2.0 - Week 2 - Workshop (MA)

Learning Objectives

- Integer representation
- MIPS Simple programs

Week 2 Padlet Discussion Board link: https://monashmalaysia.padlet.org/fermi/2022week2

Quiz on Unsigned Integer Representation

We consider unsigned integers.

Question 1 *Submitted Aug 1st 2022 at 10:18:59 am*

Change $(10110001)_2$ to hexadecimal.

B1

Question 2 *Submitted Aug 1st 2022 at 10:22:29 am*

Change $(7356)_8$ to binary.

111011101110

Question 3 *Submitted Aug 1st 2022 at 10:22:33 am*

Convert $(7356)_8$ to hexadecimal.

EEE

Quiz on Signed Integer Representation

Suppose that we use two's complement to encode signed integers, and that the maximum integer that can be encoded is 63.

Question 1 *Submitted Aug 1st 2022 at 10:25:23 am*

Can you tell how many bits are used for the encoding?

7

Question 2 *Submitted Aug 1st 2022 at 10:25:45 am*

Using the same encoding, what is the result of the operation `63+1` equal to? Suppose that there are no checks for overflow. Give your answer in base 10.

-64

Squaring an integer in Python

Write a python program (in square.py that reads a signed integer from the console and outputs its square.

You can test your program by clicking "Run", or by running the following command in the console:

```
$ python3 square.py
```

Note that your code is evaluated based on the last output line. It should only contain the result.

An example of run is:

```
$ python3 square.py
Input integer to square
2
4
```

Squaring an integer in MIPS

Faithfully translate the following python program to MIPS (in square.asm). You can suppose that the absolute value of the integer is <= 10000.

```
#we start with two variables
number = 0
square = 0

#print prompt
print("Input integer to square")

#read integer
number = int(input())

#square operation
square = number*number

#print result
print(square)
```

You can test your program by clicking "Run", or by running the following command in the console:

```
$ java -jar Mars4_5.jar square.asm
```

An example of run is:

```
$ java -jar Mars4_5.jar square.asm

MARS 4.5 Copyright 2003-2014 Pete Sanderson and Kenneth Vollmar
Input integer to square
2
4
```

Note that your code is evaluated based on the last output line. It should only contain the result (and a new line character). Further note that **upon termination, MARS prints an extra new line character, a behaviour which we will ignore for the purpose of this unit.**

Temperature Conversion in MIPS

Faithfully translate the following python program to MIPS (in convert.asm). You can assume the temperature is a positive number.

```
# Converts temperature from Celius to Fahrenheit
__author__ = "Brendon Taylor"

# Initialise global variables
temp_c = 0
temp_f = 0

# Enter the temperature
print("Input temperature in celsius")
temp_c = int(input())

# Convert to Fahrenheit (as an integer)
temp_f = (temp_c * 9//5) + 32

# Display the result
print(temp_f)
```

You can test your program by clicking "Run", or by running the following command in the console:

```
$ java -jar Mars4_5.jar convert.asm
```

An example of run is:

```
$ java -jar Mars4_5.jar convert.asm

MARS 4.5 Copyright 2003-2014 Pete Sanderson and Kenneth Vollmar
Input temperature in celsius
24
75
```

Note that your code is evaluated based on the last output line. It should only contain the result (and a new line character). Further note that **upon termination, MARS prints an extra new line character, a behaviour which we will ignore for the purpose of this unit.**

EOW: End Of Workshop

The quizzes after this slide are bonus.

They were originally part of the main workshop but the student's feedback was that we should keep more time for MIPS coding.

Signed Integer Representation in C and Python

Consider the C code below. It should be understandable even if you do not know C.

```
/* INT_MAX and INT_MIN are macros defined in limits.h
 * They define the maximum and minimum value of an int.
 */
#include <limits.h>
int main(){
   printf("INT_MAX:   %d\n", INT_MAX);
   printf("INT_MIN:   %d\n", INT_MIN);
   printf("INT_MAX+1: %d\n", INT_MAX+1);
   printf("-INT_MAX-1: %d\n", -INT_MAX-1);
}
```

Question 1

Based on the output of the code snippet, can you determine which signed integer representation is used? Explain why.

No response

Question 2

Determine the value of the maximum and minimum integers that can be represented in Python3.

No response

Quiz on MIPS syntax

Question 1 *Submitted Aug 1st 2022 at 8:55:04 pm*

What does the following MIPS code line do?

```
var:    .word 3, 11
```

- ○ It creates a variable called `word` of size 3 bytes and which stores the integer 11.
- ○ It creates a word that uses 3 characters called `var` equal to 11.
- ○ It creates a string variable called `var` containing the string `3,11`.
- ◉ It creates an array called `var` which contains the integers 3 and 11.
- ○ None of the above.

Question 2 *Submitted Aug 1st 2022 at 8:58:26 pm*

What does the following MIPS code line do?

```
trap:   lw $t0, var
```

- ○ It loads the value of the GPR `$t0` into the memory at address `var` and sets the PC to the address `trap`.
- ○ This instruction is actually not executed. The PC is set to the address `trap` and the next instruction at that address is fetched, decoded and executed.
- ○ It creates a variable `trap` of size `$t0` bytes and value `var`.
- ○ The PC is set to the address `trap` when an error occurs in the program, and the instruction `lw $t0, var` is then fetched-decoded-executed.

- It's a `trap`. (a.k.a. None of the above)

Feedback Form

Weekly Workshop Feedback Form

Question 1

I am enrolled in:

- □□ Australia
- □□ Malaysia

Question 2

What needs improvement?

No response

Question 3

What worked best?

No response

Question 4

How engaged were you by the workshop?

- □□□ Very engaged
- □□□ Engaged
- □😐□ Not impressed
- 😕😴□ Lost