CECS 360 Project 2 – VGA Synchronization

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12 October 2017

Introduction

This project introduces us to video graphics array display or just simply vga. For this project we are to display colors which will be controlled by the switches on the board. The vga sync module creates the timing and synchronization signals. The hsync and vsync signals will be connected to the vga port to control the horizontal and vertical scans of the monitor. The vga sync module will also generate a video enable to turn the display on or off.

VGA synchronization

The vga sync module will generate the hysnc signal which specifies the time required to scan a row. It will also have the vsync signal which specifies the time required to scan the entire screen. For this project we will have a screen resolution of 640 x 480 with a refresh rate of 25Mhz. This refresh rate tells us the number of pixels processed every second. The resolution of the screen is also known as vga mode.

Horizontal and Vertical Synchronization

The hsync signal will be obtained from a 0-799 counter and a decoding circuit. The counts will then be used to mark the end of the horizontal display indicated by endh. The hsync signal is also specified to be low active from count 656 to 751 and high active from 0 to 639.

The vsync signal will be obtained from a 0-524 counter and a decoding circuit. The counts will then be used to mark the end of the vertical display indicated by endv. Note that the vsync will also wait for the horizontal counter before it starts counting up. The vsync signal is also specified to be low active from vertical count 490 to 491 and high active from 0 to 479.

The hsync and the vsync signal determines if video on will be high active—video on will be active when hsync and vsync are active at the same time.

Operation

The operation is pretty strate forward. We will use switches 0-11 on the board which corresponds to vga_rgb 0-11 respectively. The first 4 switches will be for the red, the next will be for green and the remaining for the blue. Each switch also has a certain intensity to it the most significant bit of each color has the most noticeable color. You can also see that you can mix colors to produce another color.

Simulated Wave form