

Memory Pattern Game

This project performs as a pattern recognition memory game similar to the game Simon®.

Interface:

- LCD displays prompts for guiding the user, using either one or two lines as necessary. The displayed message remains on until specifically changed in a later step.
- 4 pushbuttons (SW2-SW5) are used for setup and game-play. When pressing pushbuttons to duplicate a sequence of LED flashes, note that SW2 lights up LED PB7, SW3 lights up LED PB6, SW4 lights up LED PB5, and SW5 lights up LED PB4. Pressing a pushbutton always causes the specified action to occur immediately, without waiting for the pushbutton to be released. Debounced and non-repetitive. Multiple simultaneous pushbutton presses should result in only one recorded press, the first one.
- 8 LEDs are used for displaying patterns and showing current state and pushbutton press. LEDs PB7-PB4 are used to display the pattern. When a pushbutton is pressed, the associated LED should light up until the pushbutton is released.
- Keypad is used for game level entry. Debounced and non-repetitive. Multiple simultaneous key presses should result in only one recorded key, the first one.
- 7 segment digit (rightmost) displays the level continuously after a level has been selected. Other digits stay off continuously.

Logic:

- Initial conditions at start of execution: All toggle switches are off/open/up. All LEDs and digits off. The LCD screen should start with the text "Memory Pattern Game Press SW2".
- Select the level: When SW2 is pressed, the LCD screen should then say "Enter level and press SW3". The level (from 1 to 4) should be entered on the hex keypad and displayed on the rightmost seven segment display. Do not accept any other values from the keypad. Then press SW3.
- Once the level is selected, the LCD screen should read "Level: <chosen level> Press SW2".
- Begin playing the game: Pressing SW2 starts execution at the chosen level. Then the LCD screen will display "Stage 1 begun".
- The first stage begins with a sequence of four LED flashes. The sequence should look random, but it may be the same every time the game is restarted. For example, Stage 1 may be chosen to display LEDs PB4 -> PB5 -> PB7 -> PB6. Alternatively it could be PB5 -> PB6 -> PB6 -> PB5. Or any other sequence of four flashes. The time between LED transitions depends on the level:
 - Level 1: 2.5 seconds on, 0.5 second off

- Level 2: 2 seconds, 0.5 second off
 - Level 3: 1.5 seconds, 0.5 second off
 - Level 4: 1 second, 0.5 second off
- After each sequence is fully displayed for one stage, the user must light up the LEDs in the same order using the pushbuttons SW2-SW5. There is no time limit to complete the sequence.
 - If the user cannot duplicate the sequence, turn on all 8 LEDs and display on the LCD screen “Try again. Press SW2”. Pressing SW2 will take the user back to the step labeled “Select the level”. At this point all the LEDs are turned off.
 - If the user duplicates the sequence correctly for the current stage, the game advances to the next stage displaying on the LCD “Stage Complete” for 2 seconds, then displaying “Stage <current stage> begun”. (Current stage number is from 1 to 5). Successive stages keep the original sequence and add a new random LED flash at the end of the sequence. In other words, if the original sequence had lit a 4 LED flash sequence, the next stage will light the same 4 LED sequence followed by one new LED flash. There should be 4 such stages where a new light is added to the pattern (5 stages total).
 - If the user successfully completes the 5th stage (i.e. duplicating a pattern of 8 LEDs), the game should display on the LCD “Lvl (chosen level) done Press SW2”. Pressing SW2 will take the user back to the step labeled “Select the level”.