

Computer Architecture
CPSC 32, Fall Semester 2003
Lab Assignment # 0

Due: One week after your lab session – complete by yourself.

1 Objective

This laboratory assignment will help you familiarize yourself with the UNIX and PC environments, the `spim` simulator and other utilities. It will allow you to code and run your first MIPS assembly language program. You will also learn how to interact with UNIX processes running on a UNIX host from a PC console using the X11 windowing environment.

2 Prerequisites

Before entering the lab, ensure that you have your own UNIX and PC accounts in the network of the Department of Computer Science. Check that you can log in to UNIX and PC workstations. You need to be familiar with an editor such as `vi` or `emacs`.

3 SPIM

SPIM is a software simulator that allows to executes assembly language programs for the MIPS architecture. It is a self-contained system for running these programs and contains a debugger and an interface to the operating system. The class homepage contains links to `spim` simulator code. We recommend that you download and install a version of SPIM on own machine. The computer science labs have SPIM installed.

Appendix A of the textbook contains an introduction to SPIM. Consult the class homepage for lecture notes on MIPS assembly programming, and numerous helpful links.

4 Assignment

[40 points] Write a well-documented MIPS assembly program that prompts the user to input integers a , and b . The program should calculate and print the sum $a + b$ in the following style:

```
a = 3
```

```
b = 4
```

```
The sum of a and b is 7
```

[60 points] Write a well-documented MIPS assembly program that prints a NUL-terminated string `str` of characters `[a-zA-Z]+` in lower case. Assume that the string is stored in the data segment. Particularly, this means that if your program contains the string

```
.data
str: .asciiz "AbcDeFgHIJK"
```

then it should print `abcdefghijkl`.

Follow the instructions of your Teaching Assistant to turn in your programs. You will have to study Appendix A and the lecture notes to solve the problems.

5 Suggestions

Make sure that you learn during your first lab session

- how to launch `spim`;
- how to transfer files between the PC and UNIX systems;
- how to turn in your programs;
- everything that is relevant to edit a file.

Your Teaching Assistant is willing to help. Since the background knowledge varies tremendously, you need to ask the right questions to get your problems solved.

Suggestions for the Teaching Assistants:

- Show how to do some elementary MIPS assembly programming with `SPIM`.
- Exercise 1.1 – 1.3 in the assembly language lecture notes are easy warm-up exercises.
- Explain some other programs from the lecture notes, and let the students simulate these programs.
- Explain some elementary MIPS assembly commands, such as arithmetical instructions `add`, `addi`, ... load and store commands `lb`, `lw`, `sb`, `sw`, ... various branching commands.
- Explain some examples containing a loop.