CSCI 210
HOMEWORK ASSIGNMENT 01

SIMPLE 3-BIT UNSIGNED BINARY ADDITION MACHINE

Description

You will create a combinatorial logic device which adheres to the following specifications. It will have 4 inputs and 4 outputs. The inputs are named a_2, a_1, a_0 and s. $a[2..0]$ describes a 3-bit unsigned binary number, where a_2 is the most significant bit. s is a 1-bit control signal which changes the function of the device. The outputs are b_3, b_2, b_1, and b_0, and they represent a 4-bit unsigned binary number with b_3 being the most significant bit. The behavior of the device is as follows:

IF(S==0)
    $b[3..0] = (a[2..0] + 2)$
ELSE
    $b[3..0] = (a[2..0] + 4)$

$b[3..0]$ should be connected to $LEDR[3..0]$. This means output number should be connected to the red lights. $a[2..0]$ should be driven by the switches $SW[2..0]$ and s should be attached to $SW[9]$.

Part 1: (design circuit)

Write a truth table that completely describes the behavior of this device. Create the appropriate Karnaugh maps, and derive the correct equations for the outputs. Write these neatly and cleanly for turning in. The truth table and Karnaugh maps will be due in class on Friday prior to the program submission.

Part 2: (implement in Quartus)

Using Quartus, implement the system using the equations derived in Part 1. Compile and deploy to DE0 board. Verify the design and the implementation actually works by toggling through all possible input combinations.

Submission: (no late work accepted)

Prior to the due date and time posted in Moodle, upload your project into Moodle. This will be a zip file which contains the entire project directory structure. Your submission should be named userid-210-HW01.zip, where userid is your userid. Make sure to check two things after submitting your assignment:

(1) Your file has successfully been uploaded into Moodle.
(2) Download your file from Moodle, unpack the file, load and execute it on your board. If this doesn't work for me, you will loose significant credit on the assignment.