

Tipo R
sll rd, rt, shamt

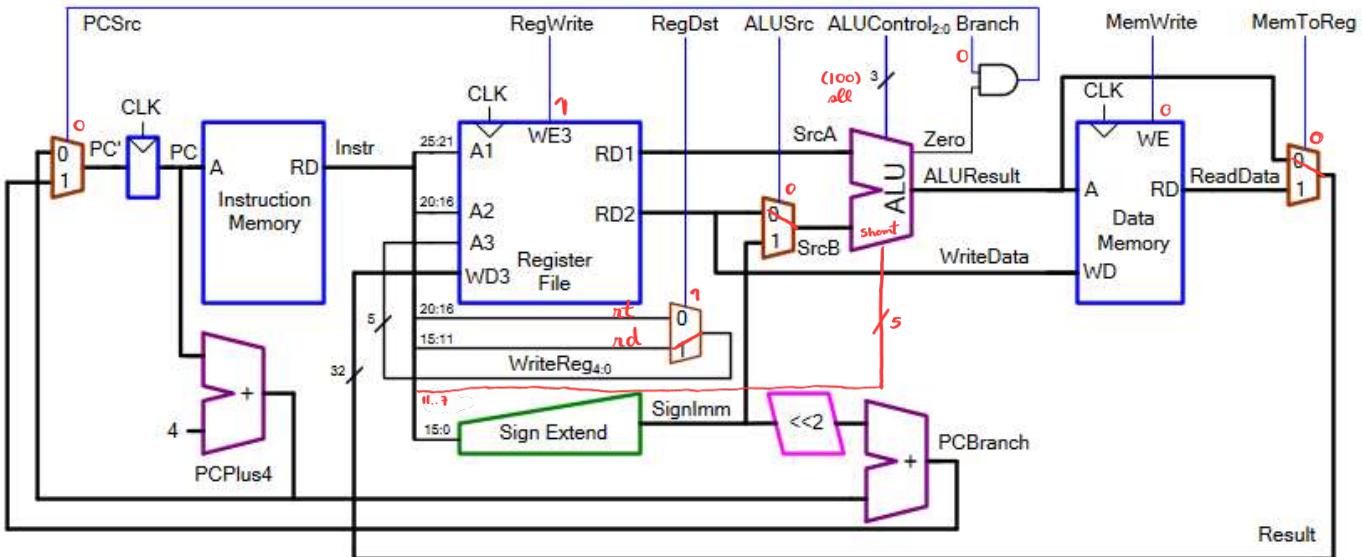
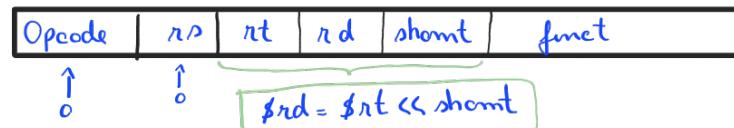


Figura 1 - Datapath single-cycle

ALUOp _{1:0}	Funct _{5:0}	ALUControl _{2:0}
00	XXXXXX	010 (Add)
01	XXXXXX	110 (Subtract)
10	100000 (add)	010 (Add)
10	100010 (sub)	110 (Subtract)
10	100100 (and)	000 (And)
10	100101 (or)	001 (Or)
10	101010 (slt)	111 (Slt)
10	000000 (sll)	100 (sll)

Tipo R →

Tabela II - Descodificador da ALU

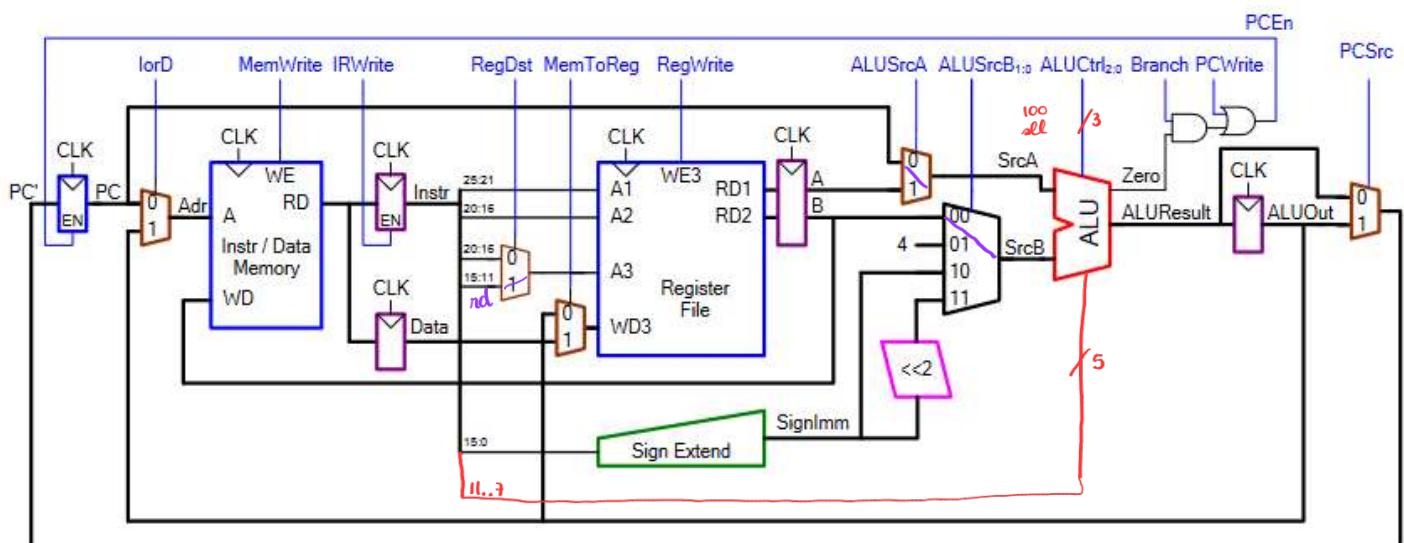
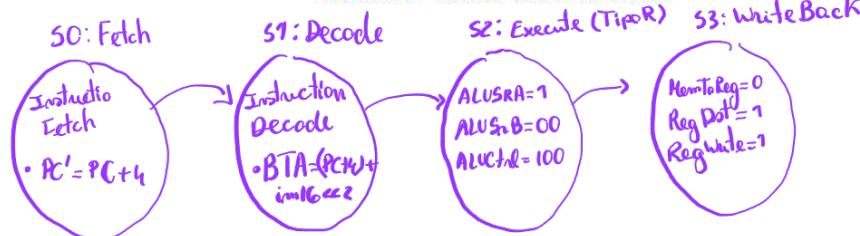


Figura 2 - Datapath multicycle



Tipo I
↳ lui \$rt, imm16



$$f_{rt} = \text{SignExtend32}(imm16) \ll 16$$

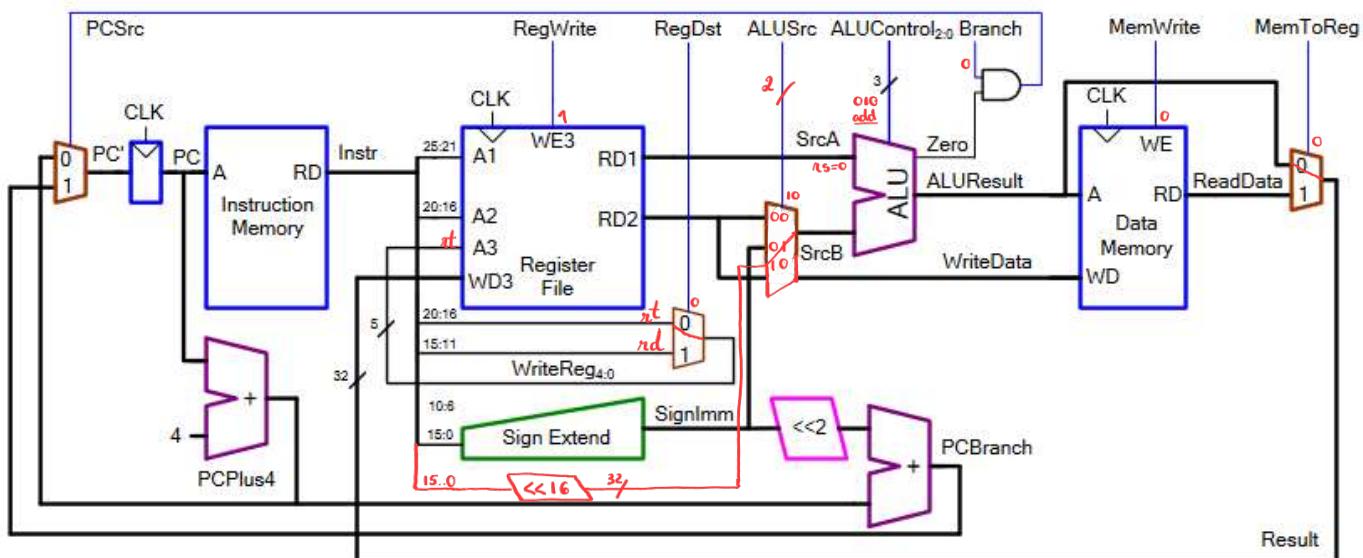


Figura 1 - Datapath single-cycle

ALUOp _{1:0}	Funct _{5:0}	ALUCtrl _{2:0}
00	XXXXXX	010 (Add)
01	XXXXXX	110 (Subtract)
10	100000 (add)	010 (Add)
10	100010 (sub)	110 (Subtract)
10	100100 (and)	000 (And)
10	100101 (or)	001 (Or)
10	101010 (slt)	111 (Slt)

Tabela II - Descodificador da ALU

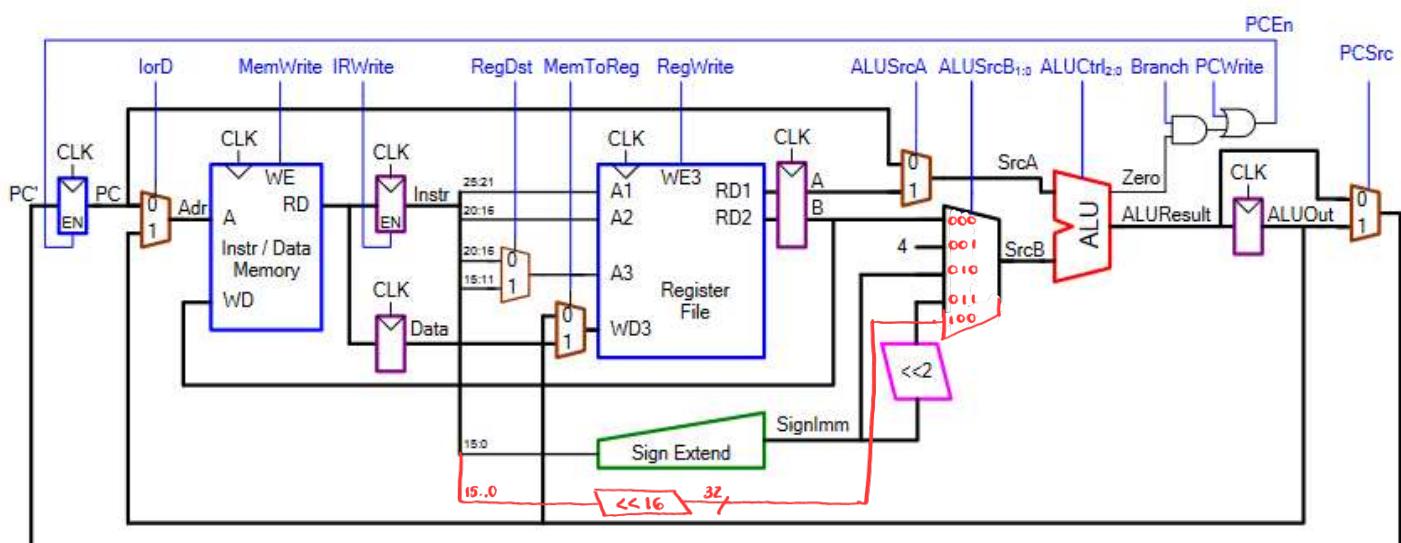
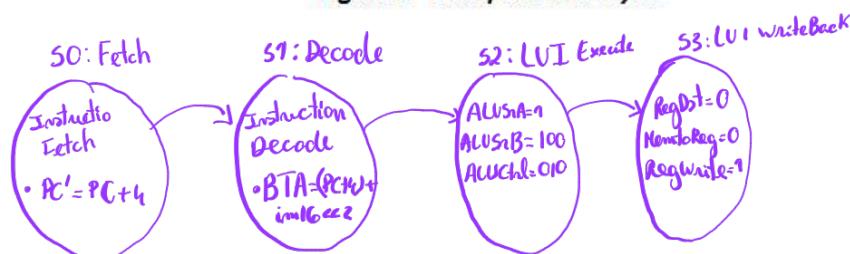


Figura 2 - Datapath multicycle



Tipo 3

ori rt, rs, imm16

Zero Extended

Opcode | rs | rt | imm16

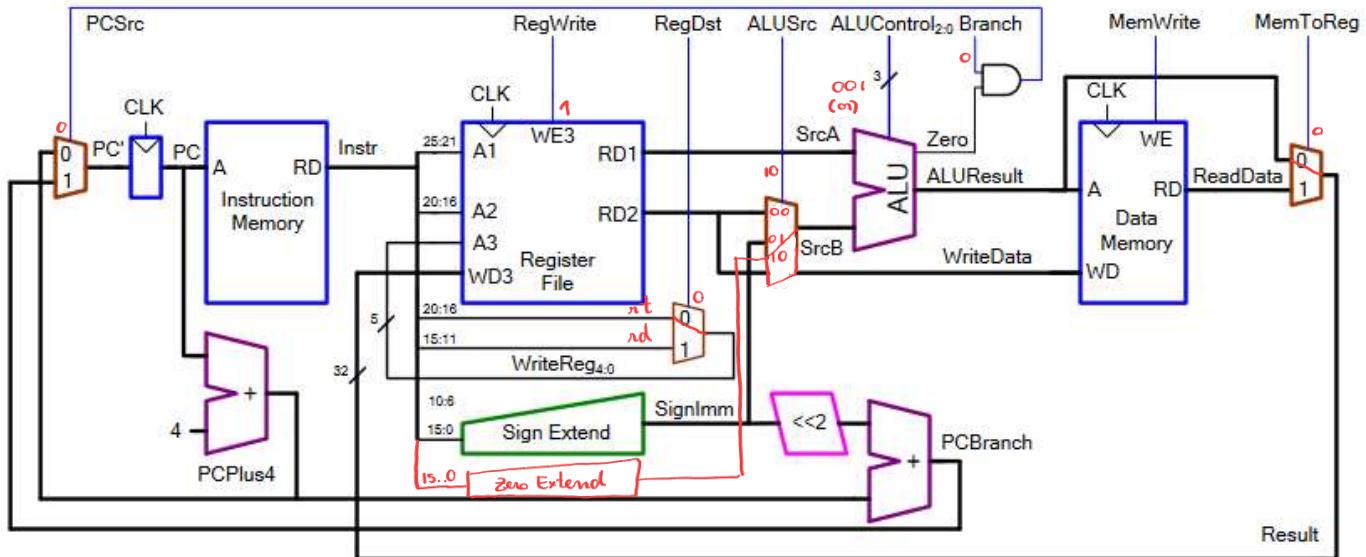


Figura 1 - Datapath single-cycle

ALUOp _{1:0}	Funct _{5:0}	ALUControl _{2:0}
00	XXXXXX	010 (Add)
01	XXXXXX	110 (Subtract)
10	100000 (add)	010 (Add)
10	100010 (sub)	110 (Subtract)
10	100100 (and)	000 (And)
10	100101 (or)	001 (Or)
10	101010 (slt)	111 (Slt)
11	XXXXXX	001

Tabela II - Descodificador da ALU

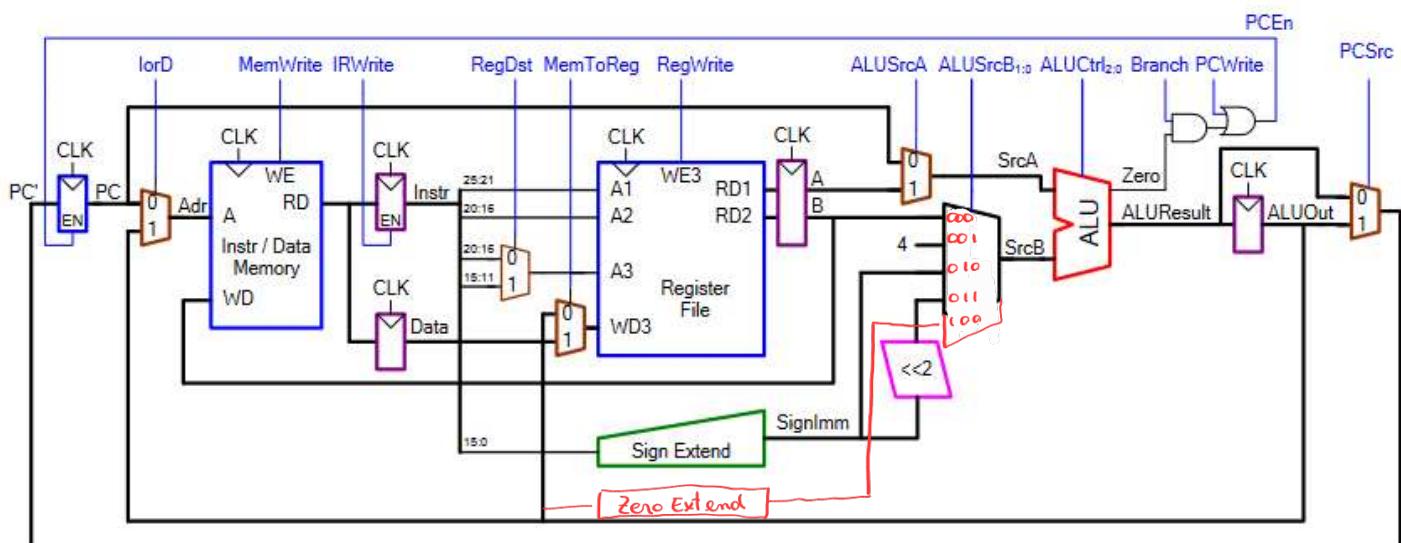
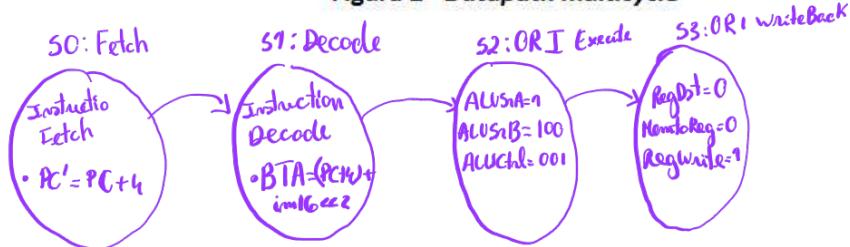


Figura 2 - Datapath multicycle



Tip I

slti rt, rs, imm16

$rt = (rs < imm16) ? 1 : 0$

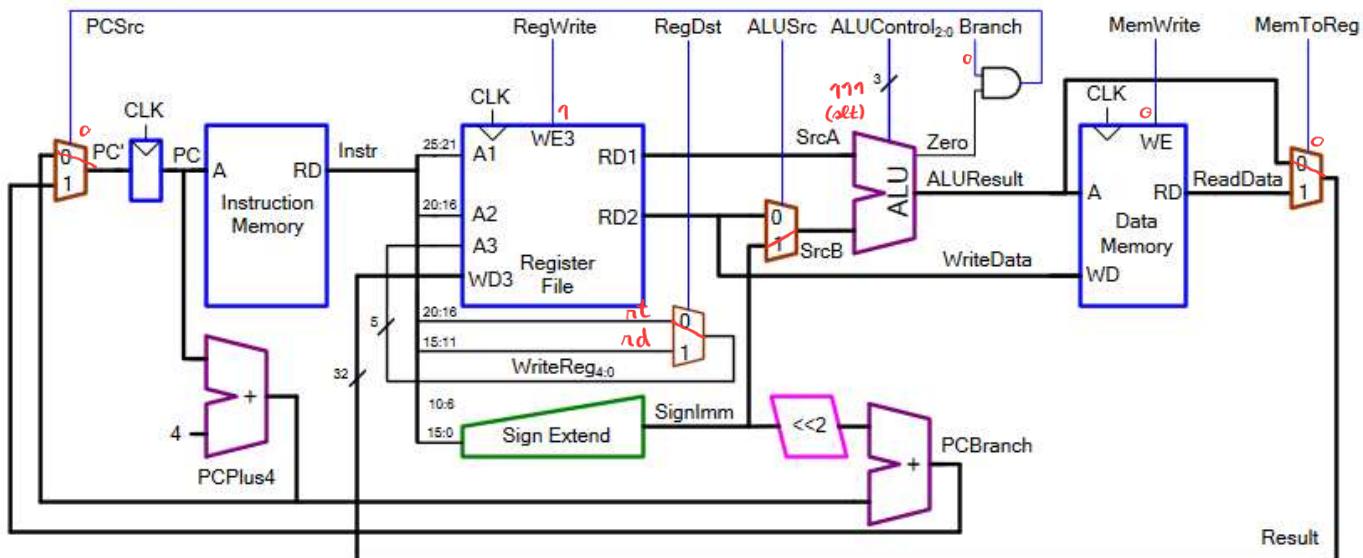


Figura 1 - Datapath single-cycle

ALUOp _{1:0}	Funct _{5:0}	ALUControl _{2:0}
00	XXXXXX	010 (Add)
01	XXXXXX	110 (Subtract)
10	100000 (add)	010 (Add)
10	100010 (sub)	110 (Subtract)
10	100100 (and)	000 (And)
10	100101 (or)	001 (Or)
10	101010 (slt)	111 (Slt)
m	xxxxxx	m (set)

Tabela II - Descodificador da ALU

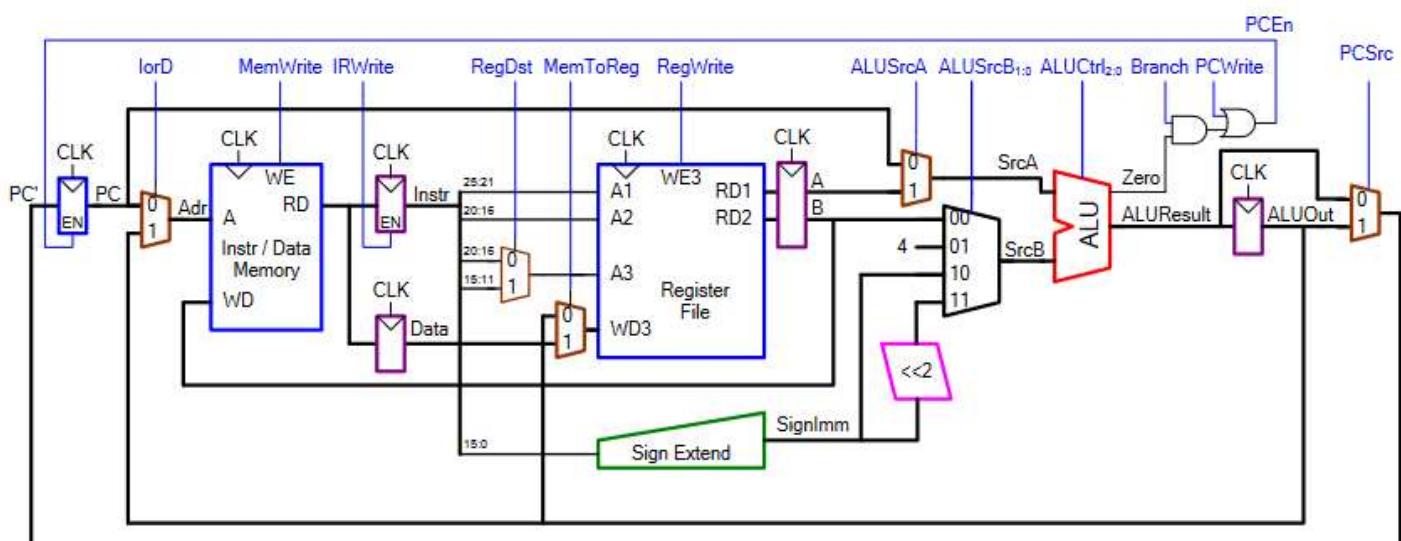
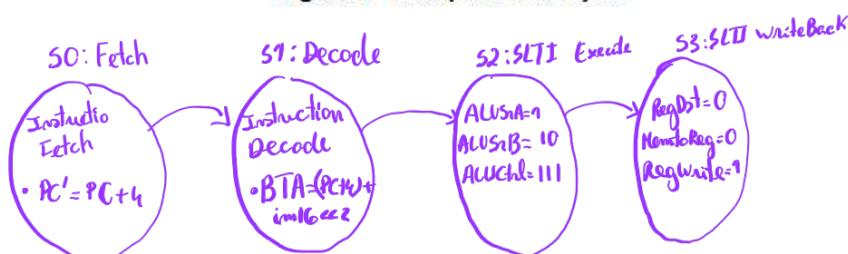


Figura 2 - Datapath multicycle



Tipo R → JR RS

: Jump → 1

Tipo R:

Opcode	RS	RT	RD	Shamt	Function
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0 0 0 0 0 001000

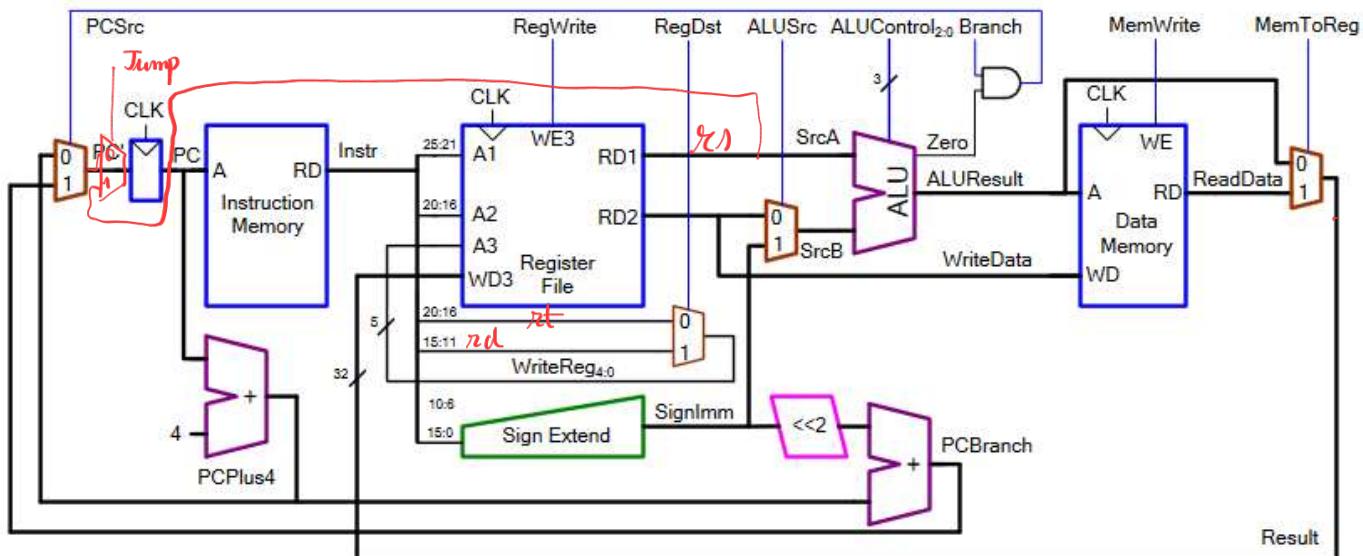


Figura 1 - Datapath single-cycle

ALUOp _{1:0}	Funct _{5:0}	ALUControl _{2:0}
00	XXXXXX	010 (Add)
01	XXXXXX	110 (Subtract)
10	100000 (add)	010 (Add)
10	100010 (sub)	110 (Subtract)
10	100100 (and)	000 (And)
10	100101 (or)	001 (Or)
10	101010 (slt)	111 (Slt)
10	001000 (jr)	010 (Add)

Tabela II - Descodificador da ALU

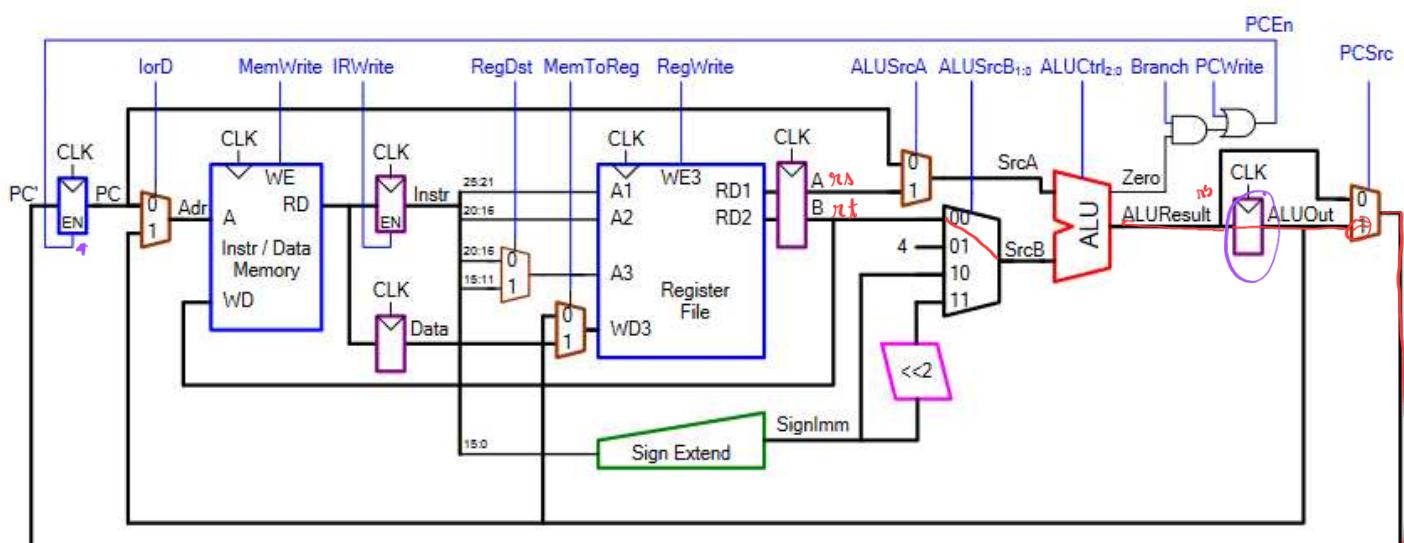
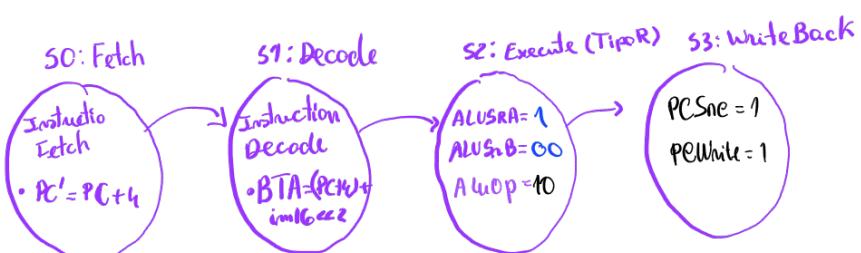


Figura 2 - Datapath multicycle



Tipo J: j label

Tipo J: Operate 6 bits

25:0
ADDRESS 26 bits

000010

$$JTA = (PC+4)_{31:28} : (Imm_{26} \ll 2)$$

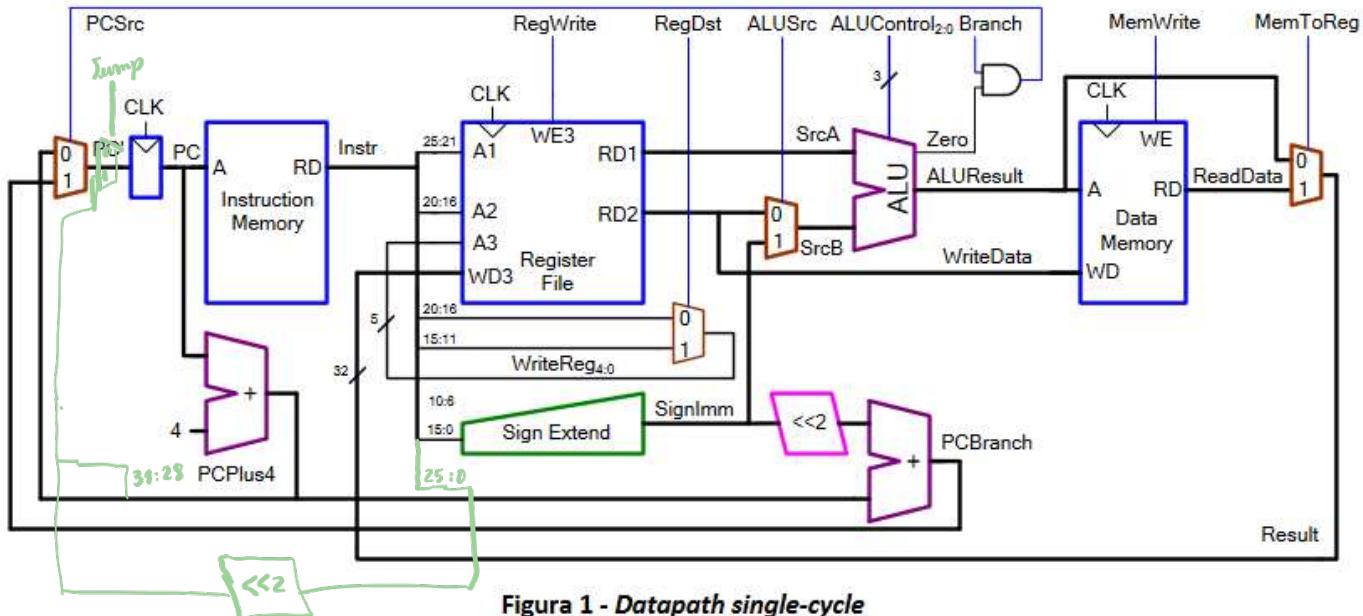


Figura 1 - Datapath single-cycle

ALUOp _{1:0}	Funct _{5:0}	ALUControl _{2:0}
00	XXXXXX	010 (Add)
01	XXXXXX	110 (Subtract)
10	100000 (add)	010 (Add)
10	100010 (sub)	110 (Subtract)
10	100100 (and)	000 (And)
10	100101 (or)	001 (Or)
10	101010 (slt)	111 (Slt)

Tabela II - Descodificador da ALU

PC
 $JTA = (PC+4)_{31:28} : (Imm_{26} \ll 2)$
 25:0

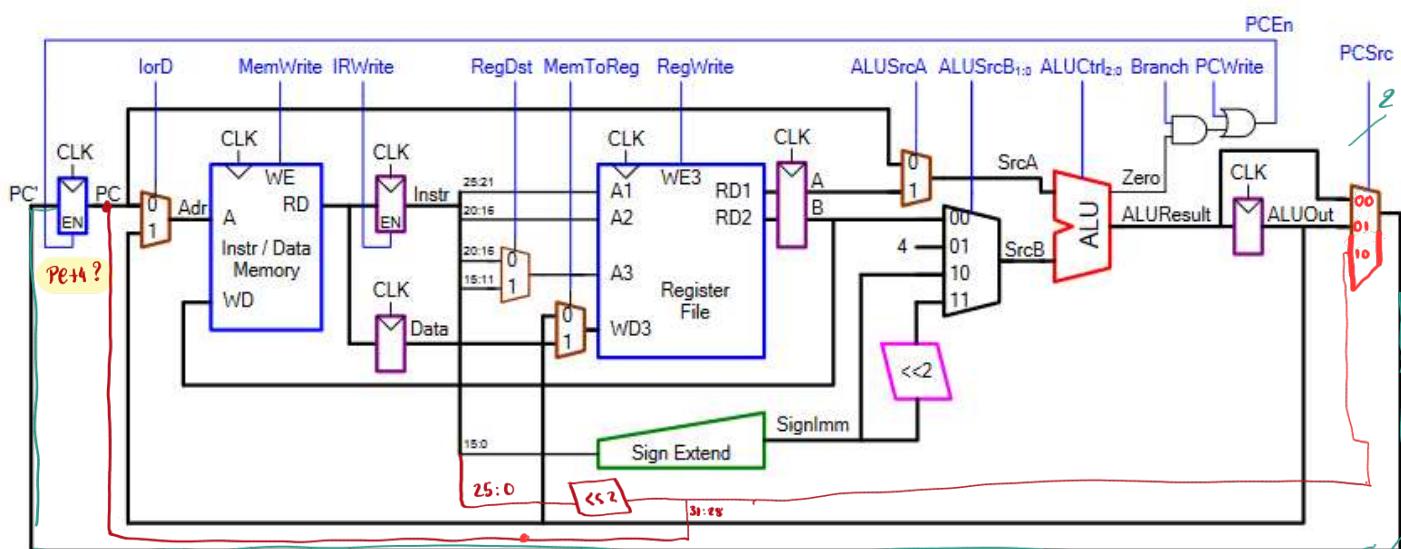
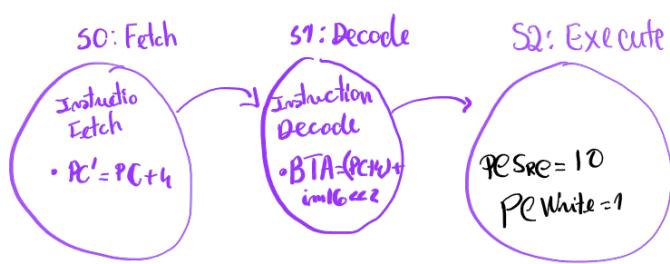


Figura 2 - Datapath multicycle



Tipos I

jal imm 26

Opcode

imm 26

0

- $JTA = (PC + 4) \oplus (imm26 \ll 2)$
- $$ra = (PC + 4)$

25
31..28

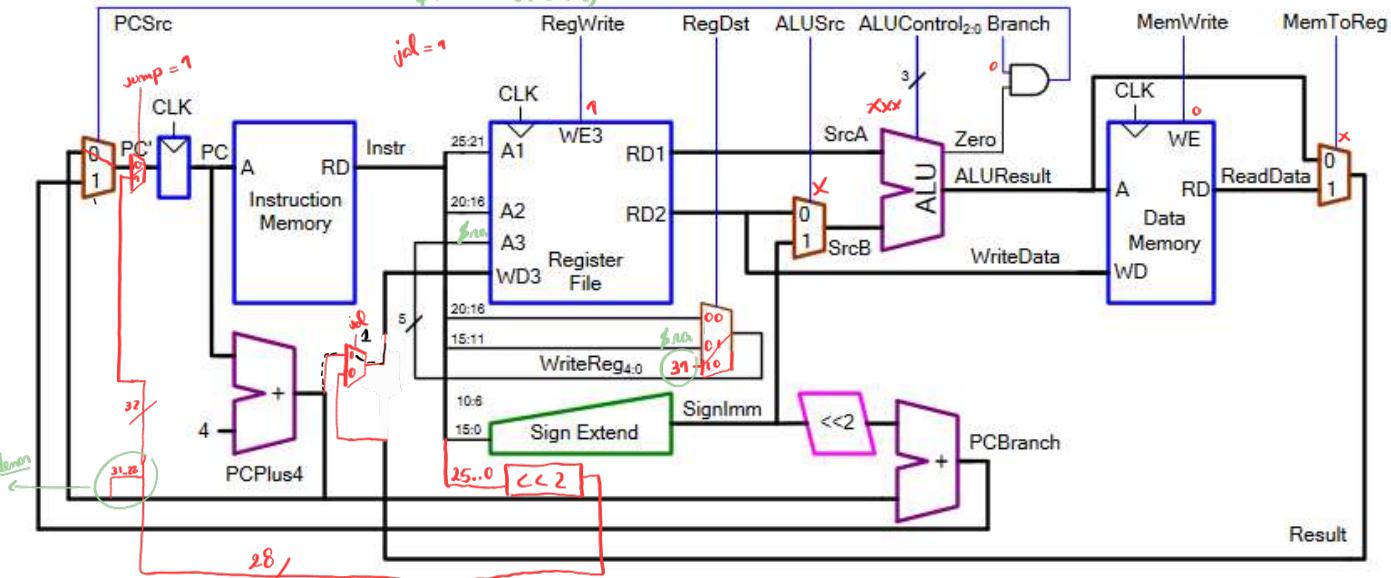


Figura 1 - Datapath single-cycle

ALUOp _{1:0}	Funct _{5:0}	ALUControl _{2:0}
00	XXXXXX	010 (Add)
01	XXXXXX	110 (Subtract)
10	100000 (add)	010 (Add)
10	100010 (sub)	110 (Subtract)
10	100100 (and)	000 (And)
10	100101 (or)	001 (Or)
10	101010 (slt)	111 (Slt)

Tabela II - Descodificador da ALU

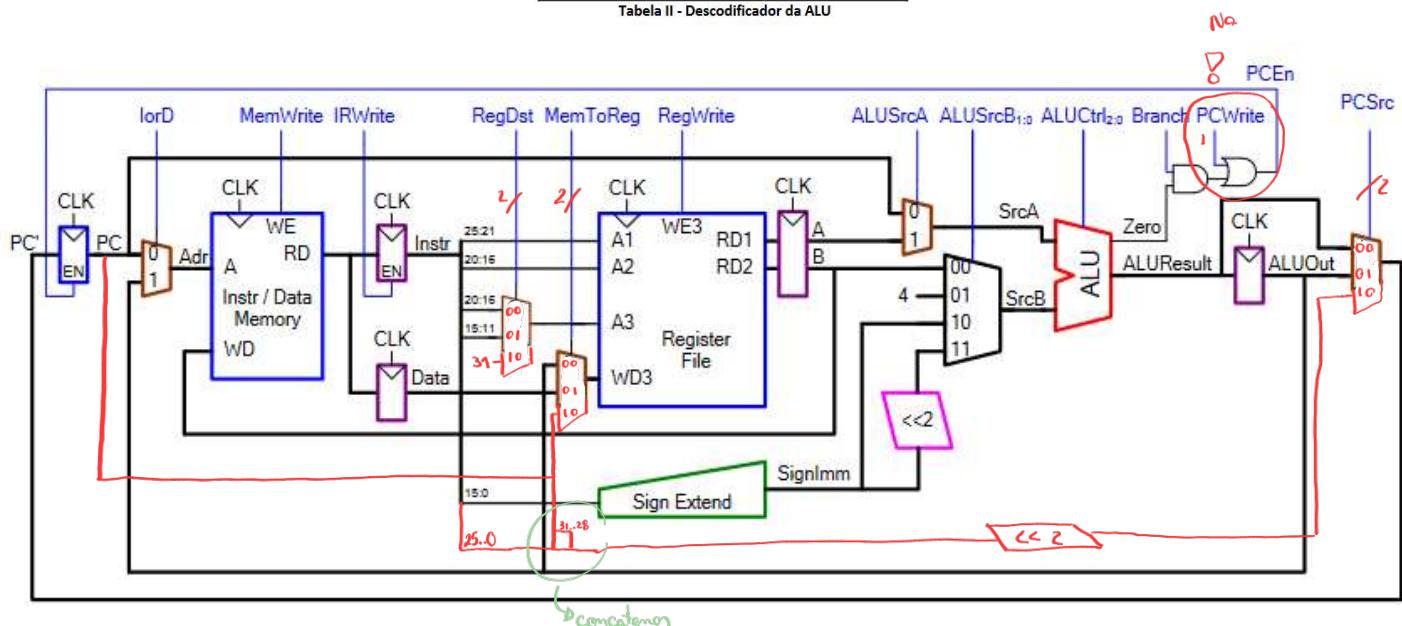
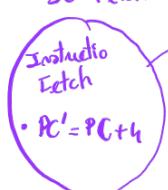


Figura 2 - Datapath multicycle

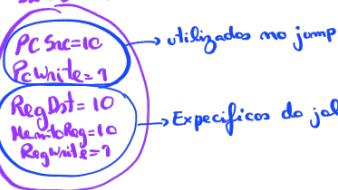
S0: Fetch



S1: Decode



S2: JAL



and rd, rt, shamt

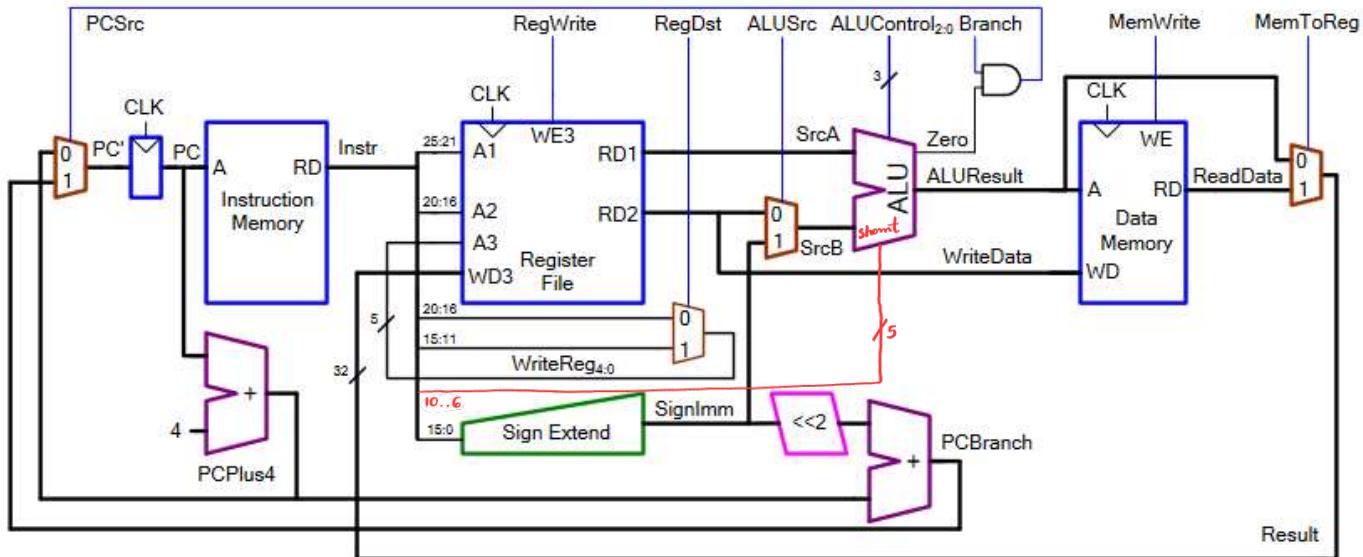


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ALUOp _{1:0}	Funct _{5:0}	ALUControl _{2:0}
00	XXXXXX	010 (Add)
01	XXXXXX	110 (Subtract)
10	100000 (add)	010 (Add)
10	100010 (sub)	110 (Subtract)
10	100100 (and)	000 (And)
10	100101 (or)	001 (Or)
10	101010 (slt)	111 (Slt)
10	000010 (<i>srl</i>)	011 (<i>srl</i>)

Tabela II - Descodificador da ALU

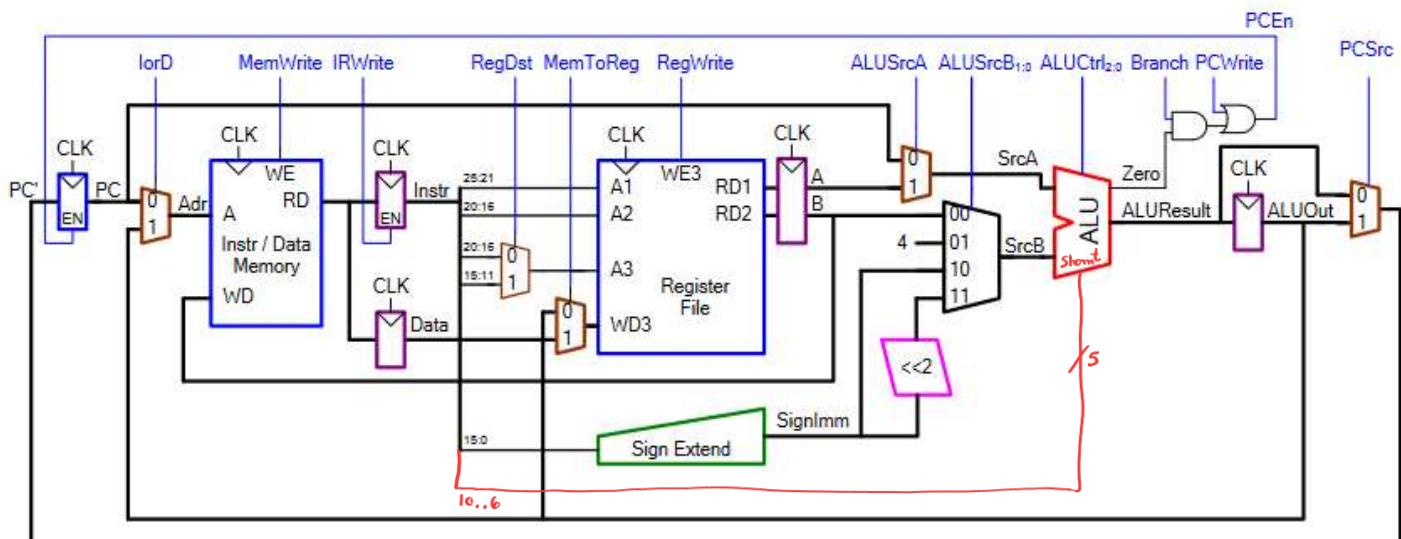
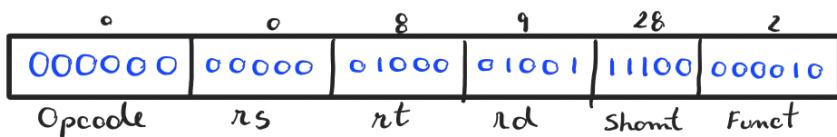


Figura 2 - Datapath multicycle

and rd, rt, shamt
srl \$t9, \$t0, 28
9 8



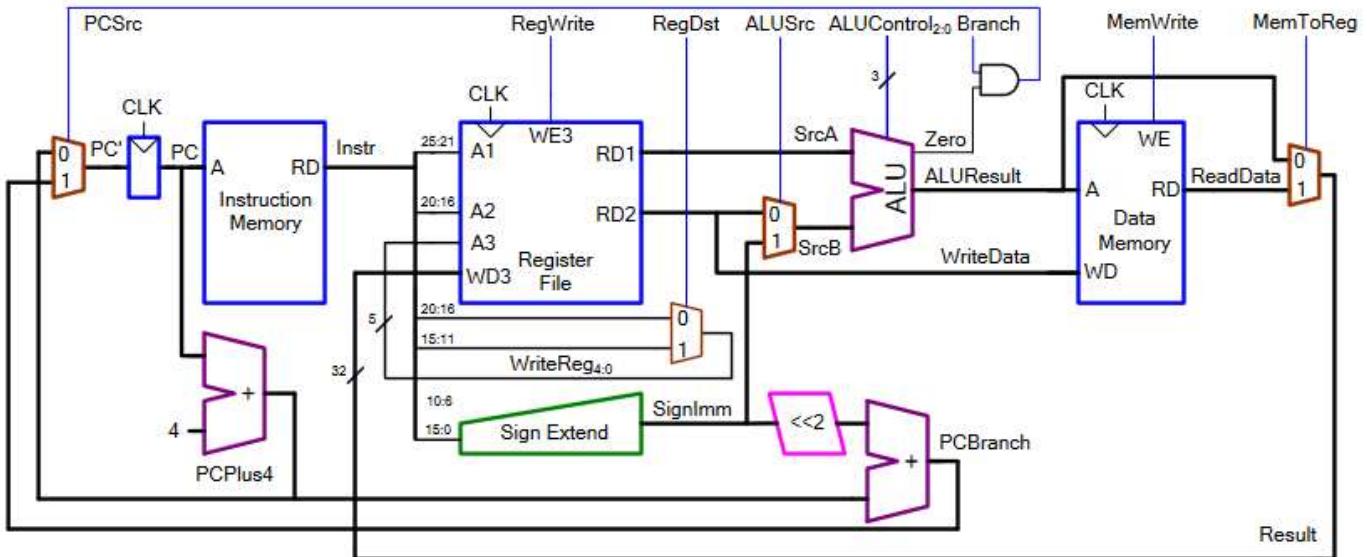


Figura 1 - Datapath single-cycle

ALUOp _{1:0}	Funct _{5:0}	ALUControl _{2:0}
00	XXXXXX	010 (Add)
01	XXXXXX	110 (Subtract)
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Tabela II - Descodificador da ALU

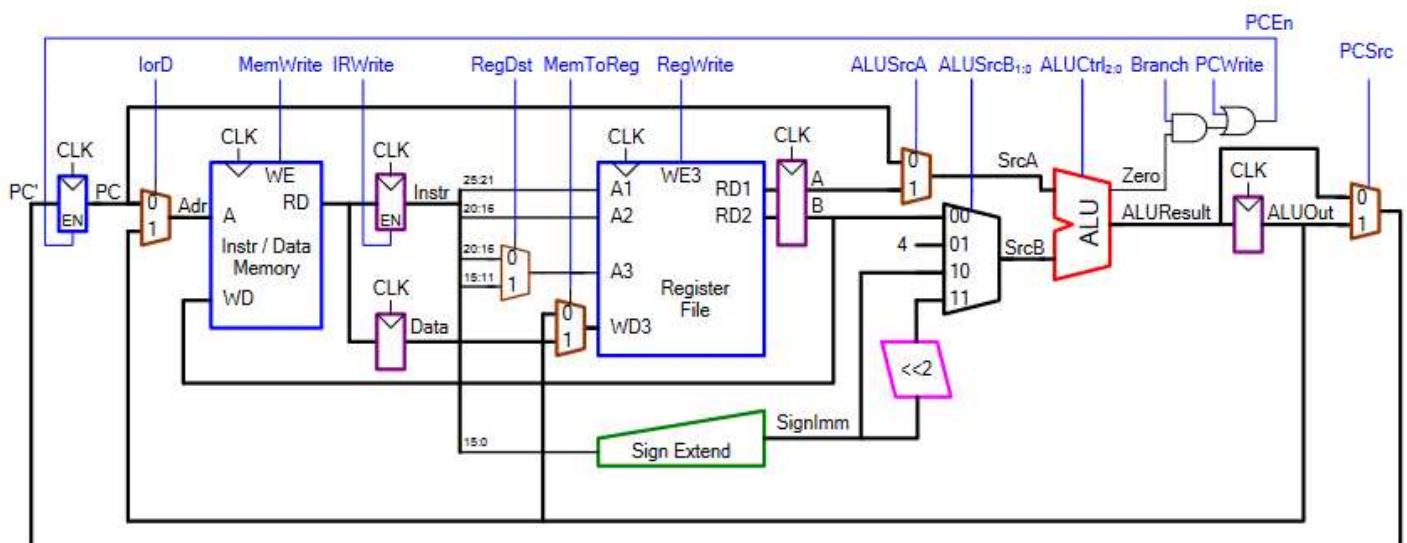


Figura 2 - Datapath multicycle