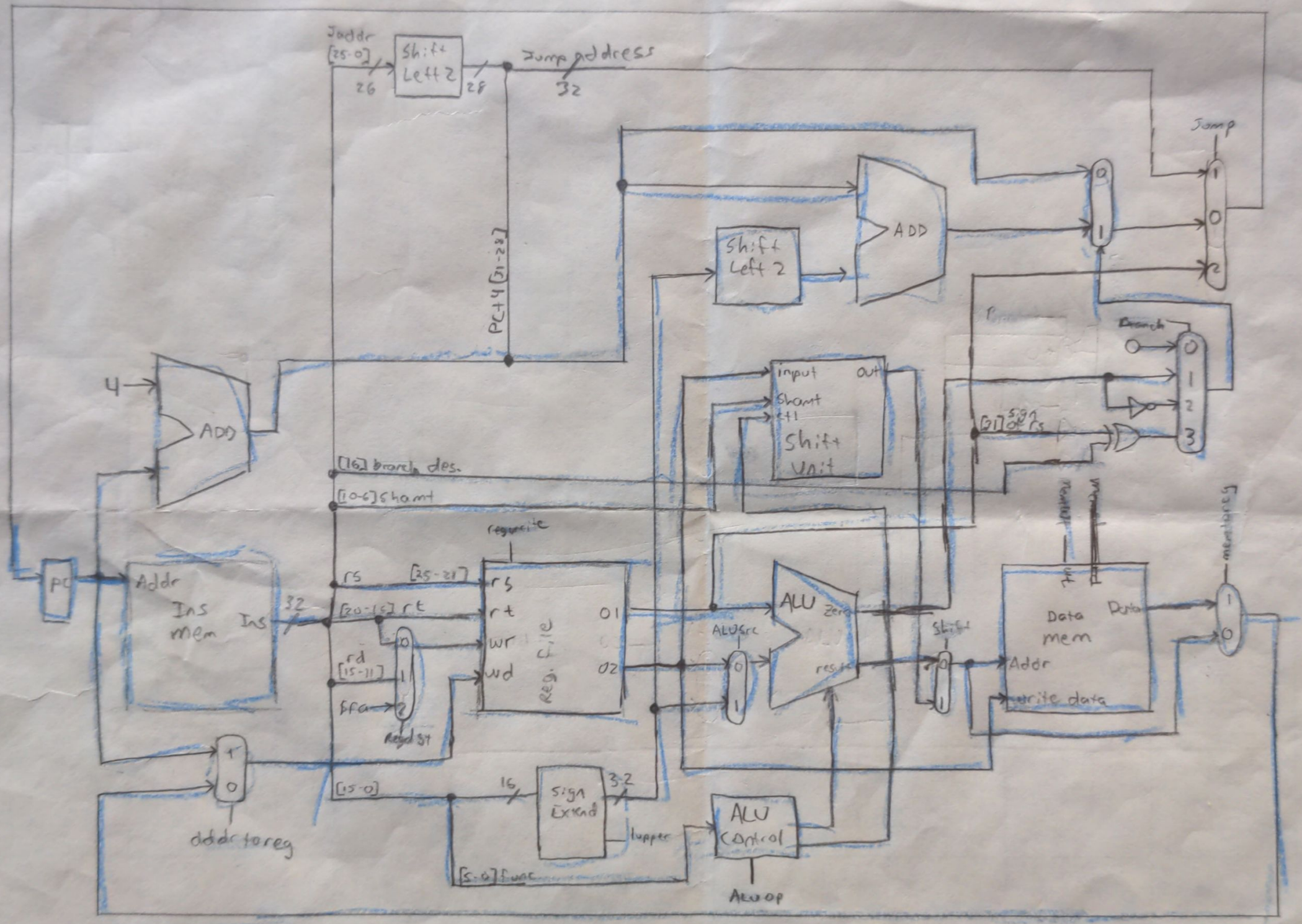
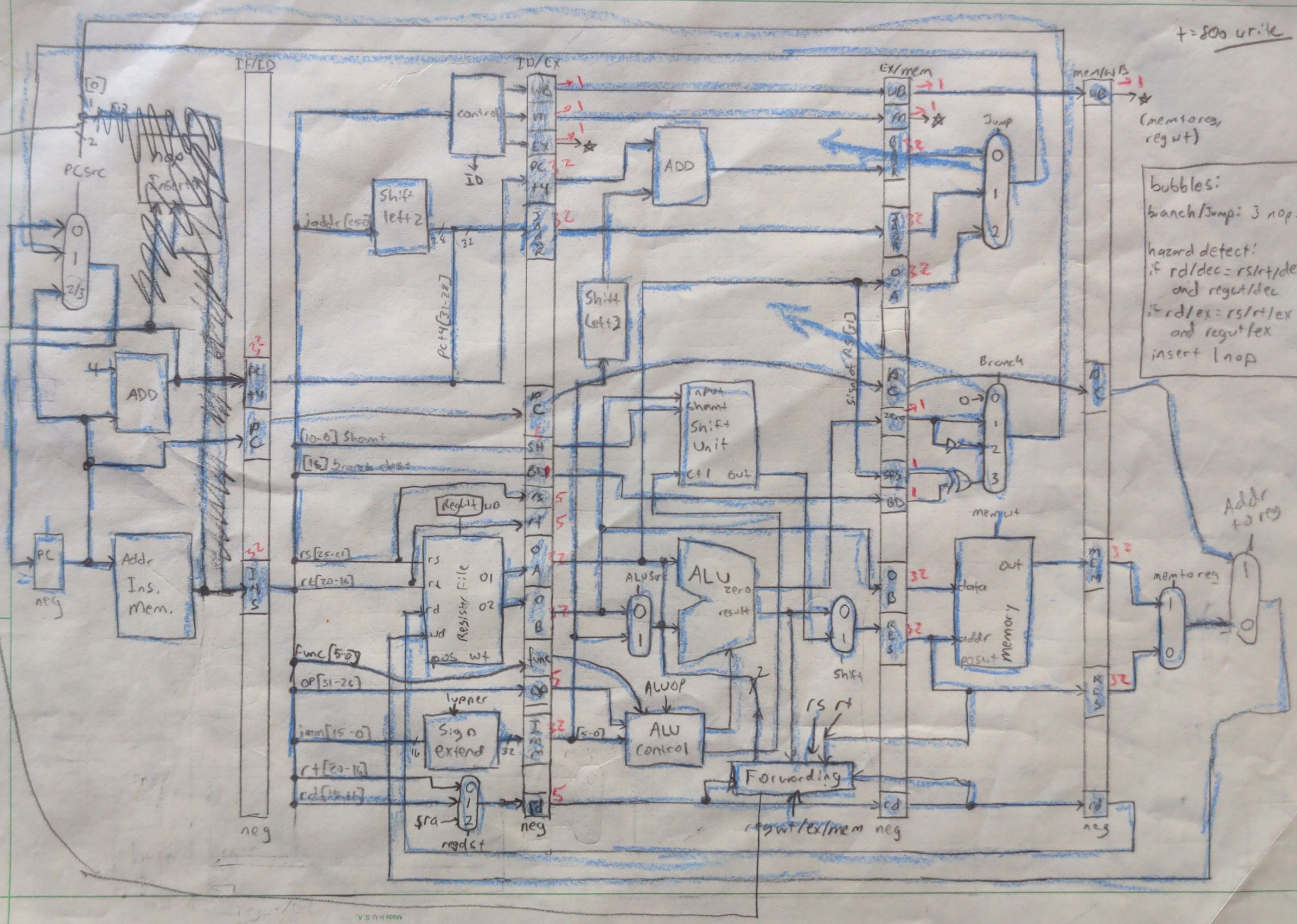

Jaddr [25-0]
26
Shift Left 2
28
Jump address
32
Jump
PC+4 [31-28]
ADD
Shift Left 2
ADD
4
PC
Addr
Ins mem
Ins
32
[16] branch des.
[10-6] shamt
regwrite
rs
[25-21]
[20-16] rt
rd [15-11]
[15-0]
Regfile
rs
rt
wr
wd
01
02
input
out
Shamt
ctl
Shift Unit
Branch
[31-26] Op
ALUSrc
ALU
Zero
result
Shift
Data mem
Addr
write data
Data
memtoreg
dddr to reg
16
Sign Extend
32
[5-0] funct
ALU Control
ALU op
lupper

Fetch | t=100 LW | Decode | t=300 LW | Execute | t=500 LW | mem | t=700 LW | Write Back

t=800 write



ALU capabilities: add, sub, and, or, xor,

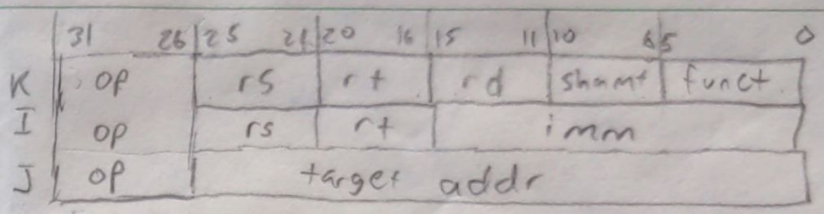
command	regdst	ALUsrc	shift	ALUop	~~MemRead~~	memwrite	memtoReg	Branch	Jump	Regwrite	Lupper	addr/stores
add/addu sub/subu and/or/xor	1	0	0	010	0	0	0	0	0	1	0	0
sll/srl/sra	1	0	1	010	0	0	0	0	0	1	0	0
slt/sltu	1	0	0	010	0	0	0	0	0	1	0	0
jr	1	0	0	010	0	0	0	0	2	0	0	0
addi	0	1	0	000	0	0	0	0	0	1	0	0
addiu	0	1	0	001	0	0	0	0	0	1	0	0
andi	0	1	0	100	0	0	0	0	0	1	0	0
ori	0	1	0	101	0	0	0	0	0	1	0	0
xori	0	1	0	110	0	0	0	0	0	1	0	0
slti	0	1	0	011	0	0	0	0	0	1	0	0
beq	0	0	0	111	0	0	0	1	0	0	0	0
bne	0	0	0	111	0	0	0	2	0	0	0	0
bltz/gtz	0	1	0	000	0	0	0	3	0	0	0	0
lw	0	1	0	000	1	0	1	0	0	1	0	0
sw	0	1	0	000	0	1	1	0	0	0	0	0
lui	0	1	0	000	0	0	0	0	0	1	1	0
j	0	1	0	000	0	0	0	0	1	0	0	0
jal	2	1	0	000	0	0	0	1	1	1	0	1

Shift control:

sll	00
srl	10
sra	11

ALU OP

use funct	010
add	000
addu	001
and	100
or	101
xor	110
slt	011
sub	111



R-format instructions

name	op	funct
· add	000000	100000
· addu	000000	100001
· sub	000000	100010
· subu	000000	100011
· and	000000	100100
· or	000000	100101
· xor	000000	100110
· slt	000000	101010
· sltu	000000	101011
· jr	000000	001000

name	funct
· sll	000000
· srl	000010
· sra	000011

I-format instructions

name	op
· addi	001000
· addiu	001001
· andi	001100
· ori	001101
· xori	001110
· slti	001010

name	op	rt
· beq	000100	
· bne	000101	
· bltz	000001	00000
· bgez	000001	00001
· lw	100011	
· sw	101011	
· lui	001111	

J-format instructions

name	op
· j	000010
jal	000011

notes:

- arithmetic ops "funct" code last 3 bits same as "op" code for I-format instructions
- slti last 3 bits match for slt/slti