Megan Leonard

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COMP 201 Homework 3

Answer the following questions based on your reading of the textbook, the module study notes, the videos, and the instructor’s presentation this week.

1. (Englander, exercise 6.5) Consider the example in this chapter in which we enter and add two numbers. Suppose we had stored the first input entry in mailbox location 00. Would the program have produced the same result? What would have happened if the program were executed a second time? What characteristic of the computer makes this true?

The program will not have the same result as it the book shows through their example. They state that the little man can not tell what is data and what is an instruction since they are both three numbers so storing data can lead to numbers that relate to other lines of code that the little man will try to run.

1. (Englander, exercise 6.10) Write a Little Minion program that prints out the odd numbers from 1 to 99. No input is required.

LOOP LDA CURRENT

OUT

ADD TWO

STA CURRENT

SUB HUNDRED

BRP EXIT

BRA LOOP

EXIT HLT

CURRENT DAT 1

TWO DAT 2

HUNDRED DAT 100

1. (Englander, exercise 6.12) The following Little Minion program is supposed to add two input numbers, subtract a third input number from the sum, and output the result, i.e.,

OUT = IN1 + IN2 -- IN3

| mailbox | mnemonic code | numeric code |
| --- | --- | --- |
| 00 | IN | 901 |
| 01 | ST0 99 | 399 |
| 02 | IN | 901 |
| 03 | ADD 99 | 199 |
| 04 | ST0 99 | 399 |
| 05 | IN | 901 |
| 06 | SUB 99 | 299 |
| 07 | OUT | 902 |
| 08 | COB | 000 |

What is wrong with this program? Modify the program so that it produces the correct result.

The problem with the program is that the third number is not being taken from the sum. The third number goes to sub instead of stored, so it is seen as the first number taking away the sum from the third number making the outcome different than expected. To fix this we change it as follows:

06 STO 98 398

07 LDA 99 599

08 SUB 98 298

09 OUT 902

10 COB 000

1. (Englander, exercise 6.16) Show how you would implement a DO-WHILE statement using Little Minion instructions.

The best way to implement this would be to start with a value then branch it using either BRA, BRP, or BRZ. One branch will run through the code based off the number then loop to the beginning, the other branch will reach the end of the part or end the code.

1. (Englander, exercise 7.3) One large modern computer has a 48-bit memory address register. How much memory can this computer address?

This is 248 which is 256 terabytes.

1. (Englander, exercise 7.12) The Little Prince Computer (LPC) is a mutant variation on the LMC. (The LPC is so named because the differences are a royal pain.) The LPC has one additional instruction. The extra instruction requires two consecutive words:

0XX

0YY

This instruction, known as move, moves data directly from location XX to location YY without affecting the value in the accumulator. To execute this instruction, the Little Prince would need to store the XX data temporarily. He can do this by writing the value on a piece of paper and holding it until he retrieves the second address. The equivalent in a real CPU might be called the intermediate address register, or IAR. Write the fetch-execute cycle for the LPC MOVE instruction.

The instructions start with the MAR to set the temporary location. Then the IN follows with the branch options of BRP, BRA, and BRZ. The LPC will be able to carry out the instructions while having the temporary XX data.

1. (Englander, exercise 7.15) Most modern computers provide a large number of general-purpose registers and very few memory access instructions. Most instructions use these registers to hold data instead of memory. What are the advantages to such an architecture?

An advantage of an architecture of this form would be how fast the data can run. The registers can hold the instructions that are currently processing while the memory will hold the instructions of the currently executing data. If the memory had to do both then it would be slowed down and it would take longer for any instructions to be able to run.

1. In two to three paragraphs of prose (i.e. sentences, not bullet lists, and 350+ words) using APA style citations if needed, summarize, and interact with the content that was covered this week in class. In your summary, you should highlight the major topics, theories, practices, and knowledge that were covered. Your summary should also interact with the material through personal observations, reflections, and applications to the field of study. In particular, highlight what surprised, enlightened, or otherwise engaged you. Make sure to include at least one thing that you’re still confused about. In other words, you should think and write critically not just about what was presented but also what you have learned through the session. Feel free to ask questions in this as well since it will be returned to you with answers.

This week we went over the little man computer and the memory. The little man computer at first glance seemed like it would be hard to learn but with the given lines it was easier than I first thought. The little man program that we used for the lab looked intimidating but was easier than I thought to understand. I can see the appeal of the little man computer and how it can be useful.

The memory is not new to me, but the registers are a new term. I knew the CPU, but I did not delve too much into the parts that make the CPU work. This chapter was quite informative, and I was glad to find new information I did not know about already. I think that this week was interesting with the new type of program and the look into the memory.