NEXYS 4 NUMBER CRUNCHER

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PURPOSE

• Create a calculator useful for binary inputs
• Perform calculations quickly and easily
• Fun way to calculate small integer values
• We were hoping we could use our project on the final exam.
THE CALCULATOR FUNCTIONS

- Addition
- Subtraction (Absolute Value)
- Multiplication
- Division

Calculations are performed using two 4-bit unsigned binary numbers as inputs (A&B). For all order dependent operations, A is considered the first input.

- Example: A ÷ B
FEATURED COMPONENTS

- FPGA (Nexys 4 DDR)
- Button - Clear
- Switches - Input
- LEDs - Output
- 7segment Display - Output
SWITCHES

• The switches are used to determine:

  • Unsigned 4-bit Binary input “A”: \(a_3, a_2, a_1, a_0\) (Range: 0 – 15)
  • Unsigned 4-bit Binary input “B”: \(b_3, b_2, b_1, b_0\) (Range: 0 – 15)
  • Which Operation will be performed: If more than one is enabled then the MSB has priority
  • If no functions are selected, addition will automatically be performed.
  • An extra switch was used to use enable the LEDS when Division is being performed

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7SEGMENT DISPLAY

• The Values displayed on the 7segment display are all shown as decimal value (base 10)

• Seven 7segment displays were used to show:
  • The Value of A and B (Range 0 – 15)
  • The Output Value (Range 0 – 225)
    • During Division the quotient will appear on the 7segment display
LEDS

• LEDS are only used during the Division Operation
  • They are used to display the value of the remainder “R” in unsigned binary
  • LED<3> is the MSB
  • LED<0> is the LSB
  • All other LEDs on the board are disabled
KEYPAD

- CPU RESET (Button "C12") is used to reset the board if the need ever arises
Top Level
POSSIBLE IMPROVEMENTS

- Improve the range to include 5 or 6 bit inputs
- Include negative values in the range
- Use a keyboard as an input
- Only make the display show up with a button is pressed