Princess Sumaya University for Technology

King Abdullah II Faculty of Engineering

Electrical Engineering Department

EMBEDDED FINAL PROJECT

AUTOMATIC WATER DISPENSER

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January 20, 2024

Abstract

This project introduces a state-of-the-art Automatic Water Dispenser designed to enhance user convenience and promote efficient resource utilization. Leveraging the capabilities of the PIC 16F877A microcontroller, this system integrates seamlessly with various components, including infrared sensors, hot and cold water pumps, an H-bridge for precise control, and a buzzer for user feedback.

The core intelligence of the system lies in the PIC 16F877A microcontroller, serving as the central processing unit to monitor and manage the dispensing process. An infrared sensor acts as the eyes of the dispenser, detecting the presence of water and triggering the system into action.

Two dedicated pumps, one for hot water and another for cold water, ensure a prompt and precise dispensing experience. The H-bridge functionality enables smooth and controlled motor operation, optimizing water flow rates to meet user preferences. The inclusion of a buzzer adds an interactive element, providing audible feedback to users during dispensing cycles.

The project showcases the synergy between hardware and software, demonstrating the capabilities of the PIC 16F877A microcontroller in orchestrating a sophisticated and user-friendly water dispensing system. This innovative solution not only streamlines the water dispensing process but also emphasizes energy efficiency and reliability, making it an ideal choice for modern environments where automation meets sustainability.

TABLE OF CONTENTS

1 INTRODUCTION

Welcome to the forefront of smart technology with our Automatic Water Dispenser project, a testament to the seamless integration of innovation and user-centric design. In this endeavor, we harness the capabilities of the PIC 16F877A microcontroller to bring you a cutting-edge solution that redefines the traditional water dispensing experience.

At the heart of our system lies the PIC 16F877A, a microcontroller renowned for its versatility and robust performance. This intelligent controller serves as the brain of our Automatic Water Dispenser, orchestrating a symphony of components to deliver an intuitive and efficient user experience.

The inclusion of an infrared sensor adds a touch of futuristic interaction, allowing the dispenser to respond to the presence water hitting the surface instantly. Paired with precision control mechanisms facilitated by an H-bridge, our dispenser ensures that hot and cold water pumps operate seamlessly, delivering the desired temperature with optimal flow rates.

As a cherry on top, a buzzer provides real-time auditory feedback, enhancing the user interface and making the dispensing process not only efficient but also engaging. Join us on this journey as we unveil the marriage of hardware and software, showcasing the prowess of the PIC 16F877A microcontroller in creating a truly smart and user-friendly water dispensing solution.

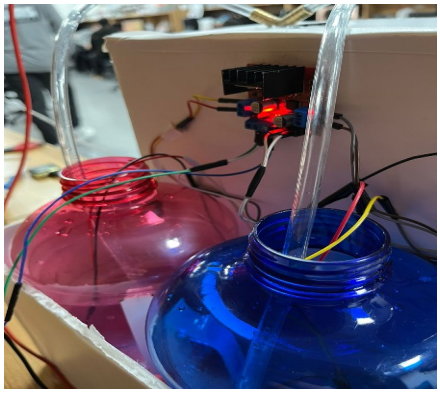
2 MECHANICAL DESIGN

The components used for the automatic water dispenser design are:

- PIC16F877A microcontroller
- Breadboard
- IR sensor
- H bridge
- 2 water pumps
- 2 tanks of water (cold & hot)
- 3 LED’s
- 2 water tubes
- Cup holder

- 8-12 V voltage source
- 5 push buttons

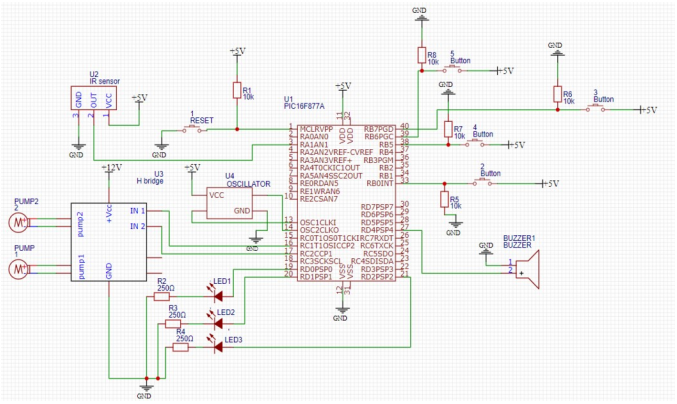
Three LED's light up above three push buttons while the other two buttons are hold and reset buttons. After the user presses one of the three buttons, two tubes are connected onto two separate pumps, which are located inside the tanks (one pump in each). The the pumps job is to dispense water into the tubes so that water is poured into the cup.
The H bridge makes sure the pumps are working accordingly. While the IR sensor detects if water has reached the surface of the cup so that the pumps turn off automatically. On the other hand, the buzzer is used to alert the user that the cup is full and the user may remove it from the cup holder.
This the external design of the water dispenser:



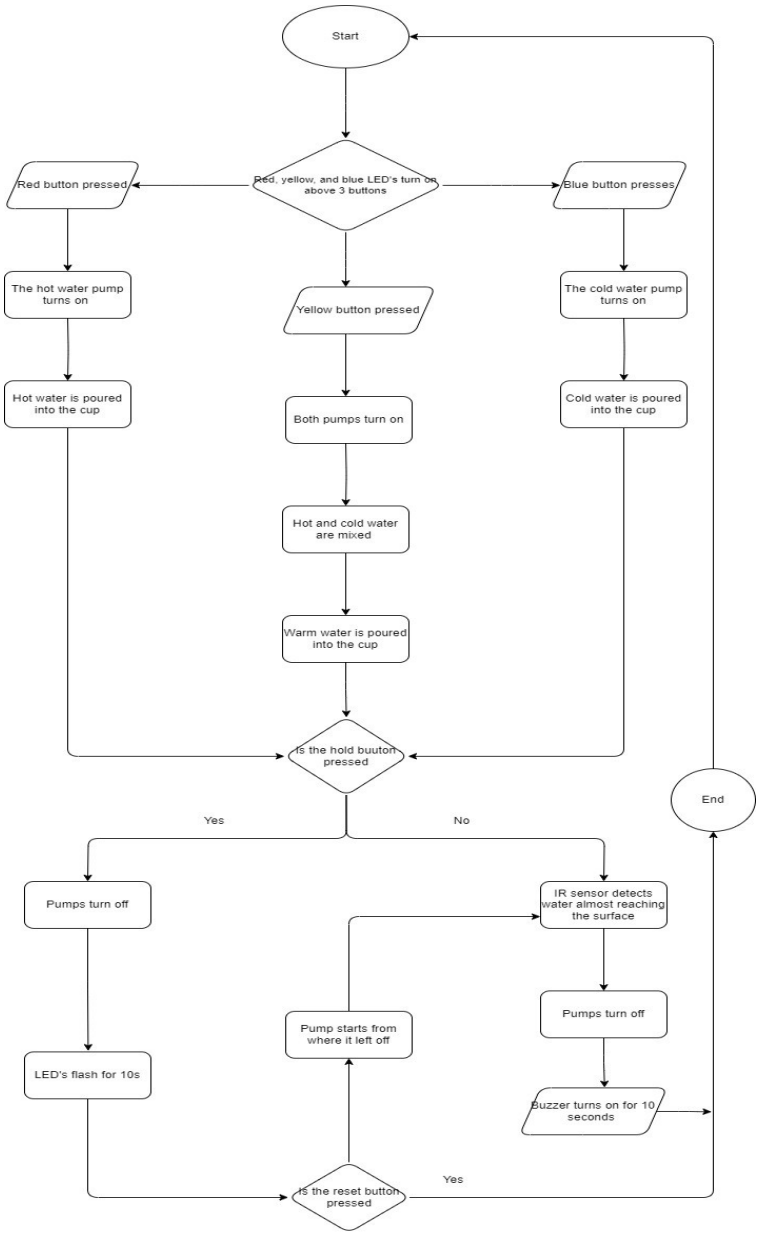
3 ELECTRIC DESIGN

- We have connected 12 V VDD, ground, and 2 pumps to the H bridge. The H bridge was then connected to the microcontroller on pins 16 and 17.
- The IR sensor is connected to 5V VDD, ground, and to the microcontroller at pin 3.
- Three LED's are connected to 250 ohm resistors which are connected to ground, the LED's are connected to the microcontroller at pins 19, 20, and 21 (RD0, RD1 and RD2).
- The buzzer is connected to ground and to the microcontroller at pin 27 (RD4).
- 4 push buttons are connected to 10k ohm pull down resistors, the push buttons are connected to the microcontroller at pins 33, 38, 39 and 40 (RB0, RB5, RB6, RB7).
- One push button is connected to a 10k ohm pull up resistors, the push button is connected to the microcontroller at pin 1 (MCLR)

Electrical design:



4 SOFTWARE DESIGN



5 CONCLUSION

In conclusion, our Automatic Water Dispenser project was conceived to re-imagine traditional water dispensing systems by integrating advanced technology. The PIC 16F877A microcontroller serves as the project's central intelligence, orchestrating a seamless operation that includes infrared sensors, hot and cold water pumps, an H-bridge, and a buzzer. This innovative solution not only enhances user convenience but also aligns with contemporary needs by automating the dispensing process, promoting resource optimization, and ensuring energy efficiency.

At the heart of our motivation is the commitment to showcasing the potential of embedded systems in creating practical, sustainable, and user-friendly technology. By marrying sophisticated components with everyday functionality, the Automatic Water Dispenser stands as a testament to our dedication to pushing the boundaries of what is achievable in the realm of intelligent systems. This project exemplifies our vision for a future where technology seamlessly integrates into our daily lives, making them more comfortable, efficient, and mindful of resource utilization.

6 REFERENCES

[1] https://github.com/oalktb/Embedded-Project/tree/011b75d75e069f3faeecb87f6364de30e9b8f7b9

[2] https://youtu.be/B13idh4j670?si=xazp7E8jUeUhXC5x