

EECS 388
LABORATORY EXERCISE VIII

ASSEMBLY LANGUAGE

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LABORATORY OVERVIEW

This laboratory involves the writing, compiling, and demonstrating of a two new tasks on the Tiva TM4C1294 evaluation board. One of these tasks calls a function to compute an equation, while the other task computes the given algebraic equation using Assembly language.

BACKGROUND

Several general data processing instructions are utilized in this laboratory exercise. These include ADDS, SUBS, MUL, and MOV. Descriptions below.

ADDS: Accepts two parameters, sums the values in the two registers and assigns the sum to the first register from the parameters.

SUBS: Accepts two parameters, subtracts the values in the two registers and assigns the value to the first register from the parameters.

MUL: Accepts two parameters, multiplies the values in the two registers and assigns the value to the first register from the parameters.

MOV: Accepts two parameters, moves the value from the second register to the first register from the parameters.

PROCEDURE & RESULTS

One small change is required for `Task_ASMCompute.c`. The equation being computed must be changed to the provided equation, this is as follows:

$$y = A^2 + 2B - 3C + D$$

Next, in the Assembly language subroutine, the following operations must be added:

```
1 MUL  R0, R0
2 ADDS R1, R1
3 ADDS R0, R1
4 MOV  R1, R2
5 ADDS R2, R2
6 ADDS R2, R1
```

```
7 SUBS R0,R2
8 ADDS R0,R3
```

ANALYSIS

The following steps through the above Assembly language operations for values of 9 for each variable in the previously stated equation:

- (i) MUL R0,R0. Value of 9 is multiplied by value of 9 and placed in R0.
- (ii) ADDS R1,R1. Value of 9 is added to value of 9 and placed in R1.
- (iii) ADDS R0,R1. Value of 9 is added to value of 81 and placed in R0.
- (iv) MOV R1,R2. Value of 9 is moved to R1 from R2.
- (v) ADDS R2,R2. Value of 9 is added to value of 9 and placed in R2.
- (vi) ADDS R2,R1. Value of 9 is added to value of 18 and placed in R2.
- (vii) SUBS R0,R1. Value of 27 is subtracted from a value of 99 and placed in R0.
- (viii) ADDS R0,R3. Value of 9 is added to value of 72 and placed in R0.

The resulting value in R0 is now 81. This matches the standard computation for the given equation:

$$y(9) = (9)^2 + 2(9) - 3(9) + (9)$$
$$y(9) = 81$$

CONCLUSIONS

The logic written for this laboratory exercise is sensible and effective, as all desired outcomes were achieved and in an appropriate manner. However, improvements could be made. Currently, a MOV operation is used for the computation of 3C. This MOV operation moves the value in one register to another to later be added back to the original register. This could be improved by moving in an actual value, not from another register, rather than allowing the MOV operation to be dependent upon the value in another register. This methodology would allow for greater flexibility and scalability for more complex Assembly language computations.