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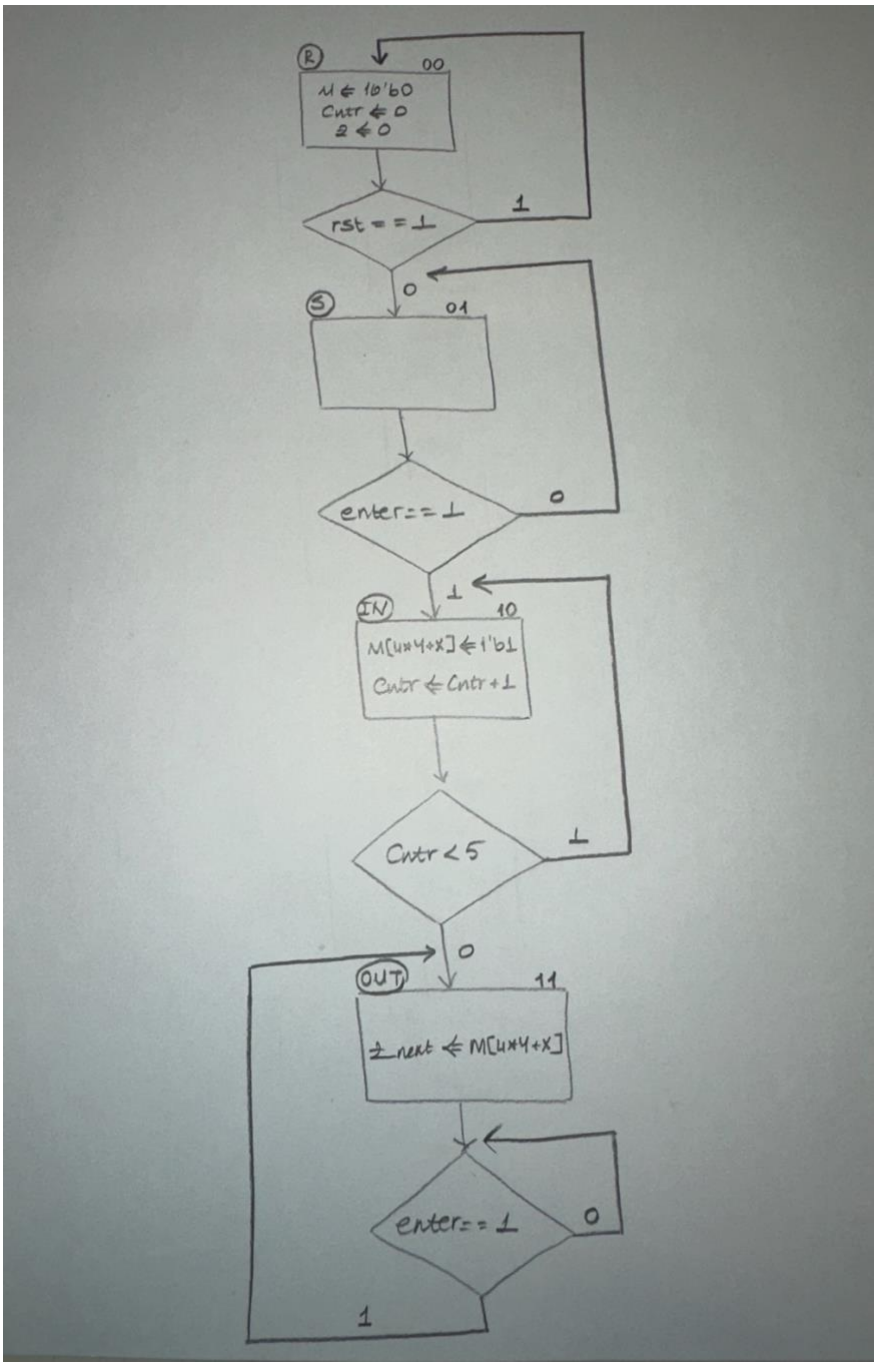
CS303 LAB REPORT – LAB #4

Drawing of my state machines:

State Machine Diagram – ASM Chart



How did I handle the inputs? How do I ensure that I sample the input signals at the positive clock edge?

The inputs X, Y, and enter are processed using synchronous logic. This is done by defining an always @ (posedge clk or posedge rst) block in my design. This block ensures that the inputs are sampled precisely at the positive edge of the clock signal, or during a reset condition when necessary.

I implemented a counter, Cntr, to keep track of how many input coordinates (X, Y) have been received so far. This counter ensures that we stay in the IN state until the 5 inputs have been collected.

When the state is IN and the enter signal is asserted (set to 1), the corresponding matrix cell is updated to 1. The specific element in the matrix is calculated using the formula M[4*Y+X], which maps the 2D coordinates (X, Y) into the flattened 16-bit register M. This ensures that every input is correctly handled and stored in the matrix at the exact location defined by the user.

How did I handle the outputs? How did I make sure that Z stays zero until enter is 1 and requests the content of a given coordinate?

Initial State Behavior: During the R (Reset) and S (Stop) states, the value of Z is explicitly set to 0. This is achieved through the reset logic where Z is initialized as 0 to ensure no unintended outputs occur before the system is ready.

Output Condition: When the state transitions to OUT and the user asserts the enter signal (sets it to 1), the output Zis updated. At this point, the value stored in the matrix at the specified coordinates (X, Y) is fetched using the formula M[4*Y+X] and assigned to Z_next.

Maintaining the Output: The output Z is updated on the next positive edge of the clock cycle, making it equal to Z_next. This ensures that the change in Z is synchronized with the clock.

By separating the combinational logic (I used for calculating Z_next) from the actual Z output update, I made sure that Z remains 0 until all conditions are valid. This design also ensures that the value at the requested coordinates by the user is displayed only when explicitly required by the user.