Digital Clock Assignment

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INTRODUCTION

This project implements a digital clock, stopwatch, and timer using an ATmega328P microcontroller. The time-keeping functionality is achieved through Timer1 interrupts, and different modes are toggled using buttons. A seven-segment display is used to display time.

HARDWARE COMPONENTS

The following components are used:
- ATmega328P microcontroller
- Six common-anode seven-segment displays
- Three push buttons (for mode selection)
- Resistors and connecting wires

CODE IMPLEMENTATION

The firmware is written in C using AVR libraries. The program is structured as follows:

0.1 Initialization

The setup function configures the microcontroller's ports and initializes Timer1 for a 1-second interrupt. The buttons are set up with internal pull-up resistors.

0.2 Timer Interrupt Service Routine (ISR)

A timer interrupt updates the clock, stopwatch, and timer values every second. It also handles day transitions and calculates the day of the week.

0.3 Mode Selection

Three buttons allow the user to switch between clock, stopwatch, and timer modes:
- Button 1: Switch to clock mode
- Button 2: Switch to stopwatch mode and reset stopwatch time
- Button 3: Switch to timer mode and reset the timer

0.4 Seven-Segment Display Multiplexing

Since only one digit can be displayed at a time, the code rapidly cycles through the six displays, setting BCD values accordingly. This creates a persistence of vision effect.
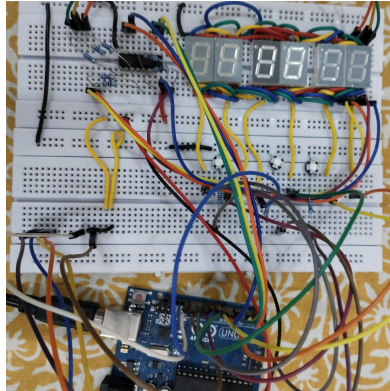
RESULTS AND OBSERVATIONS

The system successfully displays and updates the time. The multiplexing approach ensures efficient power usage.

Future Improvements

Possible enhancements include:

- Adding an RTC module for better accuracy
- Implementing an alarm feature
- Using an OLED display for improved readability

Digital Clock Circuit

Conclusion

This project effectively demonstrates how to implement a clock, stopwatch, and timer on an ATmega328P. The use of timer interrupts ensures accurate timekeeping, and the seven-segment multiplexing minimizes GPIO pin usage.

Reference

This assignment has been done with the help of dhawal's(ee24btech11015) code.