Embedded Irrigation System using AVR Microcontroller

A project report submitted fulfilment of the requirements for the degree of

Bachelor of Technology

submitted by

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1 Abstract

This project presents an intelligent irrigation system using an AVR microcontroller that automatically monitors and controls the irrigation process based on environmental conditions. The system uses various sensors to measure temperature and light intensity, and provides a user-friendly interface for setting water levels. The project demonstrates the practical application of embedded systems in agricultural automation.

2 Introduction

Modern agriculture faces challenges in water management and resource optimization. The Embedded Irrigation System addresses these challenges by providing an automated solution that monitors environmental conditions and adjusts irrigation accordingly. This system combines hardware components like sensors and actuators with software control to create an efficient irrigation management system.

3 System Architecture

3.1 Hardware Components

The system consists of the following main components:

- AVR Microcontroller (ATmega328P)
- Light Dependent Resistor (LDR)
- Temperature Sensor (LM35)
- 7-Segment Display
- LEDs and Buzzer
- Push Button
- Potentiometer

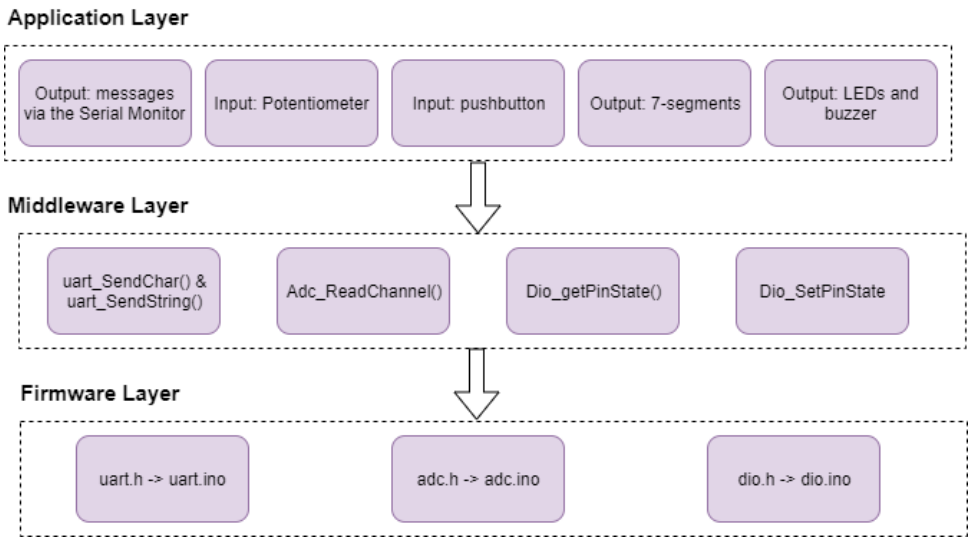

Figure 1: System Architecture

4 Implementation Details

4.1 Software Architecture

The system is implemented using modular programming approach with the following components:

- Digital I/O (DIO) Module
- Analog-to-Digital Converter (ADC) Module
- UART Communication Module
- Main Control Logic

4.2 Key Features

- Automatic environmental monitoring
- User-configurable water levels
- Visual feedback through 7-segment display
- Alert system for irrigation start/stop
- Serial communication for monitoring

5 Results and Discussion

The system successfully demonstrates:

- Real-time environmental monitoring
- Adaptive irrigation duration based on conditions

- User-friendly interface
- Reliable operation

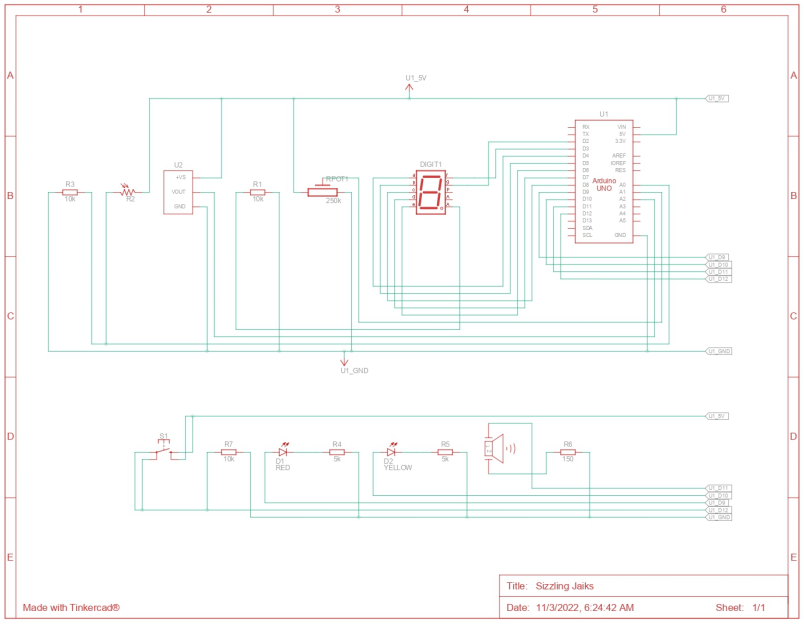

Figure 2: System Implementation

6 Conclusion

The Embedded Irrigation System provides an efficient solution for automated irrigation management. It demonstrates the successful integration of hardware and software components to create a practical agricultural automation system. Future improvements could include wireless connectivity and cloud-based monitoring.

7 References

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2. LM35 Temperature Sensor Datasheet, Texas Instruments
3. "Embedded Systems Design with AVR Microcontrollers", John Morton
4. "Automated Irrigation System Using Soil Moisture Sensor and PIC Microcontroller", International Journal of Engineering Research and Technology