ECE 153A, Friday @ 4:00pm
Lab #2A

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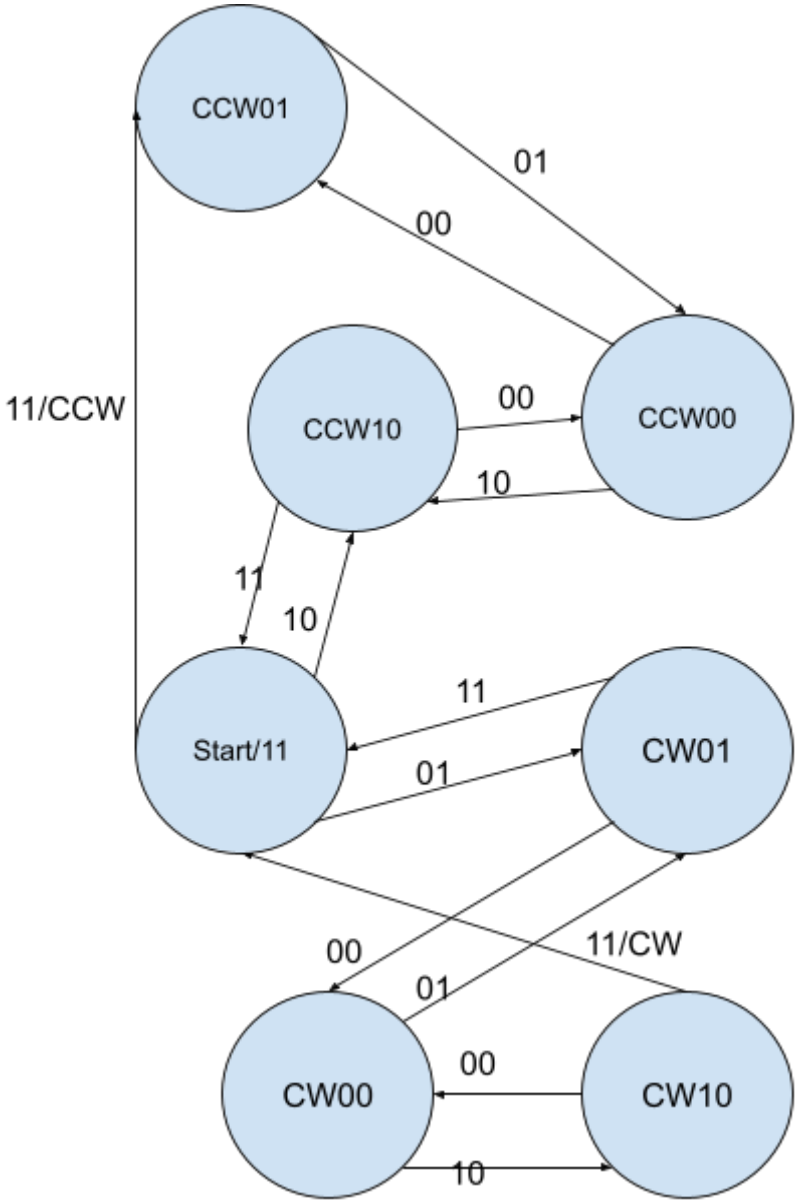
PART 1

We consider our start state 11, we detect the direction of the encoder input from the first transition. If we are going down the CW path, our first input would let us go to state CW01 and would follow the pattern of steps until we reach CW10 to Start11 where an output is produced. If the input is CCW, the same thing happens but for the CCW states.



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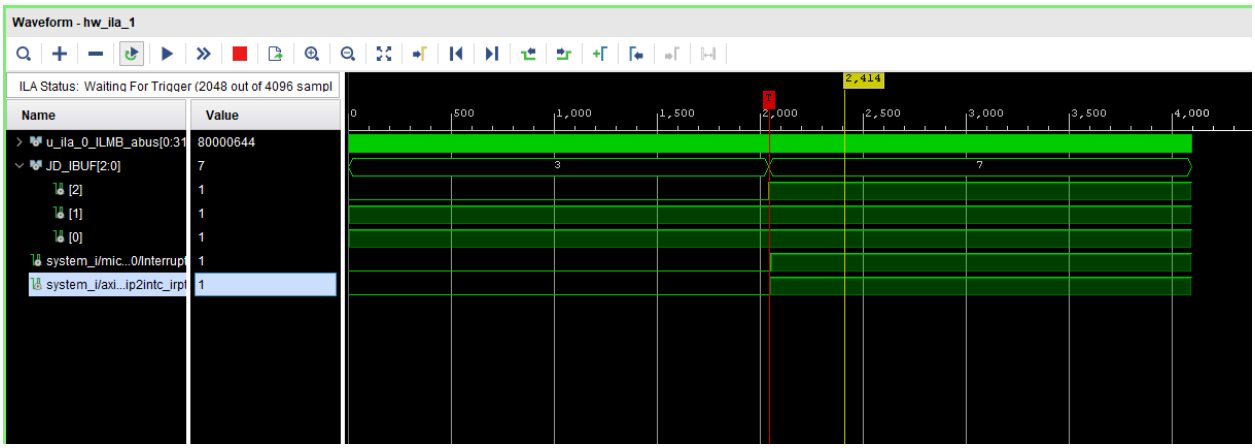
PART 2

One way to solve the debouncing problem would be by ensuring that during any state transition that does not produce an output, we allow a path back to a previous state. Let's say we are going from state CW01 to CW00, while the input bounces between 01 and 00, our machine will simply bounce between the two states until it resolves at the state it was intended to go to. This can be done for every transition except the one from CW10/CCW01 to Start/11.

However, what we ended up going with was a simple timer-delay based interrupt. On the encoder interrupt, we keep track of the current timer count and wait for it to reach a certain reset value (this comes out to about 500ms). Then we proceed with the interrupt. This works pretty well for the most part since it stops the interrupt from processing any additional noise.

PART 3

Screenshot 1: The interrupt from the push button and the GPIO signal.



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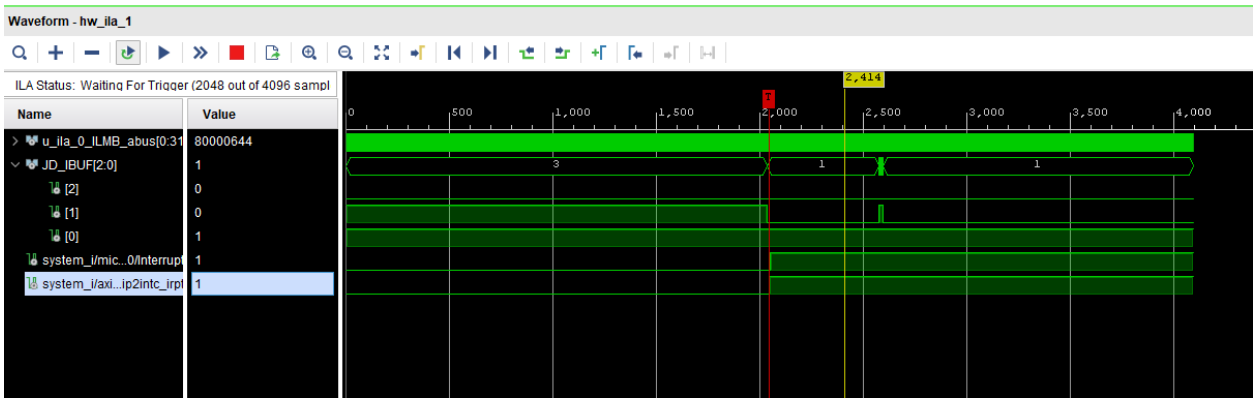
Screenshot 2: The interrupt from the twist button and the GPIO signals.



PART 4

The Machine Status Register contains the control and the status bits for the MicroBlaze allowing you to change settings such as interrupt enable, divide by zero overflow, data cache enable, etc. Bit 30 is responsible for interrupt enable, which is necessary in order to be able to use interrupts with our microblaze FPGA.