

HW2: Asynchronous 7-Segment Display

Goal

To design a non-blocking, interrupt-driven 7-segment display system that counts digits (0-9), blinks periodically, and retains the last value after power loss using EEPROM.

Design Summary

- The system uses external interrupt to detect a button press and increment the displayed digit.
- Hardware timer interrupt (Timer1) triggers blinking of the display.
- EEPROM stores two values: a “magic” byte (for data validation) and the current displayed number.
- The main loop operates asynchronously using flag variables (btnPressed, blinkFlag, isBlinking) that are set inside the interrupt routines and processed without blocking delays.
- This design allows concurrent operation of display updates, button handling, and periodic blinking.

Timing budget

- Timer interrupt period: 3s.
- Blink duration: 200 ms.
- Button debounce: 200 ms.

Test results

- Button press increments displayed number from 0 to 9 correctly.
- The displayed number blinks once every 3 seconds.
- EEPROM correctly restores the last number after the power cycle.
- Debounce logic prevents accidental double counts.
- No blocking delays observed, the system remains responsive.