**PROJECT Introduction to the MIPS Assembler ( Part 2 )**

**Objective** To examine various topics concerning the assembly language.

***PROJECT DESCRIPTION***

Design an application to allow for user input in a MIPS program.

***Information About this Project***

Create a simple MIPS program to allow users to enter a temperature and the program will convert the temperature from Celsius to Fahrenheit.

The formulas for temperature conversion are:

*Celsius to Fahrenheit* F= ( 9 / 5 ) C + 32

*Fahrenheit to Celsius* C= ( 5 / 9 ) ( F − 32 )

***Steps to Complete this Project***

**STEP 1 Creating a Temperature Converter Program in MARS**

Open MARS and go to your menu and start a new assembly ( .asm ) file by clicking on [ File ] > [ New ] .

Paste in the code that follows.

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# declare global so programmer can see actual addresses.

.globl welcome

.globl prompt

.globl sumText

# Data Area

.data

welcome:

.asciiz " This program converts Celsius to Fahrenheit \n\n"

prompt:

.asciiz " Enter an integer Celsius temperature: "

sumText:

.asciiz " \n F = "

coldText:

.asciiz "\nBrrrr!!!\n"

hotText:

.asciiz "\nIt's SWELTERING!\n"

#Text Area (i.e. instructions)

.text

main:

# Display welcome

ori $v0, $0, 4

la $a0, welcome

syscall

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# Display prompt

ori $v0, $0, 4

la $a0, prompt

syscall

# Read 1st integer

ori $v0, $0, 5

syscall

# C is in $v0

addi $t0, $0, 9

mult $t0, $v0

mflo $t0 # 9\*C

addi $t1, $0, 5

div $t0, $t1

mflo $t0 # 9\*C/5

addi $s0, $t0, 32 # 9\*C/5+32

# Display the sum text

ori $v0, $0, 4

la $a0, sumText

syscall

# Display the result

ori $v0, $0, 1

add $a0, $s0, $0

syscall

# if (F < 60), printf ("Brrr!!\n");

slti $t0, $s0, 60

beq $t0, $0, after

ori $v0, $0, 4

la $a0, coldText

syscall

j after2 # this makes it an else if - skip the else statement

after:

# else if (F >= 90) printf("It's SWELTERING!\n");

slti $t0, $s0, 90

bne $t0, $0, after2

ori $v0, $0, 4

la $a0, hotText

syscall

after2:

#instead of exit ask if continue main

# j main1

# Exit

ori $v0, $0, 10

syscall

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Now save your program as: **temps.asm**

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Test compile and run your program and enter in a Celsius value to see if the code is working.

To assemble or compile the program merely go your menu and click on

Run > Assemble or by clicking on the  Assemble icon in your toolbar area. Then if there are no errors, either go to [ Run ] > [ Go ] or click the  in your toolbar area to execute your program.

Try entering a Celsius value to 40 . You should see a result of F = 104 . It’s SWELTERING!

**STEP 2 Modify Your Program**

Modify your program such that the user is given an option to enter either a Celsius value or Fahrenheit value. If the user chooses Celsius display the corresponding Fahrenheit temp based on a temperature value input by the user. If the user chooses Fahrenheit show the corresponding Celsius value.

**STEP 3 Show Resulting Runs**

Snapshot two sample run results ( one for converting C -> F and F -> C ) into MS Word along with your modified source for credit.

**STEP 4 Questions and Answers Concerning this Computer Laboratory Project**

Open MS Word and, within a new document, place your responses to these questions. Submit your completed MS Word document for credit.

**(1) ( Assembly Language Statements )**

Explain what is accomplished by these assembly language statements, taken from the original **temps.asm** file.

ori $v0, $0, 4

la $a0, prompt

syscall

**(2) ( Assembly Language Statements )**

Explain what is accomplished by these assembly language statements, taken from the original **temps.asm** file.

# if (F < 60), printf ("Brrr!!\n");

slti $t0, $s0, 60

beq $t0, $0, after

ori $v0, $0, 4

la $a0, coldText

syscall

**PROJECT Introduction to the MIPS Assembler ( Part 2 )**

**(3) ( Assembly Language Statements )**

Explain what is accomplished by these assembly language statements, taken from the original **temps.asm** file.

.globl welcome

.globl prompt

.globl sumText

**(4) ( Assembly Language Statements )**

Was a looping type structure implemented within the original **temps.asm** file?

**(5) ( The Celsius and Fahrenheit Temperature Scales )**

When plotted on a graph, the two equations

F = ( 9 / 5 ) C + 32

C = ( 5 / 9 ) ( F − 32 )

meet at F = C = − 40 degrees.

When F = − 50 degrees, which value will be greater in value? F or C ?

Show your work that you used to arrive at this answer.