1. INTRODUCTION

In this lab, you will use the QUARTUS software package to design a mixed mode video display controller capable of displaying both text and graphics. The requirements for this lab consist of completing QUARTUS designs and printing the VHDL files, functional simulation waveforms and laboratory report. Additionally, each design will require appropriate information obtained from various compilation reports and netlist viewers. All simulations should be done using the ModelSim-Altera Simulator. You may use VHDL testbenches or ModelSim DO files to control the simulation. Additionally, you must demonstrate your design.

2. DESIGN

For this assignment you are to design a mixed mode video display controller capable of displaying both text and graphics. The VGA display resolution is to be 800x600 pixels with a 12-bit/pixel color resolution. The monitor refresh rate is to be 60 Hz. The screen is to be separated into two fields. The upper field will be used for text display and should support ten (10) rows of 8x8 characters. The text information displayed is to come from an appropriately sized RAM. The exact content of this RAM should vary to verify proper operation of the text display. Examples of useful information to display include the names and values of signals and registers that are used in your VHDL design. Font data for the characters to be displayed should come from a font ROM (tcgrom.mif should suffice).

The remainder of the video display is to be devoted to graphics display. Minimally, your design must show the display of an object that moves throughout the portion of the video display devoted to graphics. The data for the object to display should be provided by an appropriate RAM or ROM. Object motion is to be controlled using the four pushbuttons on the DE board. Horizontal movement of the object is to be controlled using PB[0] and PB[1]. If PB[0] is pressed, the object is to move to the right across the screen. If PB[1] is pressed the object is to move left. PB[0] is to take precedence over PB[1]. Vertical movement of the object is to be controlled using PB[2] and PB[3]. If PB[2] is pressed, the object is to move down the screen. If PB[3] is pressed the object is to move up. PB[2] is to take precedence over PB[3]. Limit the movement of the object to within the graphics display area of the screen. The object should not be permitted to go beyond the bounds of the graphics display area.

View the compilation report files (*.rpt) that are generated when you compile your design. Summarize LE, memory, and interconnect usage for your design. After the design is finalized, print the device floorplan showing LE, memory, and pin usage. Print the top level hierarchy shown in both the RTL Viewer and the Technology Map Viewer and include in your report. Download your design to the Altera development board and test.