Fibonacci Series

Aim :

Write a Program to Generate Fibonacci Series using 8051 Microcontroller.

Requirements :

Keil uVision5 Software.

Theory :

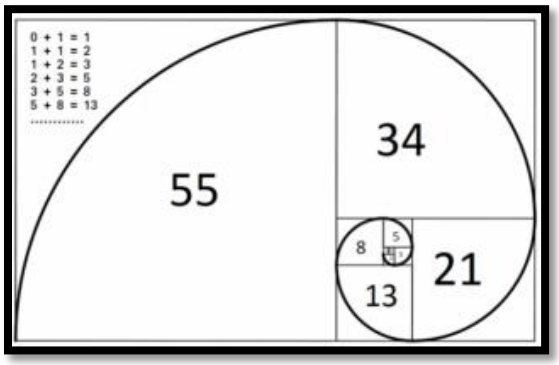
Fibonacci Series

In Mathematics, the Fibonacci numbers, commonly denoted F_n, form a sequence, called the Fibonacci series, such that each number is the sum of the two preceding ones, starting from ***0*** *and* ***1.*** That is,

$$F_0 = 0, \qquad F_1 = 1, \qquad \text{and} \qquad F_n = F_{n-1} + F_{n-2}, \qquad \text{for } n > 1.$$

The beginning of the series is thus :

0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, …



Fibonacci numbers are named after Italian mathematician **Leonardo** of Pisa, later known as **Fibonacci.** In his 1202 book Liber Abaci, Fibonacci introduced the sequence to Western European mathematics, although the sequence had been described earlier in Indian mathematics, as early as 200 BC in work by Pingala on enumerating possible patterns of Sanskrit poetry formed from syllables of two lengths.

Fibonacci numbers appear unexpectedly often in mathematics, so much so that there is an entire journal dedicated to their study, the Fibonacci Quarterly. Applications of Fibonacci numbers include computer algorithms such as the Fibonacci search technique and the Fibonacci heap data structure, and graphs called Fibonacci cubes used for interconnecting parallel and distributed systems.

They also appear in biological settings, such as branching in trees, the arrangement of leaves on a stem, the fruit sprouts of a pineapple, the flowering of an artichoke, an uncurling fern, and the arrangement of a pine cone's bracts.

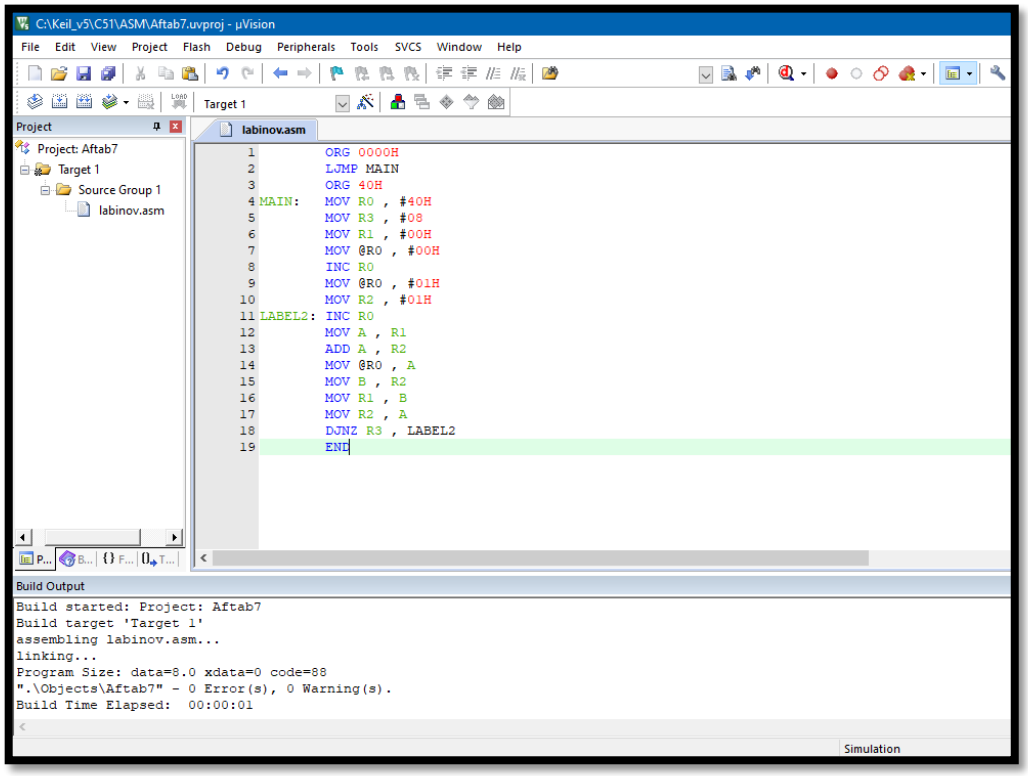
Procedure :

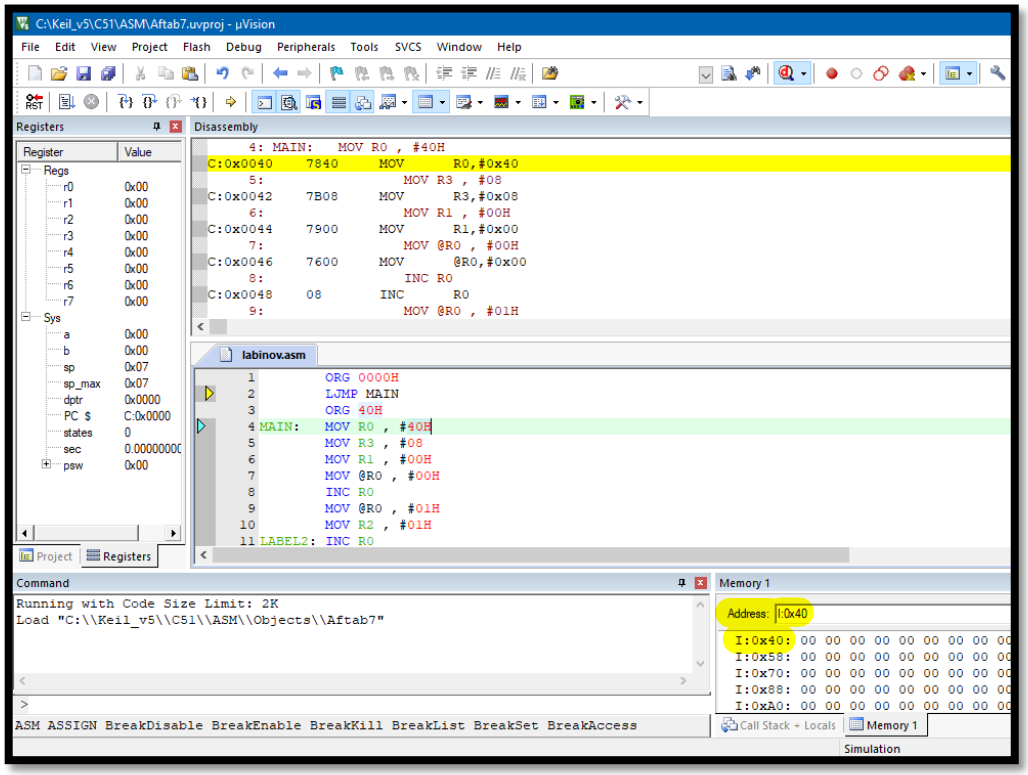
1. Open Keil uVision5 software. Click on **project** and select **new uVision project.**
2. Save the project in ASM folder of software directory. A popup window will come up in which we have to **select the device for target,** search **Intel** and select **8051AH** chip and press **ok.**
3. A popup window will come up with message **copy STARTUP.A51 to project folder?** Press **no.**
4. Now click on **new file,** write the program in this file and save it with **.asm extension.**
5. Now on the LHS **Project Window** expand **Target 1** and right click on **Source Group 1** and select **add existing file to group** and select your **.asm** file and click **Add.**
6. Press **F7** to **build target,** check for errors and fix them.
7. Now click on **Start/Stop Debug Session** and press **F5** to start code execution.
8. All the registers and flags are on the upper LHS, code on the upper RHS, command window on lower LHS and memory window on lower RHS.
9. To check the result in memory type **I:0x40** and press enter to observe the Fibonacci series.

Program to Generate Fibonacci Series :

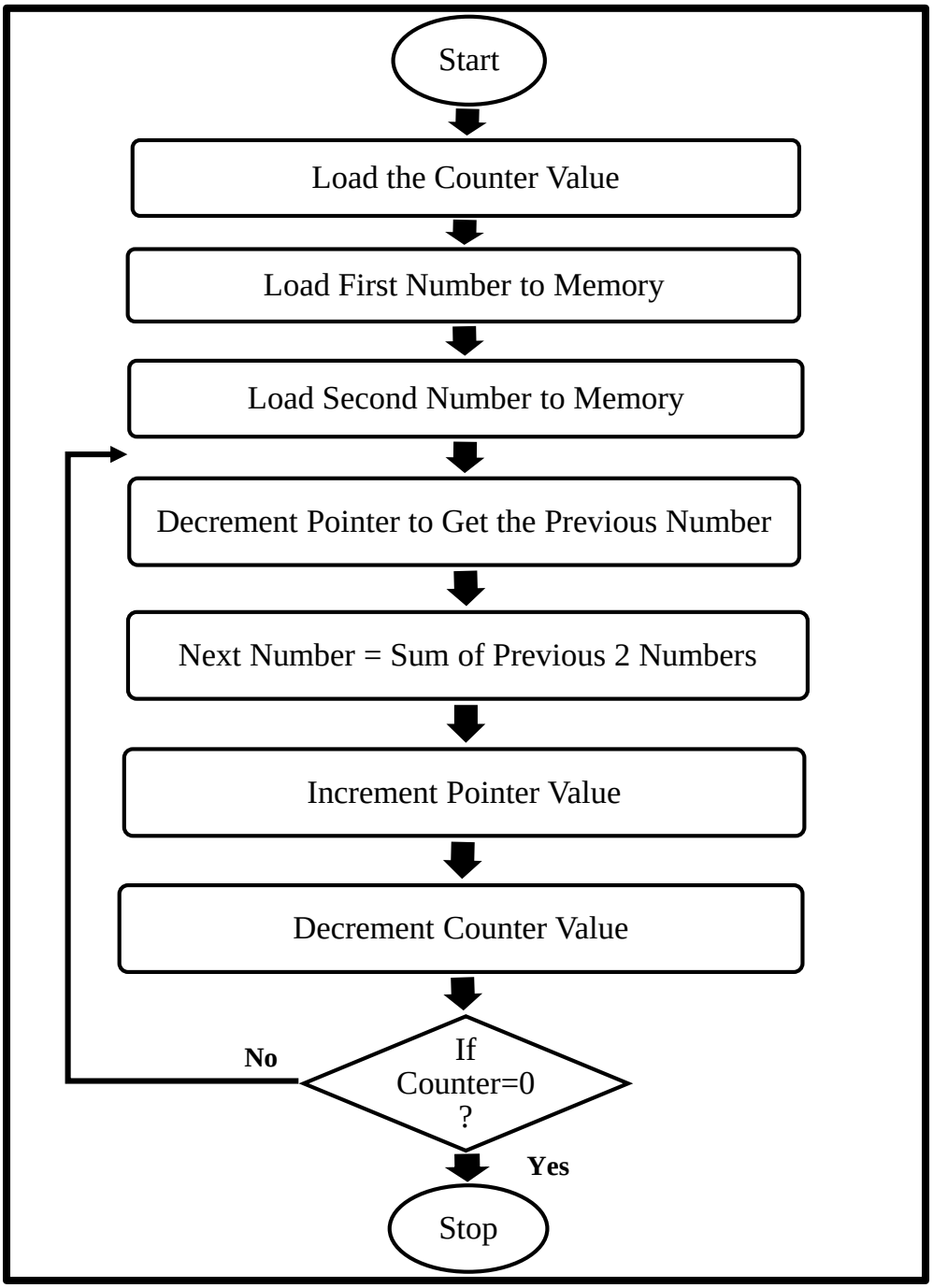
Address	Mnemonics	Operands	Comments
0000H	ORG	0000H	Start from Memory Location 0000H
0000H	LJMP MAIN		Transfer program execution to MAIN(0040H)
0000H	ORG	40H	Start from Memory Location 40H
0040H	MAIN | MOV R0	#40H	Memory Location of Series
0042H	MOV R3	#08	Number of Elements in the Series
0044H	MOV R1	#00H	Move 00H Data to R1 Register
0046H	MOV @R0	#00H	Move the 1st Number in Memory
0048H	INC R0		Increment R0 Register
0049H	MOV @R0	#01H	Move the 2nd Number in Memory
004BH	MOV R2	#01H	Move 01H Data to R2 Register
004DH	LABEL2 | INC R0		Increment R0 Register
004EH	MOV A , R1		Move the Contents of R1 to A
004FH	ADD A , R2		Add the Previous Two Numbers
0050H	MOV @R0 , A		Store the Result of Addition in Memory
0051H	MOV B , R2		Move the Contents of R2 to B
0053H	MOV R1 , B		Move the Contents of B to R1
0055H	MOV R2 , A		Move the Contents of A to R2
0056H	DJNZ R3 , LABEL2		Jump to LABEL2 if R3 ≠ 0
0058H	END		End of program

Screen Shots :





Flow Chart :


Start
Load the Counter Value
Load First Number to Memory
Load Second Number to Memory
Decrement Pointer to Get the Previous Number
Next Number = Sum of Previous 2 Numbers
Increment Pointer Value
Decrement Counter Value
If Counter=0 ?
No
Yes
Stop

Output :

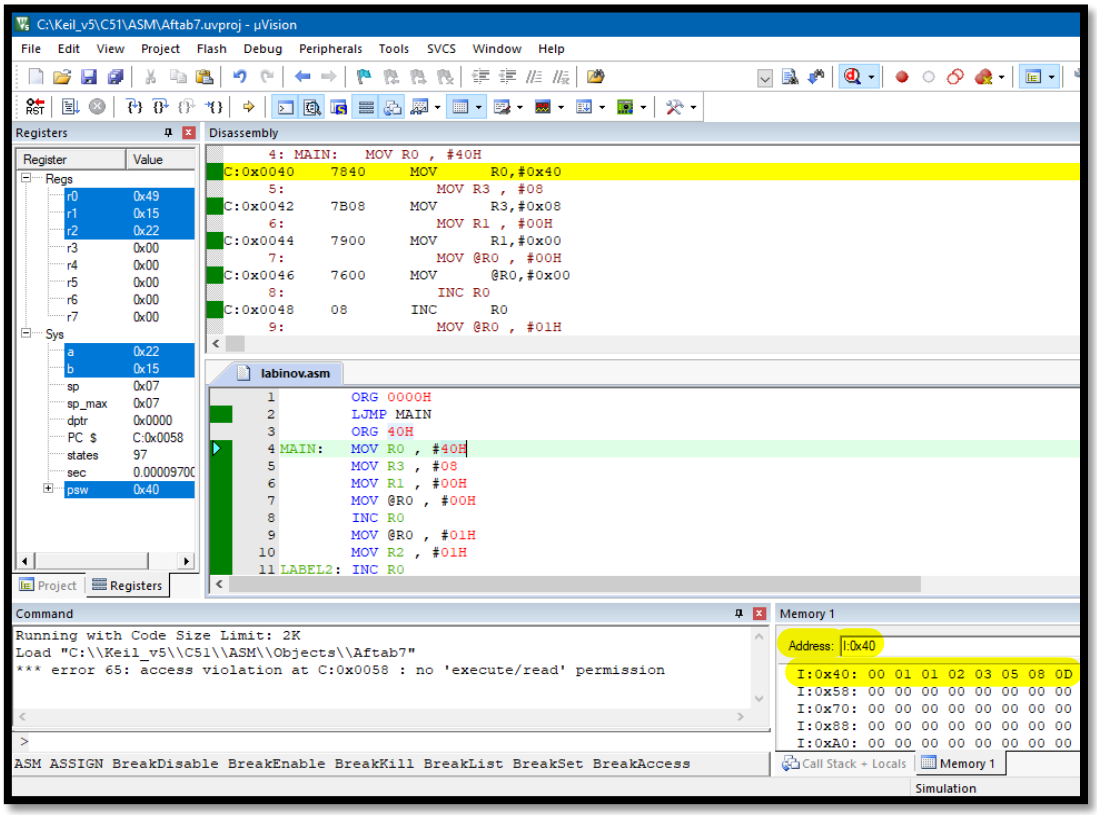
Before Execution	After Execution

R3 (Counter)
08H

R1 (Previous Number)
00H

R2 (Current Number)
01H

0040H	00H
0041H	01H
0042H	01H
0043H	02H
0044H	03H
0045H	05H
0046H	08H
0047H	0DH



Result : Program to Generate Fibonacci Series using 8051 Microcontroller was implemented successfully.