ECE554 Minilab 2 Report

In our implementation, we created a grayscaling and convolution module. The grayscaling module used the 2-tap line buffer in the RGB calculation, took the 4 pixels in an RGB square, and computed their average to produce the grayscale representation. We created a self-checking test bench that validates the outputs of this module by cycling through 2560 cycles to obtain valid outputs from the 2 taps of the line buffer.

We also implemented a convolution module that took the output of our grayscaling module and used a 3x3 filter as an input parameter. In our case, we used both a vertical and horizontal edge detection filter. We generated a new line-buffer IP that outputs 3 taps instead of 2, giving us a 3x3 data matrix that we can multiply by our filter. We also created a self-checking test bench for convolution that ran 3840 cycles to produce a valid 3x3 data matrix for comparison.

The main problem we encountered was an image duplication on the display. This was because our convolution line buffer had a row length of 640, causing the displays to overlap. We then changed the row length to 1280, which resolved our issue and gave us a clean edge-detection image.

Flow Summary:
ALM Utilization: 812/32,070 (3%)
BRAM (Block memory utilization): 182, 032 / 4,065,280 (4%)
DSP Blocks: 0 / 87 (0%) (We did not use multiplication IP)