

Checkoff Checklist: FPGA Air Brush Checklist

Oscar Guevara, Junior Neeranartvong | 6.111 Digital System Laboratory 2016

1 Commitment

Modules:

- Camera Read Module - Junior and Oscar
 - Store an image frame in BRAM
 - Instruct OV7670 camera to transmit an RGB565 image frame with 320 x 240 pixels, at 15 frames per second
- Finger Position Detection - Junior
 - Fetch an image frame stored in BRAM
 - Basic Finger Position Detection algorithm
 - Noise Filtering
 - Center Detection of a rectangle containing each finger
- Paint Module - Oscar and Junior
 - Store a drawing into BRAM
 - Update a drawing corresponding to a finger position trace
 - Just show the current finger positions and draw the pixel position to the screen (doesn't need be continuous)
- Interface Module - Oscar
 - Read a drawing from BRAM and output to the screen

2 Goals

Modules:

- Finger Position Detection - Junior
 - Accuracy Improvement
 - Centroid Detection Algorithm, etc.
- Gesture and Command Detection - Junior
 - Create a scheme that maps the hand gestures to different commands (focus on drawing and not drawing):
 - Draw/Not Drawing through hand gestures
 - Cursor through finger position
 - Erase and Click through Physical Buttons
- Paint Module - Oscar and Junior
 - Ability to adjust thickness and colors
 - Ability to erase
 - Drawing implementation corresponding to the finger position trace
 - 'Line Drawing Algorithm' to connect two consecutive finger positions (To smooth the drawing curve). Take thickness variation into account.

- Interface Module - Oscar
 - Show the drawing from BRAM and output to the specific part of screen
 - Show current parameters (color/thickness) and buttons to change parameters onto screen.
 - After clicking color change button, the set of colors is shown on the screen. User can use his/her hand as a mouse to pick the color.
 - After clicking thickness change button, user will be able to choose the level of thickness.

3 Stretch Goals

Modules

- Gesture and Command Detection - Junior
 - Ability to accurately classify main hand gestures, especially drawing/not drawing
 - Improve the scheme so that hand gestures are mapped to more commands e.g. Erasing and Clicking
- SD Card Module - Oscar
 - Load a 8-bit image from SD Card into BRAM
 - Transform arbitrary images from PC into binary/hex format and store in SD Card
 - Save a current 8-bit drawing image from BRAM into SD Card
 - Transform binary/hex data stored in SD Card to regular .bmp file
- Interface Module - Oscar
 - Font Making (A-Z, a-z, 0-9, etc.)
 - Show Save/Load buttons on the screen
 - User can choose location to save/load image data from/to the SD card
- Paint Module
 - Ability to save/load images from SD Card (more in SD Card Module)
 - Improvement of Line Drawing Algorithm
 - Sprite Strokes
 - Brush Opacity
- Easter Egg Game
- Multiplayer Drawing