**ARM Assembly Sort**

**Engineering 155 Lab I Report**

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A close-up of a document

Description automatically generated with medium confidence

**Introduction:**

The goal of this lab was to write a simple assembly program which sorts an array of signed bytes in order of smallest to greatest. We were to debug using the PlatformIO debugging tool, monitoring relevant locations in memory.

**Design Methodology:**

This lab only required a software component. In designing the assembly code, it was helpful to first write out the desired program in C, for which the bubble sort algorithm was chosen. Five subsections were created in writing the program: main, loop\_i, loop\_j, and done\_j, each corresponding to an important part in the C code.   
  
For example, main initialized the r3 register as the array being sorted and initialized the outer looping index r0 to 0, as the function would normally.

The loop\_i block compares r0 with arr.size() - 1, and branches to the “done” block if r0 is greater than or equal to the previous mentioned value. Otherwise, we assign a register r1 to 0 to emulate setting the inner loop index being set to 0.

Within loop\_j is where most of the heavy lifting is done. First we compare the value of r1 with arr.size() – 1 as before to let us know when we’re done with the loop. If r1 >= arr.size() – 1, we branch to the done\_j block. Otherwise, we check to see if arr[j] and arr[j + 1] need to be swapped. To do this, we load the value at each index into two registers, compare the values, and store them in their appropriate places.

**Technical Documentation:**

Text

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Fig. 1: Assembly code

Text, letter

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Fig. 2: Test cases

**Results and Discussion:**

All of my test cases passed and the sorting algorithm works as expected.

If I were to redo this lab, I would familiarize myself first with the difference between loading and storing bytes versus words.  
  
**Conclusion:**

I was successful in writing a sorting algorithm in assembly code and using the debugging interface within PlatformIO.

This lab took about 5 hours to complete.