EECS3216

Lab 5

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**Problem Statement**

Implement a stack in Systemverilog code to do the following:

1. Input
   1. Reset and do\_op
   2. 6-bit number as data to be store
   3. 2-bit opcode (pop or push)
2. Output
   1. The number at the top of the stack displayed on 2 7-segment displays
3. Reset is Key0
4. Do\_op is the do the operation (pop or push, of course to do a push data must have been  
   setup already on SW5 – SW0
5. The 6-bit number in SW5.. SW0
6. opcode is set by SW7,SW6
7. In ordered to push data, the data is set by SW5 to SW0, the opcode is set as 10
8. In order to pop data, opcode is set to 01
9. When you push key1, the operation is performed
10. The top of the stack is always displayed on the two 7-segment displays
11. When you push, the new data you just pushed is the top of the stack, that should be  
    displayed on the two 7-segment displays.
12. When you pop, the new data (used to be in top-1) will be the top of the stack and is displayed on the 7-segment displays
13. When you pop an empty stack, nothing happened
14. The stack size is 16
15. When you push to a full stack, nothing happens.
16. When the operation is 11 or 00 nothing happens.

**Design**

My code works as follows:

It is based on the Moore Finite State Machine.

We have 5 States: rdy, push, and op



As we as 3 variables that are used for the stack: currentIndex, savedNum and numToDisplay

A screenshot of a computer

Description automatically generated with medium confidence

Initially, the state is set to rdy

Text

Description automatically generated

It then sets the state to NextState

Text

Description automatically generated

The NextState is decided by the following:

1. If do\_op == 2, NextState = push
2. If do\_op == 1, NextState = pop
3. Else NextState = rdy

Text

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If KEY1 is clicked in the push state, the stack array at the currentIndex is set to the six bit input and the currentIndex is incremented by 1 unless the currentIndex is 16.

Text

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If KEY1 is clicked in the pop state, numToDisplay is set to the stack array at the currentIndex and the currentIndex is decremented by 1 unless the currentIndex is 0.

Text

Description automatically generated

numToDisplay is then output on the 7-segment display

Text

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If the Reset button is pushed, the stack array is set to 0 at all indexes, current index is set to 0 and the numToDisplay is set to 0.

Text

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Diagram

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