COE4DS4 Lab #1

Digital System Implementation with Real-Time Constraint

Group 16

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Exercise1:

For the question1, firstly we need to have 8 different blocks with different colors from balck (000) to white (111). To do so we have set 8 registers called diff1-8 and each one has a different rgb value, and have 8 if loops to check if the pixel is in which block and give the related rgb value to that pixel. Also we set 8 counters to check each blocks time, if no touch after one second the rgb value of that block will add 1. If it’s touched then keep the counter of that block to zero until it’s released. For the 7 segment display first, if the switch[0] is low, then take a register called position counter to record which block is the last one to be touched and check if that value is same as the least 7segment display’s number if so keep the same if not change the least 7 segment display’s value to the new one and update every segment display before to the last ones. If the switch[0] is high then compare each blocks rgb value to the color number. For instance, if diff 1 and 3 are black then the counter of black color will be two. Assigned every color counter value to the 7 segment displays from least to most ( black to white).

Exercise2:

Based on the basic idea of experiment, we need to make a filter to display a grayscale image. We computed filter calculation by using the recurrence equation. And we added new variables in the corner cases based on the recurrence equation.

In the FSM, we added a case for Filter\_config equals 6. Filer\_config[4] and Filter\_config[3] are the variables to control switch[4] and switch[5]. Then, the program performs thresholding in four situations. If switch 5 and 4 are both low, and filter calculation value is larger than 32 or less than -32, the result would replace the grayscale value with the maximum value or the minimum value. Another three situations are based on this concept.

For this part, each variable we were used should be signed number, which it’s a critical point for the calculations.