

# The Control Unit Design

Lectures 32

Section 4.3, Appendix D

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## 1 The Control Unit Design

- The Opcodes
- The ALU Opcodes

## 2 Assignment

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# The Opcodes

Instruction	op Field	funct Field
lw	100011	XXXXXX
sw	101011	XXXXXX
beq	000100	XXXXXX
addi	001000	XXXXXX
add	000000	100000
sub	000000	100010
and	000000	100100
or	000000	100101
nor	000000	100111
slt	000000	101010

- The `funct` field matters only for R-type instructions.

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# The ALUOp Codes

Instruction	op Field	ALUOp
Load/store word	100011	00
Branch equal	000100	01
Add immediate	001000	11
R-type	000000	10

- The ALUOp is determined by the op code of the instruction.

# Summary of the Control Unit Output

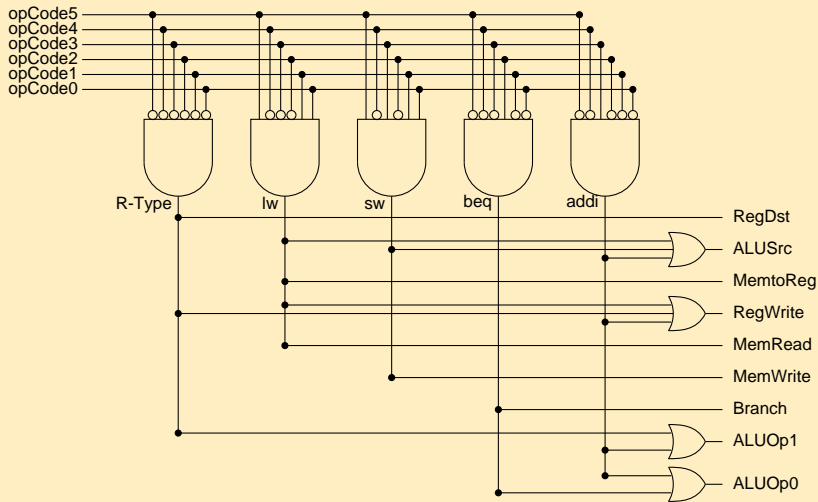
## Control Unit Output

Input							Output								
							RegDst	ALUSrc	MemtoReg	RegWrite	MemRead	MemWrite	Branch	ALUOp1	ALUOp0
OP	Op5	Op4	Op3	Op2	Op1	Op0									
RT	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0
lw	1	0	0	0	1	1	0	1	1	0	1	0	0	0	0
sw	1	0	1	0	1	1	X	1	0	X	0	1	0	0	0
beq	0	0	0	1	0	0	X	0	0	X	0	0	1	0	1
addi	0	0	1	0	0	0	0	1	0	1	0	0	0	1	1

- The control unit output.



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- Read Section 4.3, Appendix D.