CS200 - Computer Organization

Assembly Language - 2

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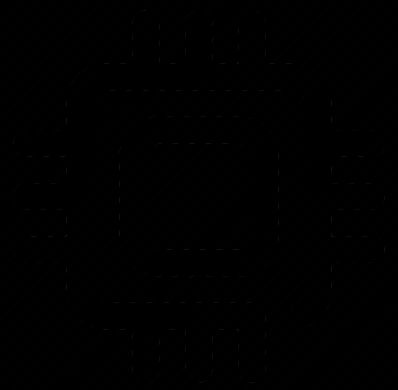
Motivation



- To learn how a String is implemented in Assembly Language programming.
- To learn how an Array is implemented in Assembly Language programming.

Assembly Language Programming

Low-level programming language in which there is a very strong correspondence between the instructions in the language and the architecture's machine code instructions.
Example: MIPS (wiki)

What is a String?

- One or more characters combined together in one unit known as String.
- Last character is a zero value.

Length of a String? in C

Refer lens.c code file in repo.

```
#include <stdio.h>
int main(){
  char *str = "MIPS is awesome!";
  int i = 0, size = 0;
  while (str[i] != 0){
    size++;
    i++;
  }
  printf("Size of the string is: %d\n", size);
  return 0;
}
```

Things to know in MIPS!

- lb - Load Byte. This command loads one byte to a register. Recall - Char is one Byte.
- We load value 11 to $v0 register to display Character.

Length of a String? in Assembly Language (1)

Refer lens.asm code file in repo.

```
# Find Size of the String.
.data
    msg: .asciiz "MIPS is Awesome!"
    nl: .asciiz "\n"
.text
    la $t0, msg
    loop:
        la $t1, 0($t0)
        lb $t2, 0($t0)
        bne $t2, $zero, notequal
        move $a0, $t3
        li $v0, 1
        syscall
        # exit
        li $v0, 10
        syscall
```

Length of a String? in Assembly Language (2)

```
notequal:
    addi $t0, $t0, 1
    # adding one to the t3 block
    addi $t3, $t3, 1
    j loop
```

Reverse a String? in Assembly Language

Essence of the code:

- looptop - goes to notequal to find the length of the string
- topReverseLoop - goes to reverseNotEqual to print the characters in reverse order
- Refer reverse.asm code file in repo.

What is an Array?

- Sequence of elements combined together with a pointer reference to the starting address.
- lw - this command is used to load word from memory to register.
- sw - this command is used to store word from register to memory.

Arrays? in Assembly Language

- Ask the user to enter the number of grades.
- Find the minimum, maximum, and average.

  Essence of the code:
- store - is used to prompt score from user and store the value in list. t0 and t9 are both pointing to the last element at the end of store subroutine.
- loop - is used to load one element at a time from the list, compare to identify min and max. calls update counter to update the registers to get the next element.
- final - is used to display the min, max, and average.
- Refer grades.asm code file in repo.

To Do

- Ask the user to provide the number of transactions.
- Find the lowest, highest, total sum, and average transactions.

Reading Assignment

- Computer Organization and Design by Patterson and Hennesssy - Chapter 04 - [4.2 - 4.4];

Questions

Do you have any questions from this class discussion?