CSC 256 - Machine Structures
Project 4

Total Points: 90 Points

Description

For project four, 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.

Before you begin, please make sure you click the link on ilearn to create your GitHub repo. After created please clone this repo with the *git clone repo_url* command.

Expected Output:

```
Sum: 7179
Reversed Number: 98654
is Palindrome: 1
```

Submission

When you have completed the assignment please commit all work done to your private repository. This can be done with the following commands:

```
git add .
git commit -m "some message"
git push
```

.

Base MIPS Code

```
.data
    endl:     .asciiz  "\n"   # used for cout << endl;
    sumlbl:     .asciiz  "Sum: " # label for sum
    revlbl:     .asciiz  "Reversed Number: " # label for rev
    pallbl:     .asciiz  "Is Palindrome: " # label for isPalindrome
    arr:        .word 1
                .word 2
                .word 3
                .word 4
                .word 5
                .word 4
                .word 3
                .word 2
                .word 1
    sumarr:     .word 1
                .word 3
                .word 44
                .word 66
                .word 88
                .word 90
                .word 9
                .word 232
                .word 4325
                .word 2321
.text

# sum             --> $s0
# size            --> $s1
# rev             --> $s2
# num             --> $s3
# isPalindrome    --> $s4
# address of arr  --> $s5
# i               --> $s6
# beg             --> $s7
# end             --> $s8
# d               --> $t0
# 10              --> $t1
# 100             --> $t3
main:

exit:
  la   $a0, sumlbl    # puts sumlbl 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 sum into arg0 (a0 register) for cout
  addi $v0, $0, 1     # puts 1 in v0 to denote we are printing an int
  syscall             # make a syscall to system

```

```
50  la   $a0, endl      # puts the address of the string endl into a0
51  addi $v0, $0, 4     # puts 4 into v0 saying we are printing a string
52  syscall
53
54  la   $a0, revlbl    # puts revlbl into arg0 (a0 register) for cout
55  addi $v0, $0, 4     # puts 4 in v0 which denotes we are printing an string
56  syscall             # make a syscall to system
57
58  move $a0, $s1       # puts rev into arg0 (a0 register) for cout
59  addi $v0, $0, 1     # puts 1 in v0 to denote we are printing an int
60  syscall             # make a syscall to system
61
62  la   $a0, endl      # puts the address of the string endl into a0
63  addi $v0, $0, 4     # puts 4 into v0 saying we are printing a string
64  syscall
65
66  la   $a0, pallbl    # puts pallbl into arg0 (a0 register) for cout
67  addi $v0, $0, 4     # puts 4 in v0 which denotes we are printing a string
68  syscall             # make a syscall to system
69
70  move $a0, $s3       # puts isPalindrome into arg0 (a0 register) for cout
71  addi $v0, $0, 1     # puts 1 in v0 to denote we are printing an int
72  syscall             # make a syscall to system
73
74  la   $a0, endl      # puts the address of the string endl into a0
75  addi $v0, $0, 4     # puts 4 into v0 saying we are printing a string
76  syscall
77
78
79  addi $v0,$0, 10
80  syscall
```

p4codeBase.s

C++ Equivalent

```cpp
#include <iostream>

using namespace std;



int main(void)
{

    int sum = 0;
    int size = 10;
    int sumarr[] = {1,3,44,66,88,90,9,232,4325,2321};
    for(int i = 0; i < size; i++){
        sum = sum + sumarr[i];
    }

    int num = 45689;
    int rev = 0;
    int d = -1;
    while( num > 0){
        d = num % 10;
        rev = rev*10 + d;
        num = num / 10;
    }

    int arr[] = {1,2,3,4,5,4,3,2,1};
    int beg = 0;
    int end = 8;
    int isPalindrome = 1;
    while(beg < end){
        if (arr[beg] != arr[end]){
            isPalindrome = -1;
            break;
        }
        beg++;
        end--;

    }


    cout << "Sum: " << sum << endl;
    cout << "Reversed Number: " << rev << endl;
    cout << "Is Palindrome: " << isPalindrome << endl;
    return 0;
}
```

p4code.cpp