**EE 474 Winter 2017 Lab 3:**

**Switch Debouncing and Using Libraries with the LCD**

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**Question #1: Do any false transitions get through to the LED? Why? If so, why don't you see the LED flicker?**

**Yes, false transitions get through. We can see on the oscilloscope that due to the bouncing the led turns on and off quickly with the extra pulse at the end of the signal. However, we do not see the LED flicker because it happens so fast. It has an effect similar to PWM, where the flicker is too fast for the human eye to perceive.**

**Question #2: Do the transitions on pin 13 change? Why?**

**The transitions do change on pin 13. This is because the code is executed sequentially in the loop so the transition on pin 13 will be very slightly delayed if we have to print out to the console first.**

**Question #3: Are the transitions on pin 13 any different? If so, please describe.**

**Yes, the debouncing procedure is used to ignore the unwanted transitions due to noise or false transitions. The transitions now did not have noticeable false transitions getting through to the led.**

**Additionally, when lowering the debounce timer to very low values, we would introduce false transitions because it is rendering the debounce procedure ineffective since false transitions are happening after the specified short debounce time.\**

**When increasing the debounce timer to larger values (100) we notice the button press must be longer in order to be recognized as a true press. Very short button presses are considered false because of the long timer and so the led does not transition.**

**In concolusion we must find a debounce timer that is not so short that false transitions are not read, and not so long that true presses are ignored.**

**Question 4: What are the limits to the size of the cube? How small can you still discern it to be a spinning cube? What is the largest size where it is still identifiable as a cube?**