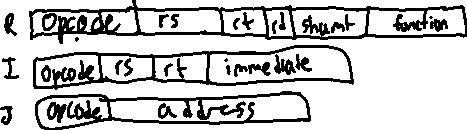
TPS Activity 1:

4. A machine instruction has 32 bits.

5. There are 3 types of formats those are R I J. All three formats have opcodes consisting of 6 bits. The j format has an address of 26 bits while the R format has an immediate of 16 bits. As shown below we can see the formats:



Addi t1, t1,2 would have opcode of 8: 00 1000 and rs of 00001 rt of 00001 and imm of 0000000000000010 Format would be of I

6. addi $s0, $zero, 25

a. Format of type I. This instruction has 4 fields. Names of these fields are opcod, rs , rt, immediate.

b. opcode is 8, rs is register ‘zero’and in hex its 0. Rt is register $s0 and in hex decimal its 16 which converts to 10 in hex . The value of the immediate value in hex decimal is 25, 11001 in binary and in hex its 19

c. Construct machine code of line 7 using values from part 7.

7. Locate address 0x00400010

a. What is the machine code of that address in: 0x0230402a(code column is hex)

Hex: 0x0230402a Binary: **00000010001100000100000000101010**

b. From binary version of this machine code it is type R and we can tell because looking over at the source code where the address is located at we see slt, t0, s1,s0. Looking at the binary version we see the the last 6 bits are 101010 which is for function. There are 6 fields.

C .Value of each field in hex is 0x02304029

d. mapping of these registers is slt rd, rs, rt and the operation is slt because the last 6 bits are the bits that represent the field for func.

e. Same at the source column

8. Look at line 17

a. Line 17 is in format I

b. values of format in hex are : 0x15000001

opcode: 000101: 5 rs: 01000:0 rt: 00000:0

c. Name of target label is LESS. Address of label in hex is 0x00000001

d. yes we put the target label LESS value in hex to the imm. because observing the I format we can see that the target value goes into imm.

e. To find the value of the immediate field we look at the binary code of it which is **00010101000000000000000000000001.**

We then get the last 16 bits of the binary code and that would be the imm field.

F. machine code is 0x15000001. It matches our hex and binary by converting. Op code and rs and rt to binary we can see it matches.

9.line 20

a. Format of this instruction is J. It takes 2 fields.

b. opcode of this instruction is 2 in hex 0x2 and binary is 000010

c. This jumps to label GREQ with an address of 0x00400030

d. You can use 26 bits in the address field of the instruction. To squeeze the address in this field we convert the decimal value to binary

e. Machine code of this instruction in binary and hex is 0x0810000c and 0000100000010000000….1100

Conversion in proc2.s:

**Line 7:**

Addi $s0,$zero,-15

Type I addi rs rt immediate

addi:

opcode: 001000

rs: 00000

rt: 10000

immediate: 1111111111110001

Addi $s0,$zero,-15

**Line 14:**

Slt $t0,$s0,$s1

Type R opcode rs rt rd shamt funct

Opcode: 000000

Rs: 10000

Rt:10001

Rd:01000

Shamt:00000

Funct: 101010

Slt $t0,$s0,$s1

32 machine code:

00000010000100010100000000101010

**Line 17:**

Beq $t0, $zero, LEEQ

Type I opcode rs rt immediate

Opcode:000100

Rs: 01000

Rt: 00000

Imm: 0000000000000110

Machine code in 32 bit is:

00010001000000000000000000000110

Beq $t0, $zero, LEEQ

**Line 20:**

J GRT

Type J opcode address

Opcode: 000010

Target Address: 00010000000000000000011100

Machine code is 32 bit is:

00001000010000000000000000011100

J GRT