ECE-2700 FINAL PROJECT

MEMORY MATCH GAME USING VIVADO & NEXYS BOARD

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VIVADO™

MEMORY MATCH GAME

A QUICK EXPLANATION

- Memory match are simple children's game like follow the leader and simon says. They are a game were a certain set of instructions are given or code and it most be repeated back the same way.

Controls For Memory Match Game.

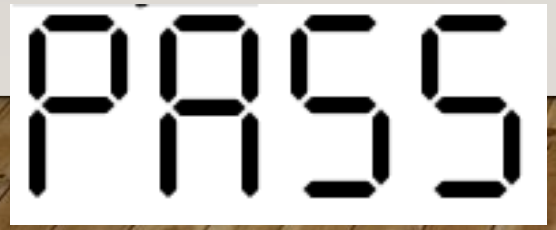
The 5 Button Input on the Nexys A7 50t will be the inputs for our simon says game.

the outside four buttons are the inputs to play the game with the center middle button being the button that starts the game.

The reset Switch is used to reset the system.

The User reads the direction the game displays, and inputs them back in the same order the game gave them to the user.

If the combination is correct the user gets a pass displayed and moves to the next level or fail.

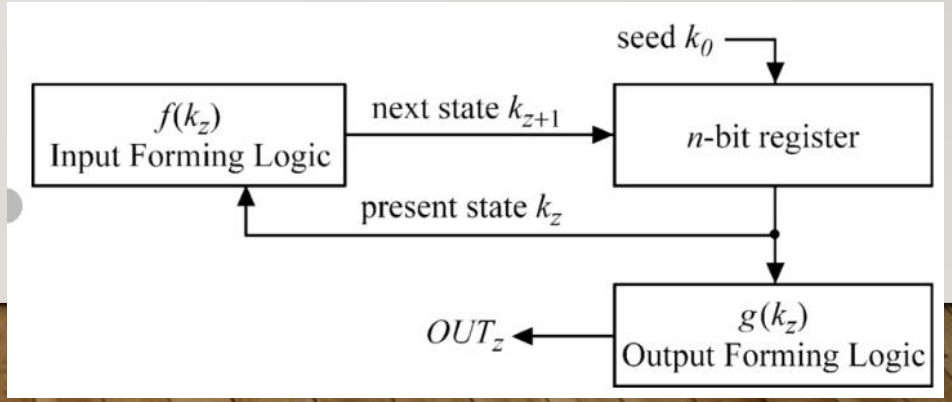


Pseudo Random Number Generator (PRNG)

PRNG is a equation or algorithm that uses a mathematical formula to give a order of rand numbers.

PRNG's use a starting state with a seed state, seed state being the number chosen to start the process.

PRNG are not perfect for situations where the application of the numbers need to be unpredictable, for example in gambling



General architecture of a digital PRNG.

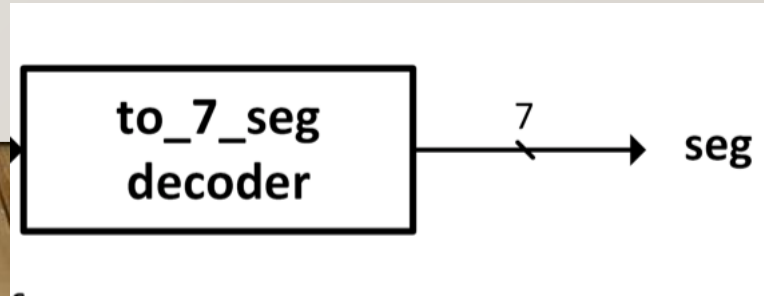
7-Segment Display and 7-Segment Decoder

A 7 Segment Decoder is a combinational logic circuit with digit input and generates a output for the segments of the display to properly display the number.

This is used to display all messages for the game on the 7 segment display.

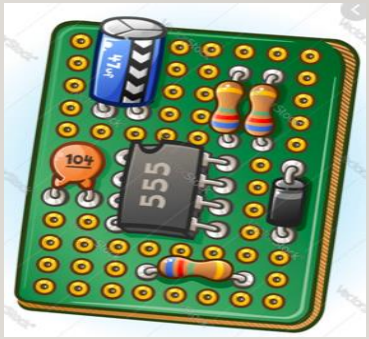
The 7 segment display is a electronic device built into the nexys a7 50t board that uses an array of 8 individual LEDs to display what is needed.

Examples of this are the Pass, Fail, and button indicator.



What the Circuit Does?

Initially, when any value got presented, the priority encoder encodes the 4-bit into 2-bit, and see if the number is in the valid range; z value is ‘1’ of the selected inputs, if it does then the PRNG launches any random number through the MUXs, once the random number displayed on the 7-seg displays, it waits for the user input, then it decides whether the user input matches the displayed value, if it does then the level counter counts that occured event as well as track elapsed time between two events and move it to the next level.



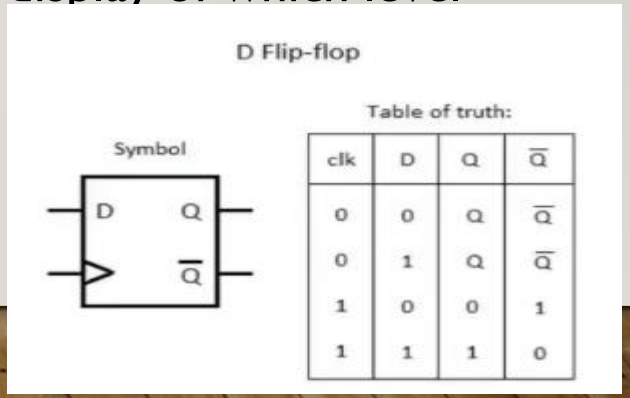
Level Counter (Register)

A register is a group of Flip-Flops used to store information.

A Register uses a sequential circuit consisting of a combinational circuit and storage element which is the D Flip-Flops that together form a feedback system.

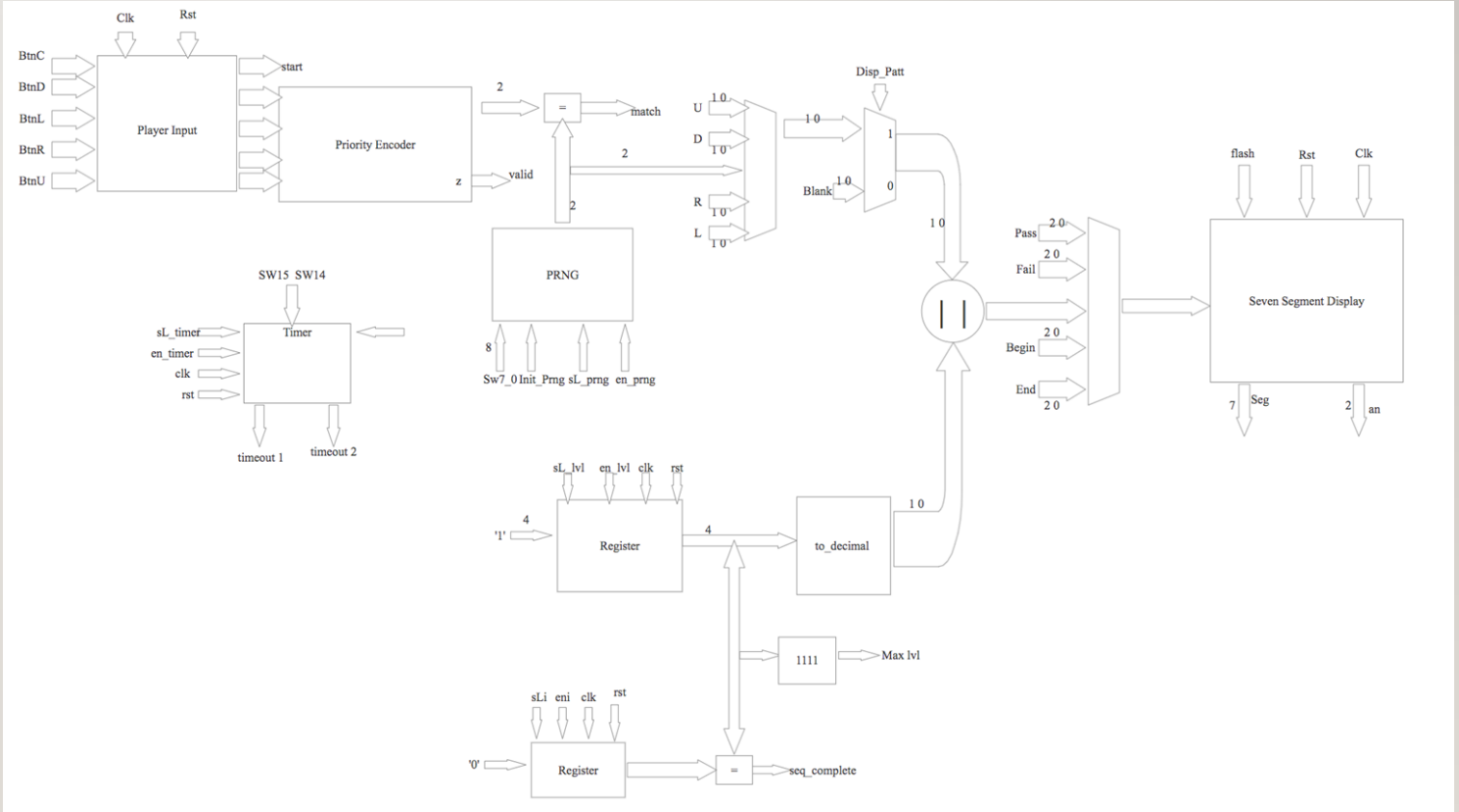
The D Flip-Flop is perfect use for the level counting since it uses the last state information to get the next state.

This is used in our simon says game to keep track on the 7-segment display of which level you are currently on.

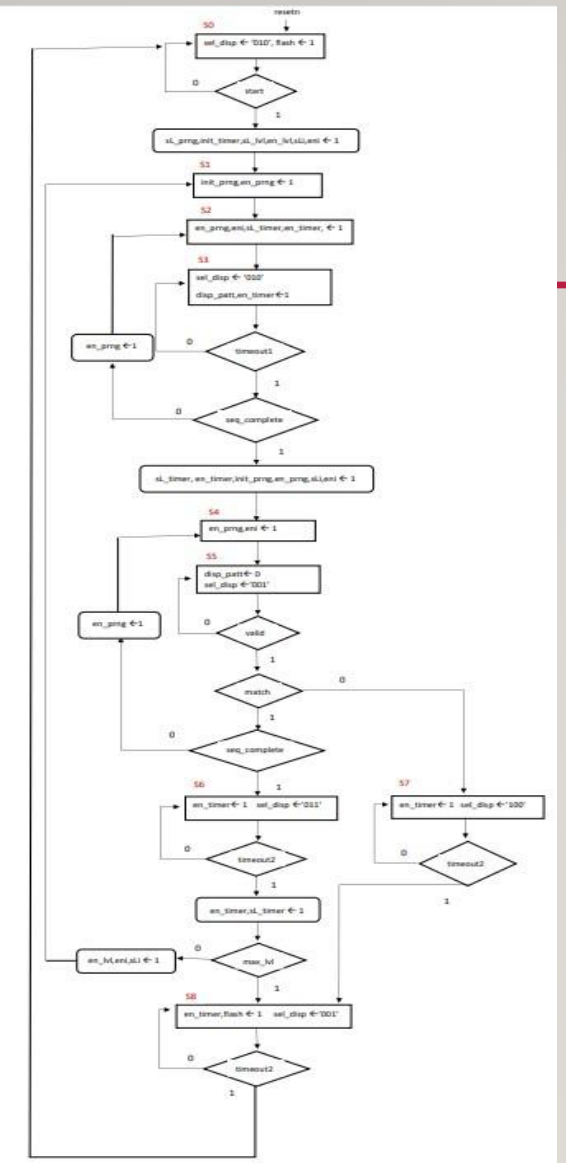


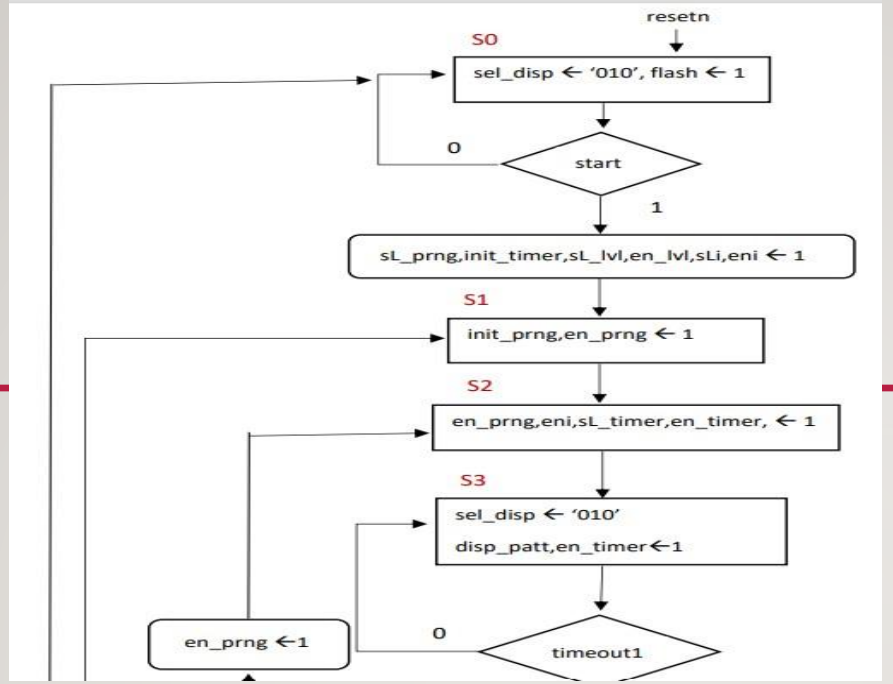
Data Path

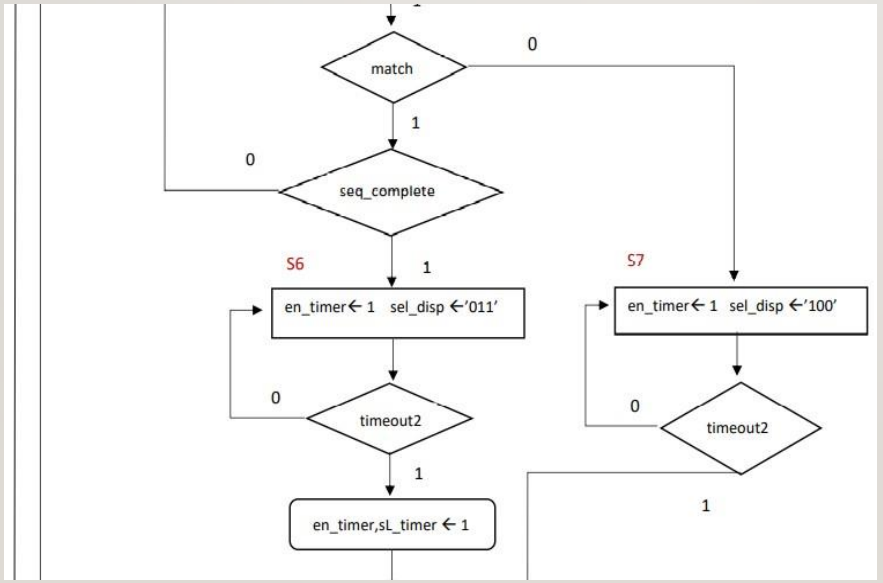
The data path shows how functions are carried out through the circuit and the direction the processes' flow.This Circuit starts with the player input more specifically with the "btnC" which activates the start functionality. As the inputs flow they are converted to binary and are compared to the output of the PRNG.The PRNG is displayed to the player and whether is matched correctly or incorrectly it's carried to the seven segment display. While this all going on the Registers are carrying out a process that will indicate what level the player is at. There is also a level cap set at 15. This is all also carried to the seven segment display

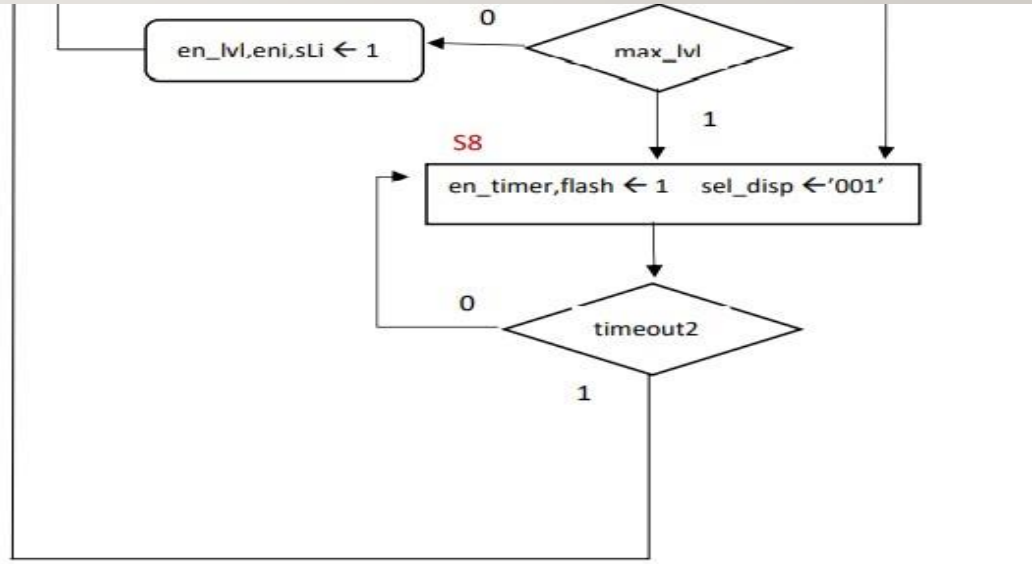


State Machine









Pre-Recorded Demo