ESTRUCTURA DE COMPUTADORES

Grado en Ingeniería Informática

Lab session 9

Variables and parameter passing: Questions

Exercise 1: Parameter passing by reference

After understanding program "09_exer_01.s", load it and run it with the Simulator. Feel free to format it and add comments to make their purpose clearer.

- Where is the value of the read variable? **Experimental technique:** look at the *data segment* window on the simulator.
- If the main program intends to add 1 to variable **`M`** that just comes to read with **`InputV`**, Which of the following options are correct?

a)

```
…
jal InputV
addi $a1,$a1,1
```

b)

```
…
jal InputV
lw $s0,M
addi $s0,$s0,1
```

c)

```
…
jal InputV
lw $s0,M
addi $s0,$s0,1
sw $s0,M
```

d)

```
…
jal InputV
lw $s0,0($a1)
addi $s0,$s0,1
sw $s0,0($a1)
```

e)

```
…
jal InputV
addi $v0,$v0,1
```

f)

```
…
jal InputV
li $s0,M
addi $s0,$s0,1
```

Once you have ended exercise 1 and have verified that the program works, answer the following questions:

- In which memory address R variable is stored?
- Run the program with values **`M=5`** and **`Q=-5`**, then look at the program data segment and get the values of variables **`M`**, **`Q`** y **`R`** stored in main memory, what are their addresses?

Question pool

1. Indicate with what machine instructions will be translated the pseudoinstruction ***lw $t0,var*** if the address of variable **var** (that is the value of label **var**) is:
   - **0x1000**
   - **0x100000**
   - **0x101000**

2. Suppose that the address of variable **A** is **0x10000000**. Compare the following two code fragments that are equivalent:

```
lw $t0, A
addi $t0, $t0, 1
sw $t0, A
```

```
la $t0, A
lw $t1, 0($t0)
addi $t1, $t1, 1
sw $t1, 0($t0)
```

   Which one of the corresponding machine codes will be shorter?

3. Consider the following code fragment:

```
aacute:   .asciiz "á"
          lb $t0, aacute
```

   What value will have register **$t0** after its execution? What value will have it if instead of **lb** we will used **lbu**? Which one of the two instructions is more correct in this case?

4. Do the test on the simulator: add instruction **addi $ra,$ra,-4** at the end of function **InputS**, just before instruction **jr $ra**, and make a program to call it, what happens? Explain the observed behavior.