The report of lab 1

Algorithm explanation:

To find the F-word, we can calculate the continuous numbers of 1. If there exists 4 continuous 1s, then the 16 bits are F-word.

We can calculate the continuous numbers of 1 in following way. As we know , LC-3 operate data as 2’s complement, if the first bit of the data is 1, it shows the data is a negative number, and if we add this data to itself, it equals move 1 bit left, so we only should judge the data with the first bit, so we can use BR(instruction).

Of course , we should store the number of continuous 1s, if there exist a 0,we should clear the record, and we cannot judge data more than 16 times,because there only exist 16 bits.

Essential parts of your code with sufficient comments:

0011 0000 0000 0000 state the start location x3000

1010 001 000010001 store the data in x3100 to R1

0101 100 100 100000 initialize R2=0(reflect the result) R3=0(contain the number of continuous 1s)

0001 100 100 110001 R4=-15,contain the most number of loop (15 bit)

0101 011 011 100000

0101 010 010 100000

0000 010 000000110 judge the bit of R1,if equals 1,branch to line 14

0001 100 100 100001 judge we loop more than 16 times or not

0000 001 000001001 if yes,branch to line 19

0001 001 001 000 001 R1 add itself,equals move 1 bit left

0000 100 000000010 judge the bit of R1,if equals 1,branch to line 14

0101 011 011 100000 if there exists a 0,then clear the record

0000 010 111111010 unconditional branch to line 8

0001 011 011 100001 if there exists a 1,R3 increment

0001 101 011 111100 if R3 equals 4,branch to line 18

0000 010 000000001

0000 111 111110110

0001 010 010 100001 exists 4 continuous 1s,so R2 increment

1111 0000 00100101 HALT

0011 0001 0000 0000 store the data for reading

Questions and Answers:

Question 1:

Please describe your algorithm.

Answer 1:

Similar to algorithm explanation mode, and add some necessary comments of the machine code. See above for details.

Question 2:

Why you circle 16 times instead of 13times ?

Answer 2:

If I only circle 13 times, when the last four bits are continuous 1s, the algorithm cannot find them, so it should circle 16 times to confirm every bits. If we want to decrease the number of circles, we should add lots of other BR, which confuse the algorithm.

Question 3:

You use LDI to load the data in x3100, can instruction LD do it ?

Answer 3:

Of course, the PC offset of LD is nine, so we can add 0xFF to 0x3001 to reach the location 0x3100.