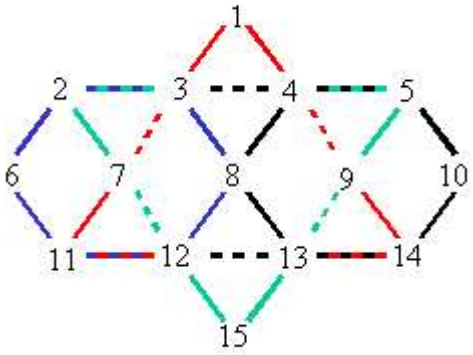
Hexer Game - System Requirements & Description

General Description

Hexer is a game or puzzle that is played using 15 LEDs and 5 switches. Each LED may be "on" or "off". The object of the game is to convert an initial configuration to a configuration with all LEDs "on".

There are five moves possible in the game (one for each switch). Four of the moves are rotations and the other move inverts some of the LEDs. This is easiest to explain using the following diagram (of the LEDs):



With this numbering of the LEDs, the switches have the following effects. The white switch inverts the inner (white) hexagon consisting of LEDs 3, 4, 7, 9, 12, and 13. The black switch rotates the right (black) hexagon consisting of LEDs 4, 5, 10, 14, 13 and 8 clockwise one position. The blue switch rotates the left (blue) hexagon consisting of LEDs 2, 3, 8, 12, 11, and 6 counter-clockwise one position. The red switch rotates the upper (red) triangle consisting of LEDs 1, 4, 9, 14, 13, 12, 11, 7, and 3 clockwise one position. And the green switch rotates the lower (green) triangle consisting of LEDs 2, 3, 4, 5, 9, 13, 15, 12, and 7 counter-clockwise one position.

There are two ways to initialize the game: randomly and manually. To randomly initialize the game, "Random Reset" is pushed together with "START" and the system sets the initial position randomly (actually pseudo-randomly). To manually reset the system the "START" button is pressed along with either "Manual Reset 1" or "Manual Reset 0". "Manual Reset 1" will load a "1" (LED on) and "Manual Reset 0" will load a "0" (LED off). During manual reset the 15 LEDs should be viewed as a giant shift register and the ones and zeros from pressing "Manual Reset 1" or "Manual Reset 0" are shifted into that shift register. For ease of use it should be shifted in numerical order (using the above diagram). After shifting in an initial position, "START" is released to begin playing the game.

User Interface

The current game state is displayed on the 15 LEDs. The current move number and possibly additional information is displayed on the 4-digit 7-segment display. The user can rotate or invert triangles and hexagons of LEDs as described above by pressing the appropriate switch. The game may be reset at any time by pressing the "START" switch along with the "Random Reset" or "Manual Reset 1" or "Manual Reset 0" switch. This resets game statistics and sets the grid to a random state if "Random Reset" was pressed. If "Manual Reset" was activated the user can manually set the initial board state. The user should get feedback (visual and/or audio) when they win or lose the game.

Memory Available

There are 4K bytes of RAM and 32K words of ROM available on the system. There is also an SD card that is used to store top scores and other information.

Input/Output Devices

Switches	6 pushbutton switches
Display	4-digit 7-segment LED with indicators 15 LEDs to display the game state
Speaker	standard speaker
SD Card	standard interface via SPI

LED Layout

Digit	Bit							
	7	6	5	4	3	2	1	0
0	Game State LED 9	Game State LED 1	Game State LED 5		Game State LED 10	Game State LED 4	Game State LED 3	Game State LED 2
1	Game State LED 13	Game State LED 11	Game State LED 8	Game State LED 15	Game State LED 14	Game State LED 12	Game State LED 7	Game State LED 6
2	Right Top Indicator	Left Middle Indicator		Left Top Indicator	Colon	Digit 4 DP	Digit 3 DP	Left Bottom Indicator
3	Digit 4 Segment f	Digit 4 Segment b	Digit 4 Segment e	Digit 4 Segment a	Digit 4 Segment g	Digit 4 Segment e	Digit 4 Segment d	Digit 4 Segment c
4	Digit 3 Segment f	Digit 3 Segment b	Digit 3 Segment e	Digit 3 Segment a	Digit 3 Segment g	Digit 3 Segment e	Digit 3 Segmen2 d	Digit 3 Segment c
5	Digit 2 Segment f	Digit 2 Segment b	Digit 2 Segment e	Digit 2 Segment a	Digit 2 Segment g	Digit 2 Segment e	Digit 2 Segment d	Digit 2 Segment c
6	Digit 1 Segment f	Digit 1 Segment b	Digit 1 Segment e	Digit 1 Segment a	Digit 1 Segment g	Digit 1 Segment e	Digit 1 Segment d	Digit 1 Segment c

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