

Project 1 – Exploring Machine Language

This project deals with developing an understanding of how a computer chip operates at the most basic level. In this project you will interact with a machine language simulator and create a small program. This project is worth 4 extra credit points on your course grade. In order to receive grade credit, you must submit the output of a correctly functioning program by the beginning of the final exam.

To accomplish this assignment, download the zipped file named SIM.zip. This contains the documentation for the SIM simulator, which has been developed especially for teaching purposes. This download contains text files representing sample programs and the sim.exe program which is the simulator itself. Read the documentation to understand how the CPU simulated by SIM works and what its instruction set is. Create a folder on your PC named MySim and copy the downloaded files to it. That is all you need to do to install the simulator. Play with it using the sample programs. When you are comfortable with it, develop an original program to meet the following programming problem.

Programming problem

Develop a program in SIM machine code that adds up all of the integers from 1 through 26. The program should output the accumulating sum as it builds up. In other words, the output will be the binary equivalent of 1, then 3 (2 added to 1), then 6 (3 added to 3), then 10 (4 added to 6). After adding the final integer (26) to the accumulating sum, the program should stop.

This program must use a loop in order to accomplish its result; you can't simply store 26 integers in memory and then try to add them up. The second example program in the download shows a good way to develop and implement looping logic.

Hints and advice

Read the documentation carefully! In order to program in machine language you need to code in binary. Numeric values are expressed in binary and the instruction themselves are encoded as zeros and ones. The download includes documentation on the very limited SIM instruction set and also a chart showing numbers expressed in binary.

The simulator runs at the DOS prompt, it has no graphic user interface. To get to the DOS prompt you select Programs, then Accessories, and the Command Prompt. Position to your MySim folder using the `cd\` DOS command.

Your program should be named proj1.txt. You must house it in your MySim folder. When run by the simulator it will produce an output file named proj1.lis in your MySim folder. For ease of interpretation Section 2 of the output file will display the output of your program in both binary and decimal.

You create the program source code file proj1.txt file using NotePad, not Word. You can use NotePad or Word to view the output file proj1.lis. Submit your proj1.lis file as printed by Word for grading credit.

In order to receive grade credit, your solution must produce correct results. Sorry but on this problem there is no possibility of partial credit, it is all or nothing!