

Lecture 28, Nov 21, 2022

Subroutine and Stack Example

```
int FINDSUM(int N) {
    int sum = 0;
    while (N != 0) {
        sum = sum + N;
        N = N - 1;
    }
    return sum;
}
```

```
int main() {
    FINDSUM(5);
}
```

```
.data
N: .word 5
.text
.global _start
```

```
_start:
    la s4, N
    lw a0, 0(s4)
    jal FINDSUM
    ebreak
```

```
FINDSUM:
    addi t0, zero, 0
```

```
WHILE:
    beqz a0, ENDLOOP
    add t0, t0, a0
    addi a0, a0, -1
    j WHILE
```

```
ENDLOOP:
    add a0, zero, t0
    jr ra
```

- Recursive version:

```
int FINDSUM(int N) {
    if (N == 0)
        return 0;
    else
        return N + FINDSUM(N - 1);
}
```

```
FINDSUM:
    bnez a0, PUSH
    jr ra
```

```
PUSH:
    addi sp, sp, -8
    sw a0, 4(sp)
    sw ra, 0(sp)
```

```
addi a0, a0, -1  
jal FINDSUM
```

```
lw t0, 4(sp)  
add a0, a0, t0
```

```
lw ra, 0(sp)  
addi sp, sp, 8  
jr ra
```