# Lab1 report

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This lab requires to write a program in LC-3 machine language to detect whether or not a 16-bit value has at least three consecutive '1's, if the value satisfy this property, store value 1 in R2, otherwise store 0. So we need to detect the value bit by bit.

Algorithm

The algorithm is:
1. Make R3 = 1000 0000 0000, load the value to R1
2. R1 & R3 bit by bit, if the left bit in R1 is 1, R0++
3. when R0+3 consecutively, let R2 = 1, or R2 = 0

The main structure:
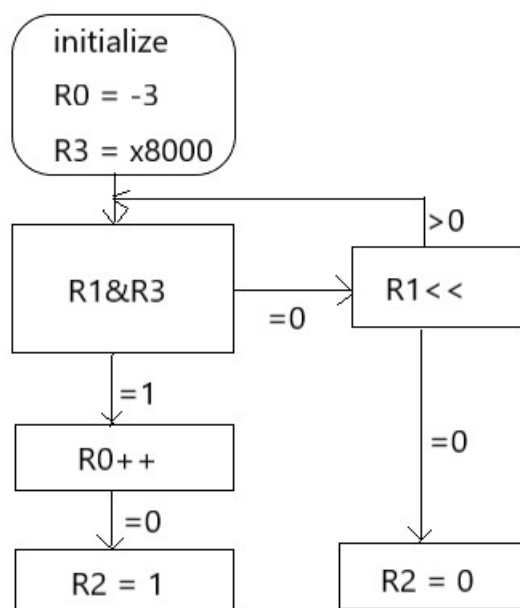
Code

```
0011 0000 0000 0000 ;the program is located in position x3000
0101 000 000 1 00000 ; R0 = 0
0101 010 010 1 00000 ; R2 = 0
0101 011 011 1 00000 ; R3 = 0
0101 100 100 1 00000 ; R4 = 0
0001 000 000 1 11101 ; R0 = -3
0001 011 011 1 00001 ; R3 = 1
0001 100 100 1 01111 ; R4 = 15
0001 011 011 000 011 ; R3>>
0001 100 100 1 11111 ; R4--
0000 001 111111101 ; if R4 > 0, R3>>again
0010 001 011110101 ; load the number from x3100 into R1
0000 010 000001010 ; if R1 = 0, R2 = 0, over
0101 100 001 000 011 ; R1 and R3 to R4
0000 010 000000100 ; if R4 is 0, R0 = -3
0001 000 000 1 00001 ; R0++
0000 010 000000111 ; if R3 = 0, R2 = 1, over
0001 001 001 000 001 ; R1>>
0000 111 111111001 ; jmp x3011
0101 000 000 1 00000 ; R0 = 0
0001 000 000 1 11101 ; R0 = -3
0001 001 001 000 001 ; R1>>
0000 111 111110101 ; jmp x3011
1111 0000 0010 0101 ; halt
0001 010 010 1 00001 ; R2 = 1
1111 0000 0010 0101 ; halt
```

The Results