Keiran Berry

CENG320L

Lab 5 Report

20 October, 2022

1. Lab Overview

The goal of this lab was to teach implementing an assembly file into existing C code, through writing the color_to_gray function. It also was meant to teach nested loops and .equ statements. For me, this lab taught me a lot about debugging and using gdb, as well. I learned much about assembly in general and became more comfortable with debugging it, as well as setting up Visual Studio Code in order to have an easier time editing the files which I was working with. This lab required a lot of work on my part, but I am overjoyed to have it finally working.

My thought process for this lab was to allocate nonvolatile registers for rgbimage, as well as i and j, since they needed to be kept safe throughout the running of the program. I loaded the width and height into registers w0 and w1, respectively, so that they could be called for the allocate_grayimage function. Since the function would overwrite x0 with its return value, I loaded the width into w2, and the rows for the rgb and gray images into x3 and x4. I then set i equal to 0, and began looping through with i and j. In the i loop, the arrays at i for the rgb and gray images were loaded in, and then the red, green, and blue values were loaded in in the j loop. Still in the j loop, I did the math on the values in order to get the final gray value, before storing it in the gray array at i, offset by j. Once the loop concluded, I just gave back the registers I allocated.

2. Bugs and Hurdles

This lab was incredibly difficult for me, because it required a lot of debugging and even some trial and error on my part. At the end of the day, the iteration of my lab that finally worked looks incredibly similar to my original attempt, it just forced me to learn a lot more about debugging to actually fix it. I created a few iterations of the lab, each having bugs with my ldrb statements and my strb statement until eventually figuring out I was probably just using the wrong registers. I also got a bit lucky, as I could never get my mov statement to actually have x0 return the correct value. I ended up just taking out the mov statement to try and run the lab in order to get some sort of output after hours of messing with my code, and it happened to work as-is. Another issue I ran into was not being able to see the actual tictac.ppm image, because I couldn't get it to work properly with GIMP for some reason.

3. Results

After this lab, I feel much more comfortable with the ssh, as well as gdb and looking through my own code. I feel that I have learned a lot about assembly syntax and loops through this lab. I started by just coding up the things I had written down from the lab period, confused about what exactly each piece was supposed to do, and after working on the lab for so long I completely understand the skeleton which I had in the lab period, as well as all of the bits that I filled in and messed around with until they finally functioned as anticipated.