ECEN 3002 – Video Project, Part Three

Due Thursday, March 4th, end of day

50 points

For part three, you will add support for 1080p60 resolution into your VGA Controller design. 1080p60 is similar to 720p60, except for the number of lines and pixels, and also requires a different pixel clock frequency.

Your design will not support both resolutions simultaneously, but instead you will use a macro setting in Quartus to conditionally compile for either 720p or 1080p.

The submission for this portion will be your project .qar file, and a photo of your display running in 1080p60 mode with the stripes pattern.

Specific Requirements for Part 3:

1. Use a macro called “highres” (no quotes) to dictate how your video controller will compile and operate. When highres is defined, your project will compile and run at 1080p resolution. When highres is not defined, your project will compile and run at 720p resolution.

2. Use your 720p stripes pixel generator for both resolutions. In 1080p mode, you will see narrower stripes that do not extend all the way to the bottom of the monitor.

1080p60 Parameters:

```
1080p 1920 x 1080 60Hz, 148.5 Mhz pixel clock
2200 pixels per line, 1125 lines per frame
h_synch and v_synch are active high

parameter h_pixels = 1920;  // visible pixels per line
parameter h_fp = 88;        // horizontal front porch width
parameter h_bp = 148;       // horizontal back porch width
parameter h_synch = 44;     // horizontal synch pulse width
parameter v_lines = 1080;   // visible lines per frame
parameter v_fp = 4;         // vertical front porch width
parameter v_bp = 36;        // vertical back porch width
parameter v_synch = 5;      // vertical synch pulse width
```

Project Hints:

1. If you define both the 720p and 1080p parameters in a parameters file, the compiler can compile correctly based on whether the macro is defined. Don't forget to make your horizontal and vertical pixel counters wide enough to support both resolutions.

2. You should use two separate PLLs. While it is possible to use one PLL with two separate clock outputs, the PLL output frequencies will be compromised in terms of their actual vs. desired frequencies. Feel free to look a this in the PLL wizard. Using separate PLLs will give you more accurate pixel clock frequencies. You can use a conditional assignment to instantiate the correct PLL.

3. Make certain your Quartus project has a .sdc file (you can use the file generated by SystemBuilder).

4. The output stripes pattern will be compressed into the upper left 2/3 of your screen (approximately). You do need to drive the remaining area of the screen with video when in 1080p mode, this may require a small modification to your pixel generator (depends on how you implemented it).