**EE 316 Computer Engineering Junior Lab**

**Design Project 5**

**Spring 2017**

**Specification: Electronic Etch a sketch**

**Due Date: Thursday, April 13 - lab demo**

**Monday, April 20, written report due.**

You are to design an electronic version of the familiar Etch a Sketch game introduced in the early ‘60s by the Ohio Toy company. Our system should consist of hardware to “etch” a sketch on a PC monitor. The hardware must the parallel port on a personal computer.

The hardware should have:

* two potentiometers to control the **x** and the **y** positions on the sketch on the drawing area on the PC and the VGA monitor
* a Nexys4 board
* an external LCD display connected to a single PMOD connector
* a bluetooth dongle and a RF transceiver.
* a USB keyboard and
* a 4 channel 12-bit A/D converter with I2C interface - PmodAD2 -
* One VGA cable

The software on the PC must run under Windows OS and provide a typical Windows graphical sketch pad. When the hardware powered, the system should display an initial message “Hardware Ready, both on the PC monitor and the external VGA monitor and the LCD display.

The sketch pad on both monitors should have the following functionality:

1. It should have a 256x256 pixel size sketch pad or drawing area (default).
2. This default pen (stylus) width is 1 pixel.
3. The default colors of the sketch and the drawing area should be black and white, respectively.
4. The software should detect if your hardware is connected; both the software and the hardware should be informed as to the state of the connection.
5. Should display the current color of the drawing pen outside of the drawing screen using a box.

The hardware should have the following functionality. The user should be able:

1. to erase the sketch at any time
2. to change the color (C) of the pen using the USB key board. This should not affect the colors of previously drawn sketch. Use hex value for the color code (e.g. CRRGGBB, where RR is for red, GG is green and BB is blue). Note: the color ranges on the VGA & the PC monitors will be different.
3. to choose the width (W) of the drawing pen from a range of 1 to 7 pixels (using PS/2 or USB key board). Use the suggested code: W1 – W7.
4. to double the size (S2) of the sketch area and toggle back to its default size (S1) on the PC monitor at any time.

Note that the keyboard connected to the Nexys4 board should be able recognize, at the minimum, the English alphabets from A through Z, the numbers 0 through 9, the Enter and Backspace keys.

The both monitors and the LCD panel should also display the sizes of the sketch board and the stylus color and the widths at the bottom of the screen. When the user types the word it should be displayed on the VGA monitor and the external LCD panel, any mistake in typing can be corrected using the “Backspace” key. When the user finishes typing the word, he/she should press “Enter”. At this time, the user should be able to retype to update the color, size and width information.

The code word should be stored in a memory on the FPGA board. The software should “read” color (C) and width (W) instructions from the memory and modify the color and width of the pen.

**Option 1:** (5 points) Use the onboard tri-color LED on the Nexys4 board to display the pen color

**Option 2:** (5 points) Use a button on the Nexys4 to save the drawing in software on the PC in any of the portable graphic format of your choice.

**Grade distribution:** If it is possible to etch a drawing only on the PC monitor, the project will receive a maximum of 80% of the grade. If only the external VGA monitor is used, the project will receive up to 90% of the grade. If both monitors are used, the project will **qualify** for 100% of the grade and options (up to 10 points).

Teams:

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| --- | --- | --- | --- | --- | --- | --- |
| **Team1** | **Team2** | **Team3** | **Team4** | **Team5** | **Team6** | **Writer** |
| Bruska | Griffin | Bruce | Lowit | Oliver | Marsanskis |  |
| Shippee | Craddock | Straw | Trahan | Zander | Heck |  |
| Law | Michaels | Kuhns | Beyer | strenk | Farden |  |