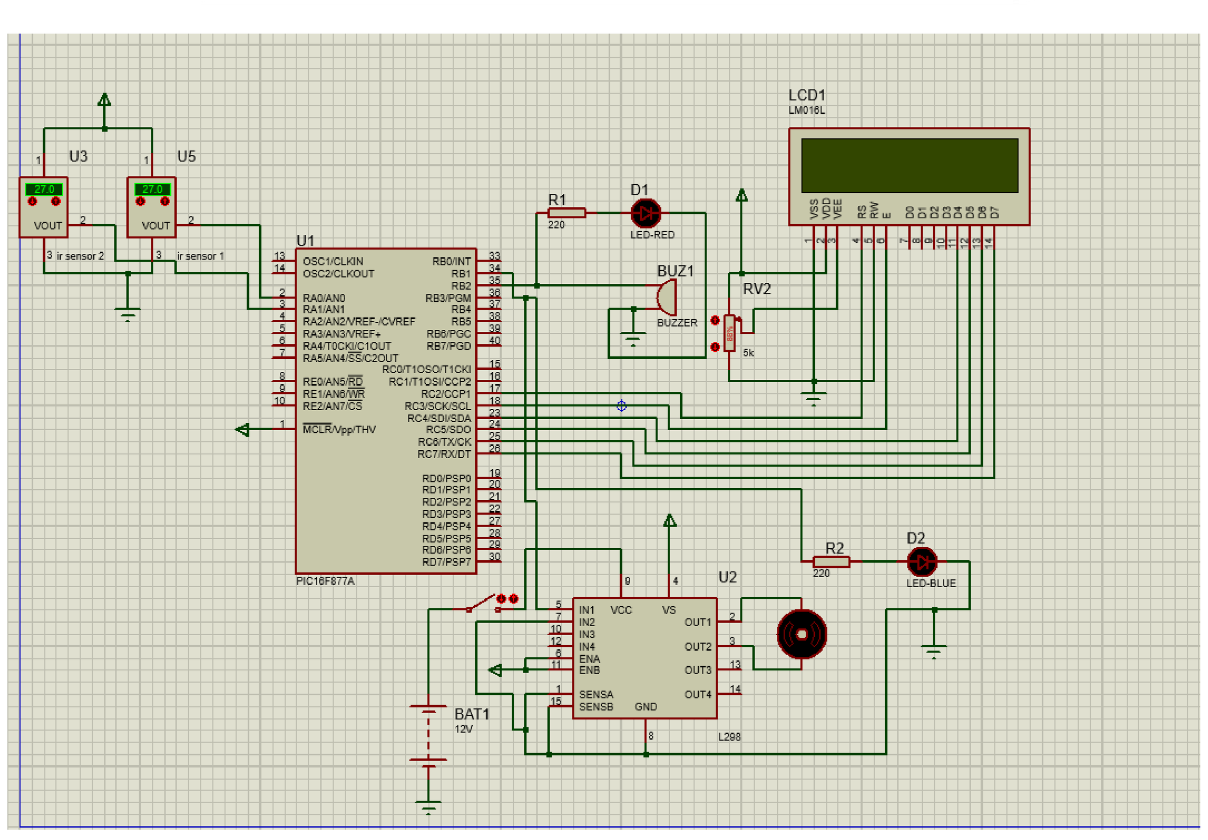
In today's world, efficient water management is a critical concern due to the increasing scarcity of water resources and the growing demand for sustainable solutions. Traditional water tank systems often suffer from issues such as overflow, dry runs, and inefficient water usage, leading to water wastage and potential damage to the infrastructure. To address these challenges, smart water tank systems have emerged as a viable solution, leveraging modern technology to optimize water usage and management.

This project focuses on the development of a smart water tank system using the PIC 16F877A microcontroller. The PIC 16F877A, a popular choice in embedded systems, offers robust performance and versatile interfacing capabilities, making it ideal for this application. The smart water tank system aims to automate the monitoring and control of water levels, ensuring efficient water utilization and minimizing wastage. By integrating various sensors and control mechanisms, the system can provide real-time feedback and take proactive measures to maintain optimal water levels, thereby enhancing overall efficiency and reliability.

Design

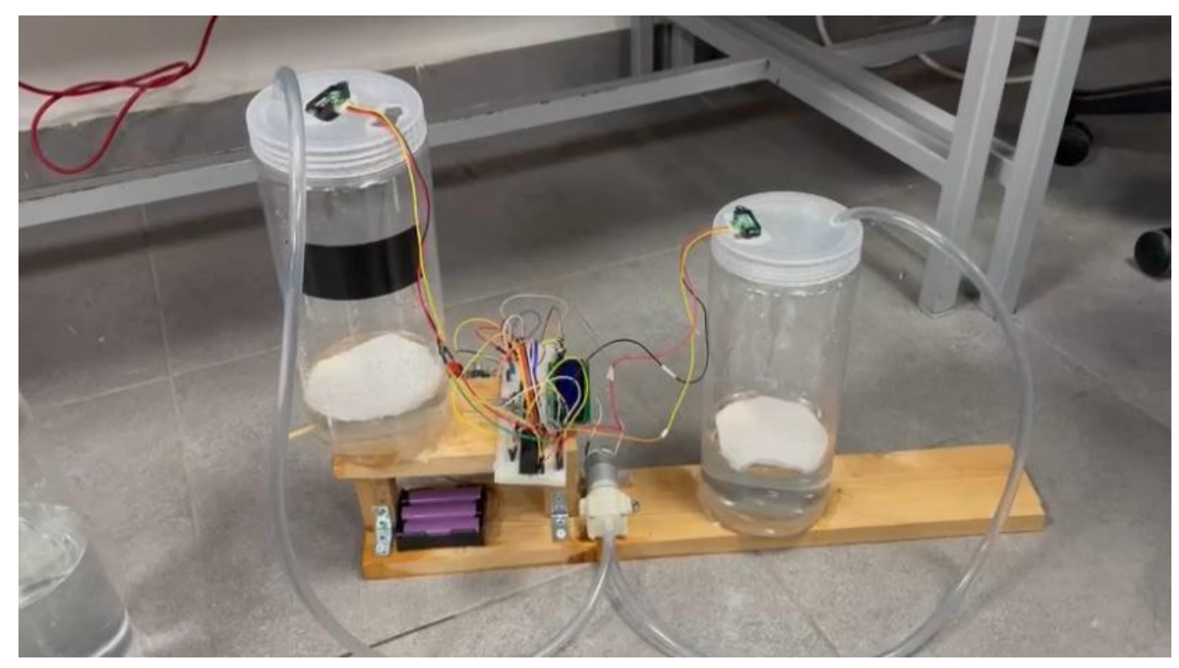
To implement our recommended design, which determines whether water should be pumped based on the parameters set using the microcontroller, the hardware design compromises IR distance sensors to measure the water level. Based on the sensor's measurement if the water level in tank 1 is less than or equal to 25% aside with the water level in tank 2 is normal the water pump will start working along with blue light turned on and tank 1 will be filled until it reaches 100% or until tank 2 reach less than or equal to 15%. If tank two at anytime reached below 15% the buzzer and red light will be turned on. To provide power to the pic and the other components we used a 12v battery to mainly supply our dc motor and water pump and connected it to a buck converter (power regulator) to supply the microcontroller with 5v only as it can't receive high voltages, or it will burn. The main idea of this project is to ease the process of constantly checking the water level on our tanks and to minimize any danger a human could face through that process, so everything is displayed through a 16×2 LCD screen implemented at home or any desired place along with a buzzer and red light to alert the costumer that the main water tank is empty so they can call for a refill instantly, and then when refilling while the pump is on a blue light will be on along with the LCD displaying the water level on both tanks.

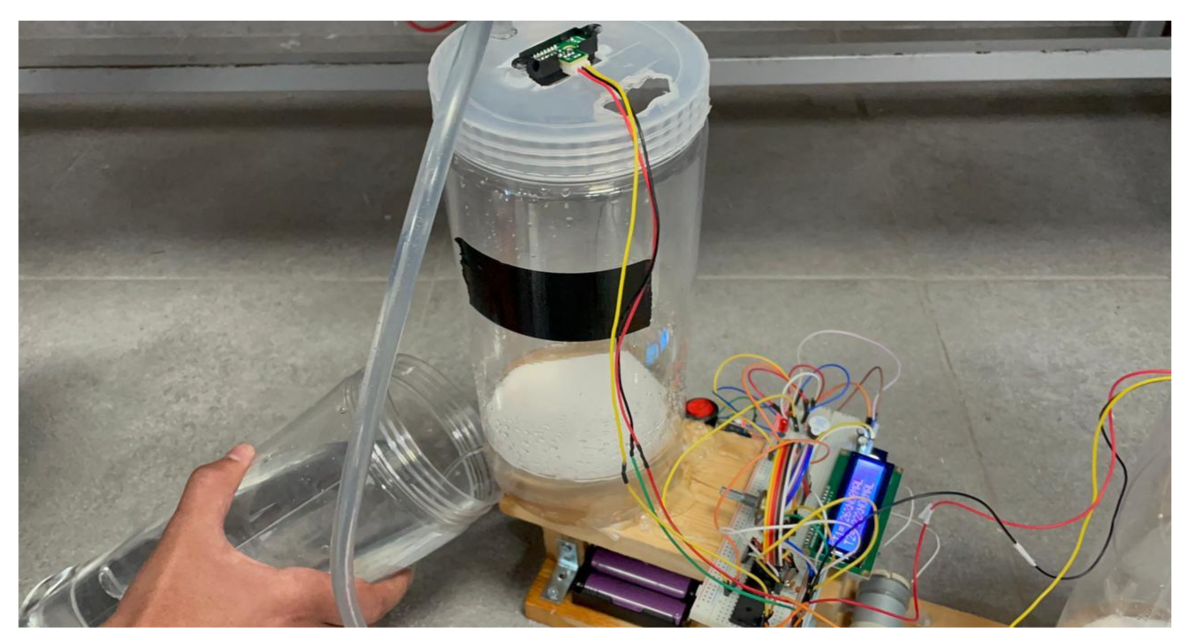


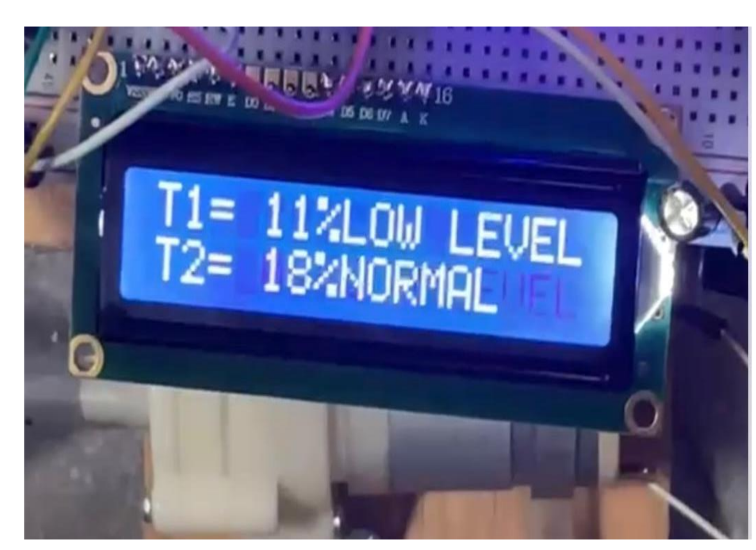


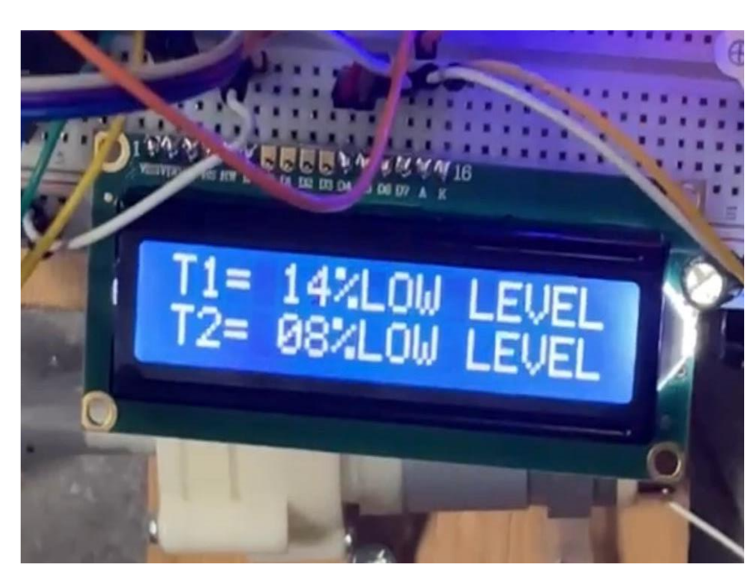
Results

The implementation of the smart water tank system using the PIC 16F877A microcontroller demonstrated significant improvements in water management efficiency. During testing, the system successfully automated the monitoring and control of water levels in both tanks, responding accurately to the predefined thresholds. The IR distance sensors provided reliable measurements, triggering the water pump and corresponding indicators as expected. When the water level in tank 1 fell below 25%, the system activated the pump and blue light, effectively refilling the tank while ensuring that tank 2 did not fall below 15%. In cases where tank 2 reached critical levels, the buzzer and red-light alert functioned correctly, providing timely warnings. The 16×2 LCD screen delivered clear, real-time updates on water levels, enhancing user convenience and safety. Feedback from users highlighted the system's reliability and the ease of monitoring water levels remotely, reducing the need for manual checks and preventing potential overflows or dry runs. Overall, the smart water tank system proved to be a robust solution, achieving its goals of optimizing water usage and ensuring efficient management with minimal human intervention.









Conclusion

Our tank project was a journey of learning and problem-solving. We faced several challenges, from creating delay functions and displaying results on the LCD to dealing with faulty breadboards and burnt PICs. Despite these hurdles, we managed to build a functional system that monitors and controls water levels in two tanks.

Using the PIC 16F877A microcontroller, we read sensor values, converted them to meaningful data, and displayed the information on an LCD. The system effectively controls water levels, ensuring they stay within desired limits. This project highlighted the importance of thorough testing, careful assembly, and having backup plans.

In the end, we not only created a useful water management system but also gained valuable insights into the practical applications of embedded systems. This experience has equipped us with the knowledge to tackle similar projects in the future, making technology work for us in everyday life.