

ECE3700J Introduction to Computer Organization

Lab 2 Assembly Programming

Purpose

This lab is design for you to have a programming experience with RISC-V assembly instruction set.

Tasks

Develop a RISC-V assembly program that operates on a data segment consisting of an array of 32-bit signed integers. In the text (program) segment of memory, write a procedure called `main` that implements the `main()` function as well as procedures for other subroutines described below. Assemble, simulate, and carefully comment the file. Screen print your simulation results and explain the results by annotating the screen prints. You should compose an array whose size is determined by you in the `main` function and is not less than 30 elements.

In this lab, you are allowed to use only RV32I BASE INTEGER INSTRUCTIONS. Any Extension Instruction Sets or pseudo-instructions should be avoided.

```
main() {
    int size = ...; //determine the size of the array here
    int hotDay, coldDay, comfortDay;
    int tempArray[size] = {36, 25, -6,
                           ... //compose your own array here
                           //test data will be provided at demonstration
                           };
    //hotDay is the number of values greater than or equal to 30 in tempArray[]
    hotDay = countArray (_____, _____, _____);

    //coldDay is the number of values less than or equal to 5 in tempArray[]
    coldDay = countArray (_____, _____, _____);

    //comfortDay is the number of values between 5 and 30 in tempArray[]
    comfortDay = countArray (_____, _____, _____);
}

int countArray(int A[], int numElements, int cntType) {

    /*****
    * countArray(int A[], int numElements, int cntType);
    * Count specific elements in the integer array A[] whose size is
    * numElements and return the following:
    *
    * When cntType = 1, count the elements greater than or equal to 30;
    * When cntType = -1, count the elements less than or equal to 5;
    * When cntType = 0, count the elements greater than 5 and less than 30.
    *****/
    int i, cnt = 0;

    ..... //complete the code here
    //must call functions hot(), cold(), and comfort()
    return cnt;
}

int hot(int x) {
    if(x>=30) return 1;
}
```

```
        else return 0;
    }

    int cold(int x) {
        if (x<=5) return 1;
        else return 0;
    }

    int comfort(int x) {
        if (x>5 && x<30) return 1;
        else return 0;
    }
}
```

Deliverables

This is a 1-week lab. The full score for this lab is 200 points.

- 1) Demonstrate your program and simulation results to the TAs before your lab session ends. Go through the program step by step and show corresponding changes in the registers and memory.
- 2) Upload the source file(s) on Canvas by **22:00 pm, September 30, 2023**.

This is an individual assignment. Your work must be submitted electronically to Canvas before the specified due date. Late submission will result in 0 point for the corresponding deliverables. Source code must be submitted before a grade for this lab can be assigned.

Grading Policy

Demonstration: 80%

Source code: 20%