Managing SystemVerilog Parameters for Synthesis and Simulation

1. Problem statement

You should not hard code values into your SV code, but instead define parameters. Place these parameters into a separate file, and include the parameter file in the modules that reference it.

Your video controller design will first use 720p resolution, but you will need to support 1080p in a future lab. Therefore, creating your project with a selectable set of video timing parameters is a good design practice.

2. Notes

a. Parameter names typically use upper case letters, although this is not a requirement.
b. DO NOT add the parameter file as a Quartus source file.
c. When simulating your design using Modelsim, you do not need to do anything differently, parameters will be picked up automatically.

3. Use of preprocessor directives

The following preprocessor directives can be used:

`ifdef

The **`ifdef** directive tests for the existence or definition of a macro. The macro name is unimportant, but can be used to select between different sets of parameter values. In this document **hi_resolution**. is used to select between two values for HS, depending on the video resolution generated by the vtc module.

`else is identical to any if / then selection.

`endif** is used to close a **`ifdef block.

`define is used to define the existence of a macro.

`include performs a direct text substitution from the included file.

4. Create a parameter file

To begin, put all design parameters into a single file. Use a .svh file extension instead of a .sv extension, in order to allow differentiation of the parameter file, and as a reminder that this file should **not** be added as a source file to Quartus. For this example, the file will be called params.svh. You can add as many parameter statements as you need after the **`ifdef** and **`else** directives.

The macro **hi_resolution** will be defined when the testbench is compiled, but will not be defined otherwise. Here is an example params.svh file:

```
`ifdef hi_resolution
    parameter HS = 20;  // Use this value if hi_resolution is defined
    parameter VS = 5;
`else
    parameter HS = 40;  // Use this value otherwise
    parameter VS = 10;
`endif
```

5. Use the parameter file

The module vtc will reference the values in the params.svh file. You may need to have a `define in your module if you test for the existence of a macro in params.svh. To use the params.svh file, you must have a `include statement in any module that refers to the parameters.

In the example snippet below, hi_resolution is not defined (the `define is commented out), and the parameters HS and VS are used. Since hi_resolution is not defined, the value of HS will be 40, and the value of VS will be 10.

```
module vtc (
   input blah blah blah
   output blah blah blah
);

# `define hi_resolution
`include "params.svh"
…….

assign a = HS;
assign b = VS;
```