EE 4142/ EE5190 LABORATORY - DIGITAL SYSTEMS DESIGN II Spring 2022: February 14-15 Lab Sessions
Lab #3. – ASM implementation using Xilinx ISE HAWK (High-intensity Activated crossWalK)

HAWK - Pedestrian Crosswalk

Objective

The purpose of lab is to familiarize with the process of ASM design implementation using Xilinx Vivado

Prelab (30%) DUE BEGINNING OF LAB

1) Based on the provided Block Diagram and final ASM Chart, **specify the contents of the ROM table.**

2) Specify the contents of the **Programming table** based on the ROM table in part 1).

In lab session (50%) –

1. Understand and synthesize all the modules of the ASM design implementation.
   - Create a 4-bit register using D Flip Flops.
   - Create the ROM module by using the *Programming table* created for the prelab.
2. In the main schematic, set up the state register and ROM using the circuit diagram provided. YP, NS and the clock should be input markers. HYL, HRL, HW and HDNW should be connected to output markers. Both the present state and next state nets should be connected to output markers.
3. Generate a *Verilog Test Fixture* to perform verification of the HAWK circuit
4. Run the simulation and analyze the behavior of the ASM HAWK using ISim tool:

Report (20%) *Due Thursday Feb 18th by 11:59PM

Lab Description:

UTEP Parking and Transportation Services has installed on Schuster Avenue at Prospect Street and Lawton Drive to provide a protected pedestrian crossing activated by the push of a button. The device is called a **HAWK** (**H**igh-intensity **A**ctivated cross**W**al**k**). The HAWK is normally in an "off" position until it is activated by a pedestrian wanting to cross the busy street. The HAWK functionality is described as follows:

• For the pedestrians, the lights work much like they do on a regular stop light: When a pedestrian wishes to cross the street, they push a button. A "Do not walk" symbol is illuminated while the system prepares the crosswalk for safe crossing. When safe to cross, a "Walk" symbol is illuminated.

• For vehicles, the lights will remain off when no pedestrians are present and motorists can drive through the crosswalk without stopping. **Once a pedestrian pushes the button**, the following occurs:

- 1) The signal begins to display a flashing yellow light that warns drivers approaching the crosswalk to slow down. Pedestrians wait.
- 2) The flashing yellow light is followed by a solid yellow light, telling drivers to prepare to stop. Pedestrians wait.
- 3) The signal then changes to a solid red for the drivers to stop at the stop bar, and the pedestrian gets a walk signal.
- 4) The system utilizes a scale sensor to detect the presence of a pedestrian still in the crosswalk. If a pedestrian has not finished crossing, the signal will continue to be a solid red for the drivers.
- 5) Once the scale sensor becomes inactive by the absence of pedestrians in the crosswalk, the solid red signal for drivers converts to a flashing red signal. This allows vehicles to proceed with caution after stopping and making sure that the road is clear (just like a regular stop sign).

I. BLOCK DIAGRAM

II. SIGNAL DEFINITION

Inputs

YP – Active high, **P**edestrian push button where a “1” means a pedestrian desires to use the crosswalk and has pushed the button

NS – Active low, **S**cale sensor is activated. A “0” means a pedestrian is still walking through the crosswalk, a “1” means no pedestrian is detected at the crosswalk by the scale

Outputs

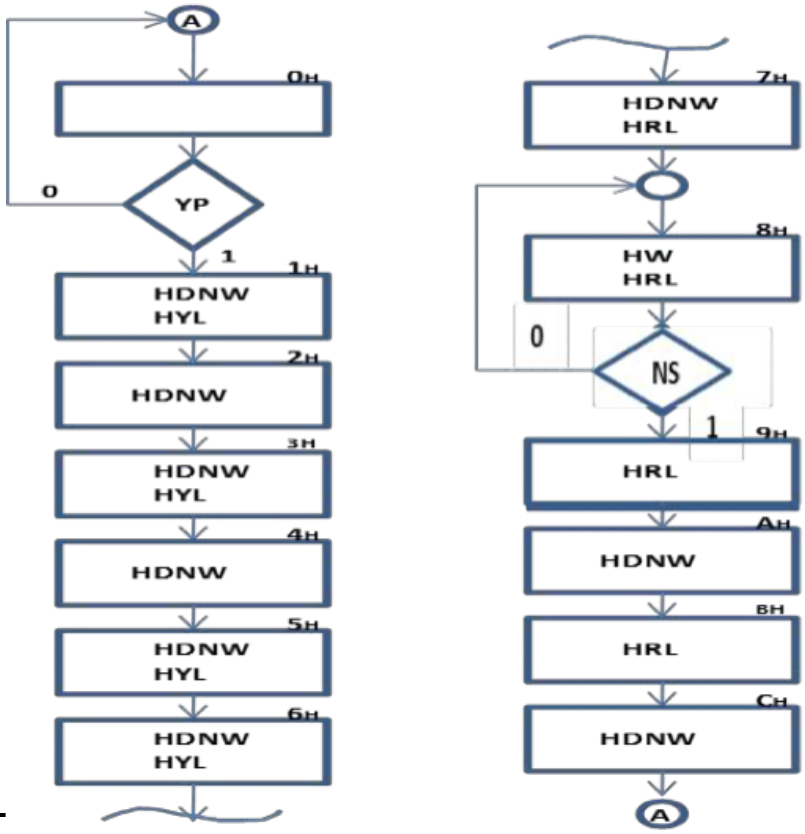
HDNW - Active high, asserts pedestrian “**D**o **N**ot **W**alk” symbol

HW - Active high, asserts pedestrian “**W**alk” symbol

HRL - Active high, asserts motorists **R**ed **L**ight

HYL -Active high, asserts motorists **Y**ellow **L**ight

III. ASM CHART



IV. ROM Table *(*Please create your own):*

V. CIRCUIT DIAGRAM