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COE 301: Computer Architecture

LAB 04: Flow Control

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Agenda

- Unconditional Jump
- Conditional Jump
- Pseudo Instructions
- Examples: if statement and for loop
- Live Examples
- Tasks

Unconditional Jump

- Code Labels are used to define important locations in code.
- (j) jump instruction is used to jump to another location in code unconditionally.
- Syntax: j label

Conditional Jump

- Branch instructions is used to jump to another location in code if a condition is satisfied.
- Basic Branch Instructions: beq, bne, blez, bgtz, bltz, bgez
- Syntax: beq \$op1, \$op2, label2
 - If \$op1 equals (in value) to \$op2, go to label2
- Used in loops and if statements

Pseudo Instructions

- Branch pseudo instructions:
 - blt, bltu
 - ble, bleu
 - bgt, bgtu
 - bge, bgeu
- Translates to one or more basic instructions.
- e.g. blt \$s1, \$s2, label => slt \$at, \$s1, \$s2
bne \$at, \$zero, label

Example 1: If statement

```
if ( a == b ) {  
    c = d + e;  
}  
else {  
    c = d - e;  
}
```

Assume **a**, **b**, **c**, **d**, **e** are
stored in **\$s0**, **\$s1**, **\$s2**,
\$s3, **\$s4** respectively

```
beq $s0, $s1, true  
# false here  
sub $s2, $s3, $s4  
j exit  
true:  
add $s2, $s3, $s4  
exit:
```

```
bne $s0, $s1, false  
# true here  
add $s2, $s3, $s4  
j exit  
false:  
sub $s2, $s3, $s4  
exit:
```

Example 2: for loop

```
for (int i=0;i<n;i++){  
    loop body  
}
```

```
li $s0, 0  
loop:  
beq $s0, $s1, endLoop  
#loop body  
addi $s0, $s0, 1  
j loop  
endLoop:
```

```
li $s0, 0  
loopCheck:  
blt $s0, $s1, loop  
...  
loop:  
#loop body  
addi $s0, $s0, 1  
j loopCheck
```

Assume **i** is stored in **\$s0**
and **n** is stored in **\$s1**

Live Examples