CSC 256 - Machine Structures
Project 5

Assigned : March 27th, 2017
Due : April 3rd, 2017 @ midnight
Total Points: 90 Points

Description For project five, your objective is to convert the given C++ code into MIPS assembly. Please do not modify the C++ code itself. You are only allowed to make modifications to the assembly file. Start writing your code below the main: label and above the exit: label. For this project stay BETWEEN these labels.

When doing a C++ to MIPS conversion, it can be done in the following steps:

1 Assign variables to registers. When inspecting code, any constant values in expressions may need to be assigned to temporary registers.

2 Initialize variables to registers. (actually put the values into the registers.)

3 Then move onto the rest of the code.

Expected Output:

```
String: dlrow laer eht ot emoclew
```

Submission
When you have completed the assignment please upload your .s file to ilearn. PLEASE DO NOT UPLOAD ANY OTHER TYPE OF FILE.

Base MIPS Code

```
.data
    endl:    .asciiz  "\n"   # used for cout << endl;
    label:   .asciiz  "String: "
    string:   .byte    'w','e','l','c','o','m','e',' ', 't','o',' ','t',
       'h','e',' ', 'r','e','a','l',' ','w','o','r','l','d'
.text

# addr of string --> $s0
# beg  --> $s1
# end  --> $s2
# temp --> $s3
main:

exit:
  la   $a0, label     # puts label into arg0 (a0 register) for cout
  addi $v0, $0, 4     # puts 4 in v0 which denotes we are printing a
      string
  syscall             # make a syscall to system

  move $a0, $s0       # puts address of string into arg0 (a0 register)
      for cout
  addi $v0, $0, 4     # puts 4 in v0 to denote we are printing a String
  syscall             # make a syscall to system

  la   $a0, endl      # puts the address of the string endl into a0
  addi $v0, $0, 4     # puts 4 into v0 saying we are printing a string
  syscall

  addi $v0,$0, 10
  syscall
```

p5codeBase.s

C++ Equivalent

```cpp
#include <bits/stdc++.h>

using namespace std;



int main(void)
{

    char string[] = "welcome to the real world";
    int beg;
    int end;

    beg = 0;
    end = 24;
    char temp;
    while(beg < end){
        temp  = string[beg];
        string[beg] = string[end];
        string[end] = temp;
        beg = beg + 1;
        end = end - 1;
    }

    printf("String : %s\n", string );

}
```

p5code.cpp