Report for Lab1
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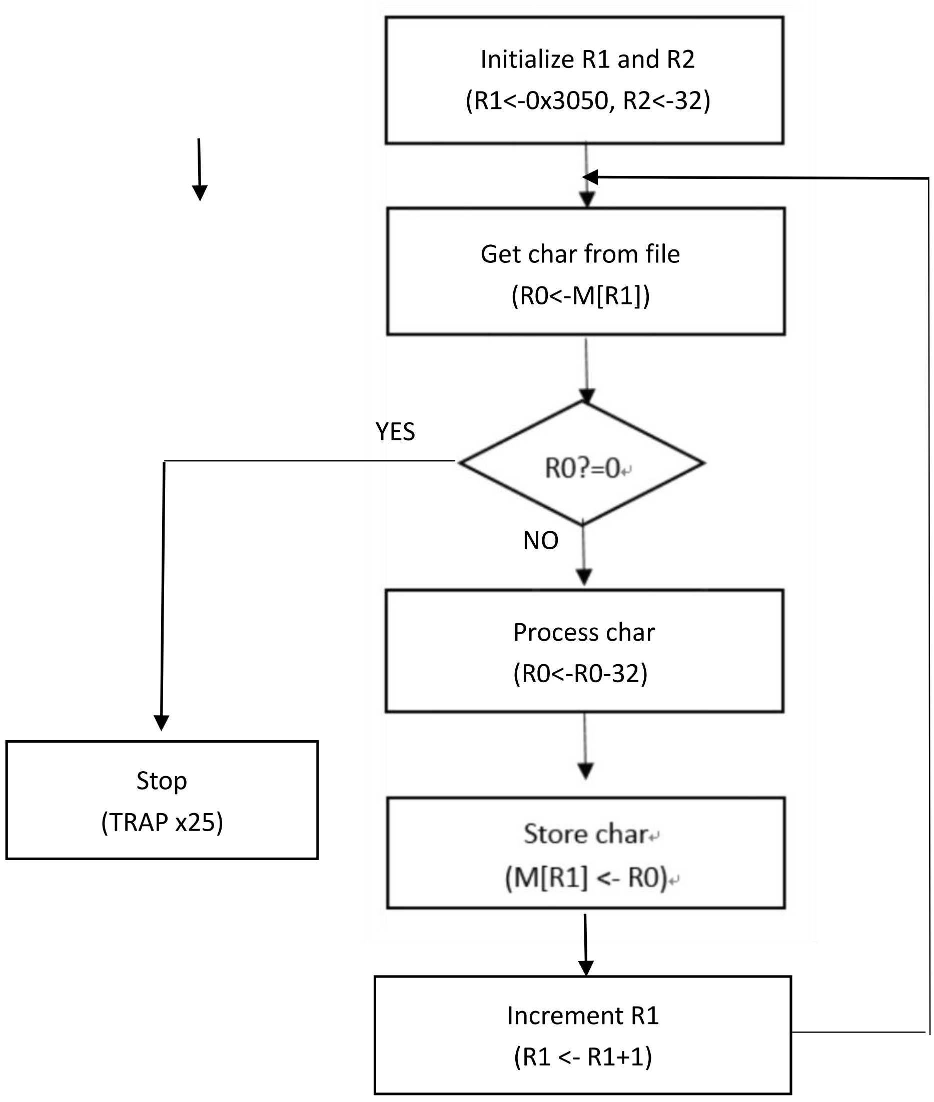
Part 1 Purpose

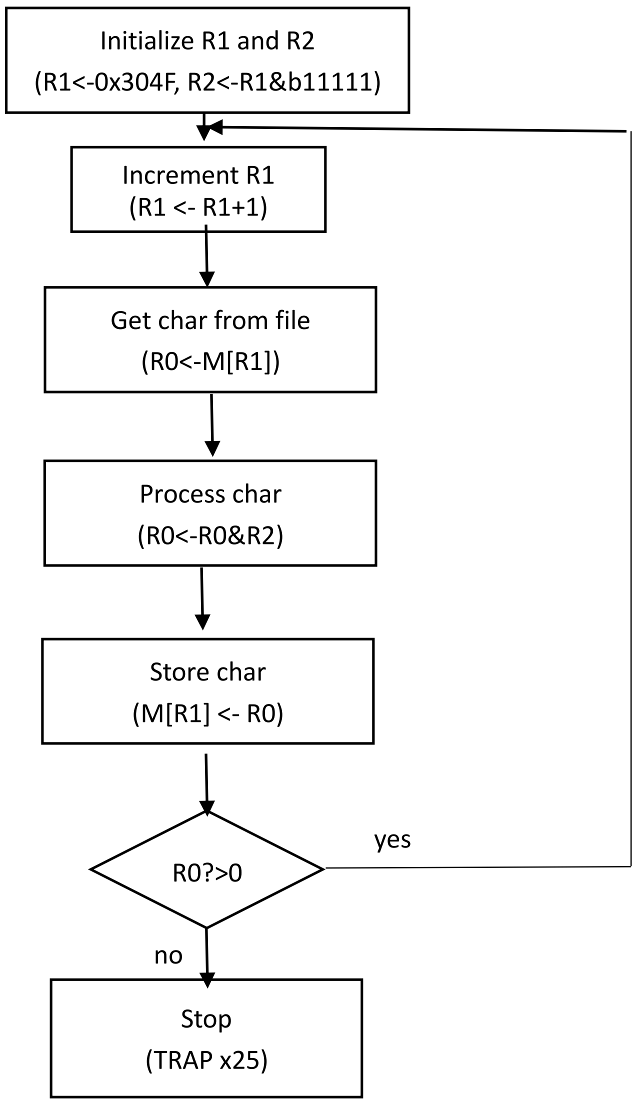
In this assignment, I'm asked to write a program in LC-3 machine language that converts a string of lower case letters in the memory into uppercase and stores the resulting value in memory.

Part 2+3 Principles+Procedures

For this lab, we need only tow general purpose register R0 which will contain the value of the processed character, R1, which will be regarded as the pointer for the char to be processed and R2, which will be used to calculate R0-32.The flowchart of the algorithm that solves the problem can be as follows, which needs 9 or 10 instructions.



Then after several hours, I found the solution with only 8 instructions, with the flowchart of the algorithm that solves the problem as follows.



Some details:

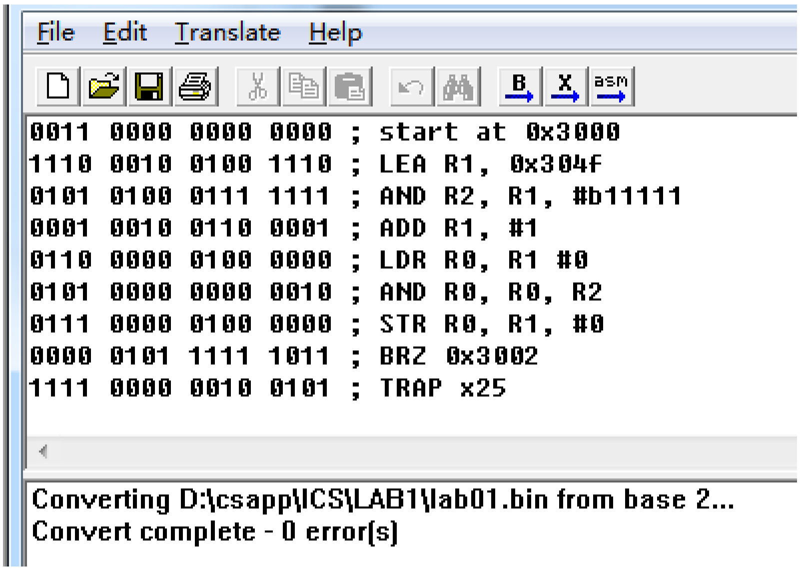
Because the chars will start from b 0110 0001 to b 0111 1010, the 6th bits from right side are all 1,which means R0-32 can be realized by R0 & b 1111 1111 1101 1111. So in this method, a mask is used. Since the first address for characteristcs is 0x3050, the previous will be 0x304f, i.e. b0011 0000 0100 1111, which can be used as a mask for R2, which should result in R0 & R2 being R0-32.

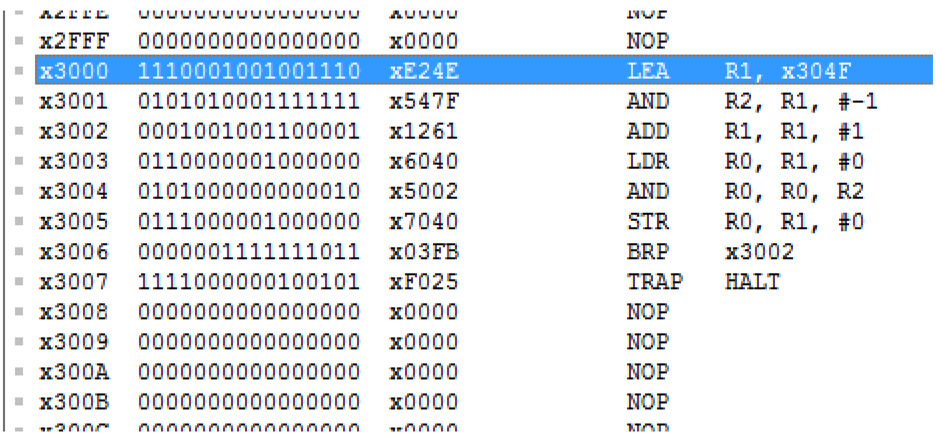
Here is my code:

```
0011 0000 0000 0000 ; start at 0x3000
1110 0010 0100 1110 ; LEA R1, 0x304f
0101 0100 0111 1111 ; ADD R2, R1, #b11111
0001 0010 0110 0001 ; ADD R1, #1
0110 0000 0100 0000 ; LDR R0, R1 #0
0101 0000 0000 0010 ; AND R0, R0, R2
```

0111 0000 0100 0000 ; STR R0, R1, #0
0000 0101 1111 1011 ; BRZ 0x3002
1111 0000 0010 0101 ; TRAP x25

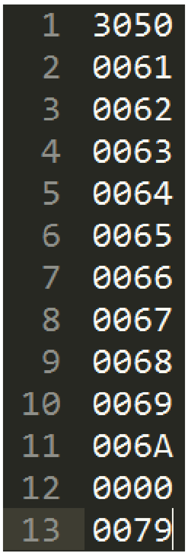
The result of the compilation





Part 4 Result.

Set the values from 0x3050 IN DATA.hex as follows: .



run it.:

x3050	0000000001100001	x0061
x3051	0000000001100010	x0062
x3052	0000000001100011	x0063
x3053	0000000001100100	x0064
x3054	0000000001100101	x0065
x3055	0000000001100110	x0066
x3056	0000000001100111	x0067
x3057	0000000001101000	x0068
x3058	0000000001101001	x0069
x3059	0000000001101010	x006A
x305A	0000000000000000	x0000
x305B	0000000001111001	x0079

x3050	0000000001000001	x0041	NOP
x3051	0000000001000010	x0042	NOP
x3052	0000000001000011	x0043	NOP
x3053	0000000001000100	x0044	NOP
x3054	0000000001000101	x0045	NOP
x3055	0000000001000110	x0046	NOP
x3056	0000000001000111	x0047	NOP
x3057	0000000001001000	x0048	NOP
x3058	0000000001001001	x0049	NOP
x3059	0000000001001010	x004A	NOP
x305A	0000000000000000	x0000	NOP
x305B	0000000001111001	x0079	NOP

The result is correct.