Lab Assignment #2

Overview

In the game of Nim, two players take turns removing objects (sticks, matches, stones, etc.) from several rows of these objects. In a given turn, a player must remove one or more objects and all of these objects must be from the same row. The object of the game is to avoid being the player that removes the last object (or in alternate versions of the game, to be the player that removes the last object). The number of rows and objects in each row can change (or even be random) depending on which variation of the game is played.

For this assignment, you will design and implement an electronic version of this game for the LPC1769 using its general purpose I/O subsystem to interface with LEDs and switches.

Hardware requirements

- Interface a row of 5 blue LEDs, a row of 5 green LEDs and a row of 5 red LEDs to output ports on the LPC1769.
- Interface 6 switches to input ports on the LPC1769. Three of the switches select a row for Player 1 and three of the switches select a row for Player 2.
- To make your demonstration clearer, physically group the LEDs and switches for a particular row together.
- Try to maximize the brightness of the LEDs, but do not exceed the maximum recommended/operational current limits of any of the devices. Do not draw more than 75 mA for the LEDs from the USB cable.

Software requirements

At the start of the game, all of the LEDs should be on. For each player's turn, they can press one of their switches (corresponding to a particular row) one or more times. Each time they press the switch, one of the LEDs on that row should turn off (representing an object being removed from that row). Once a player has selected a particular row, the switches for the other rows should be ignored until the other player presses one of their switches (that is, the software should not let the players cheat). The game is over once all of the LEDs have been turned off; at that point, the software should pause for a few seconds and then start a new game.

Additional requirement for 3 person teams

Interface an additional 4 LEDs to the LPC1769 that represent the number of games won by each player, 2 LEDs for each player. Initially, all of these score-keeping LEDs are off. After a player has won a game, an additional score-keeping LED for that player should turn on; if they are both already on, nothing needs to be done. A player is considered to have "won" when their opponent has been forced to turn off the last LED.

What to demo

1. Start a new game.
2. The two players should take turns pushing their switches and play the game as described above.
3. Show that attempts to cheat (a player pressing switches for more than one row per turn) are ignored.
4. At the end of the game, a new game should automatically restart.
5. For 3 person teams, play several games to show that the score-keeping LEDs work properly.

What to put in the lab report

- The objectives of the assignment (essentially, the overview above but in your own words)
- The design of your solution
  - Show how you derived component values
  - Show that the operational current limitations are not exceeded by the design. Be sure to consider the combined effect of all LEDs on simultaneously and not just an individual LED.
- The details of your solution
  - Include the software source code (use a fixed-width font so the indentation looks reasonable).
  - Complete schematic
    - Label all of the components with a reference ID (R1, R2, LED1, etc)
    - For resistors/capacitors, show their value
    - For devices that have them, label the pin numbers
- The major (EE, CpE, or other) and individual contributions of each team member.
- Any additional comments (uncompleted objectives, additional features, etc)

Due date

February 9th