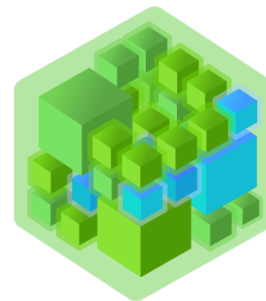


Instruções de Desvio Incondicional

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LABORATÓRIO DE COMPUTAÇÃO
DE ALTO DESEMPENHO

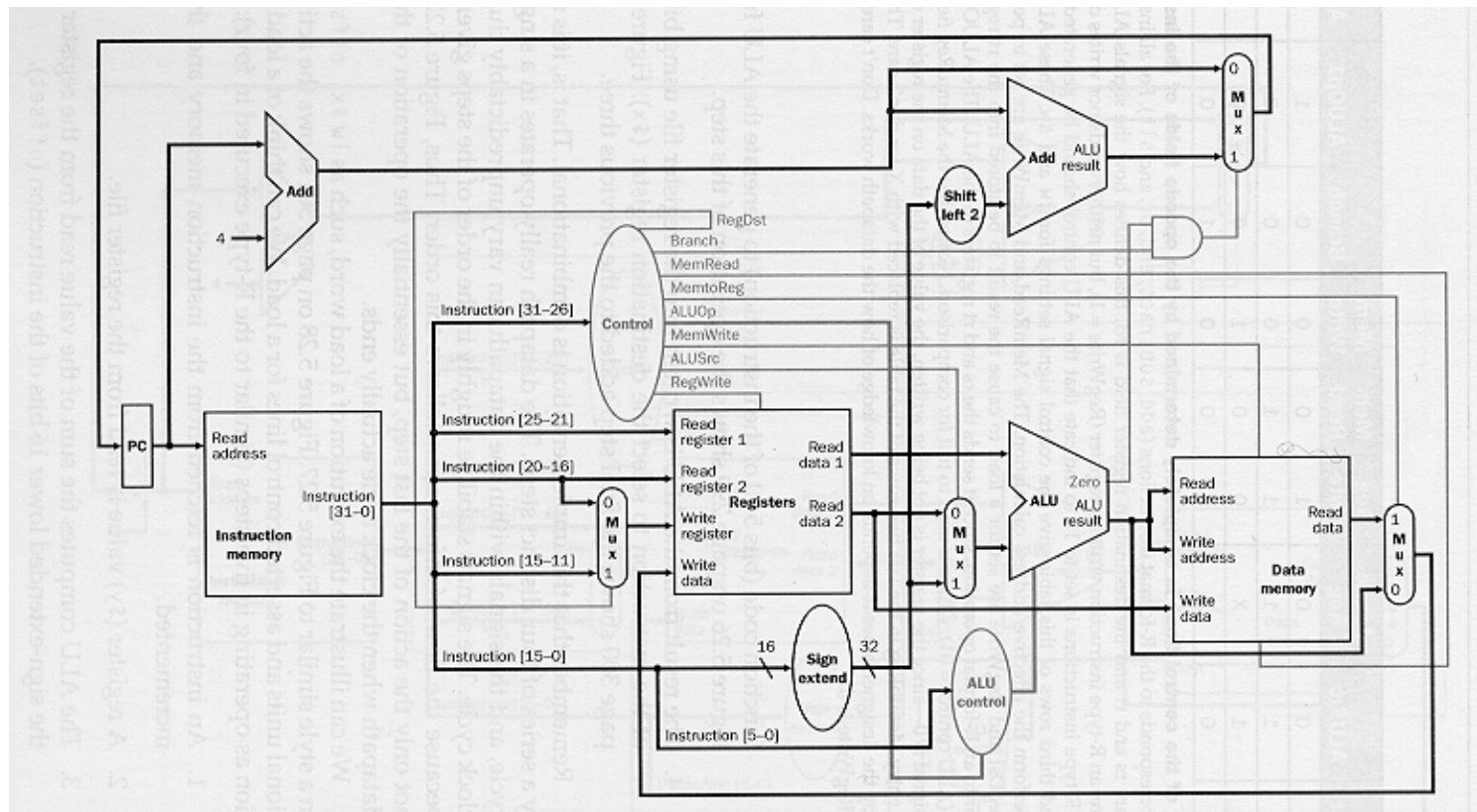
Instruções de Desvio Incondicional



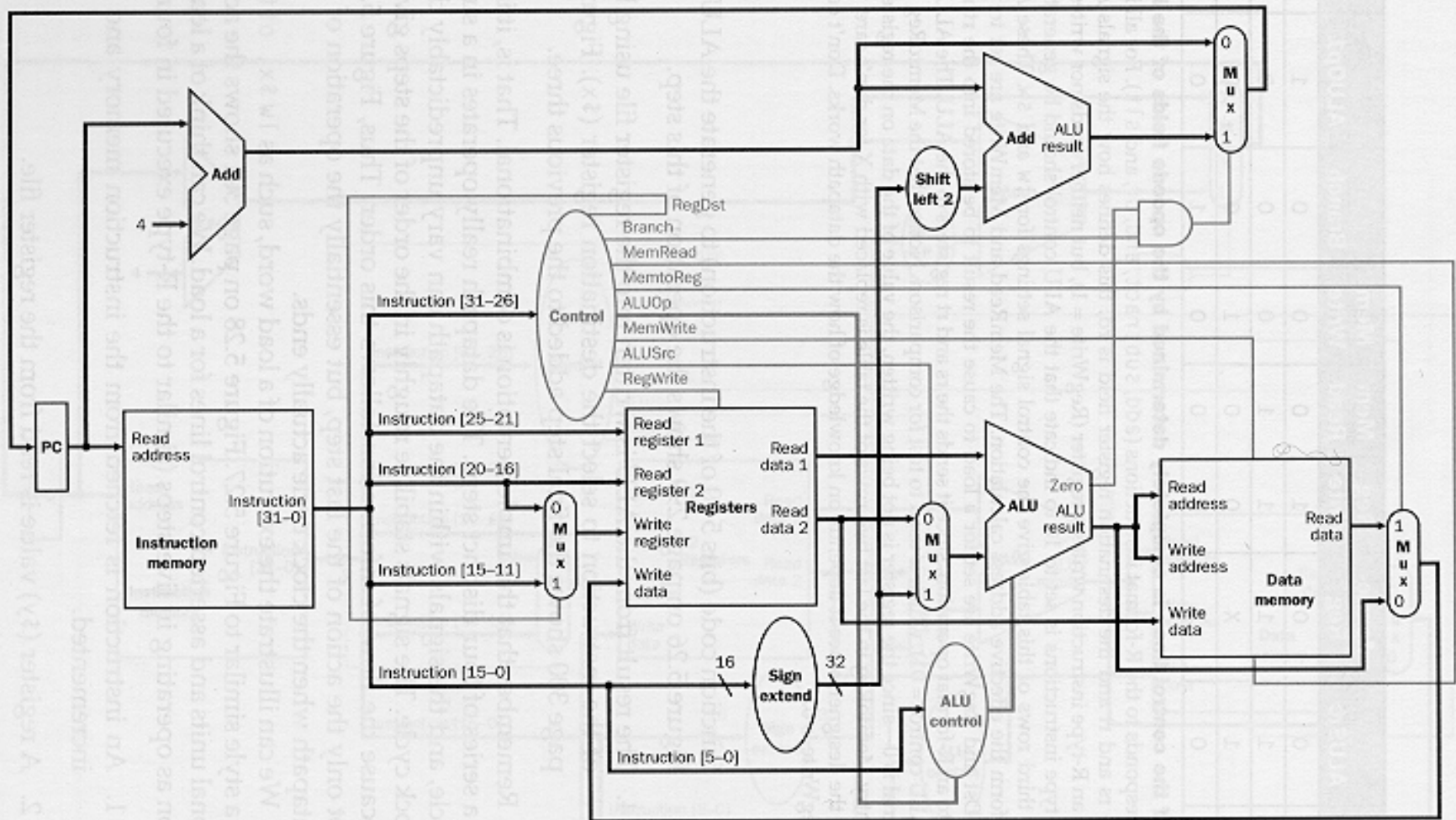
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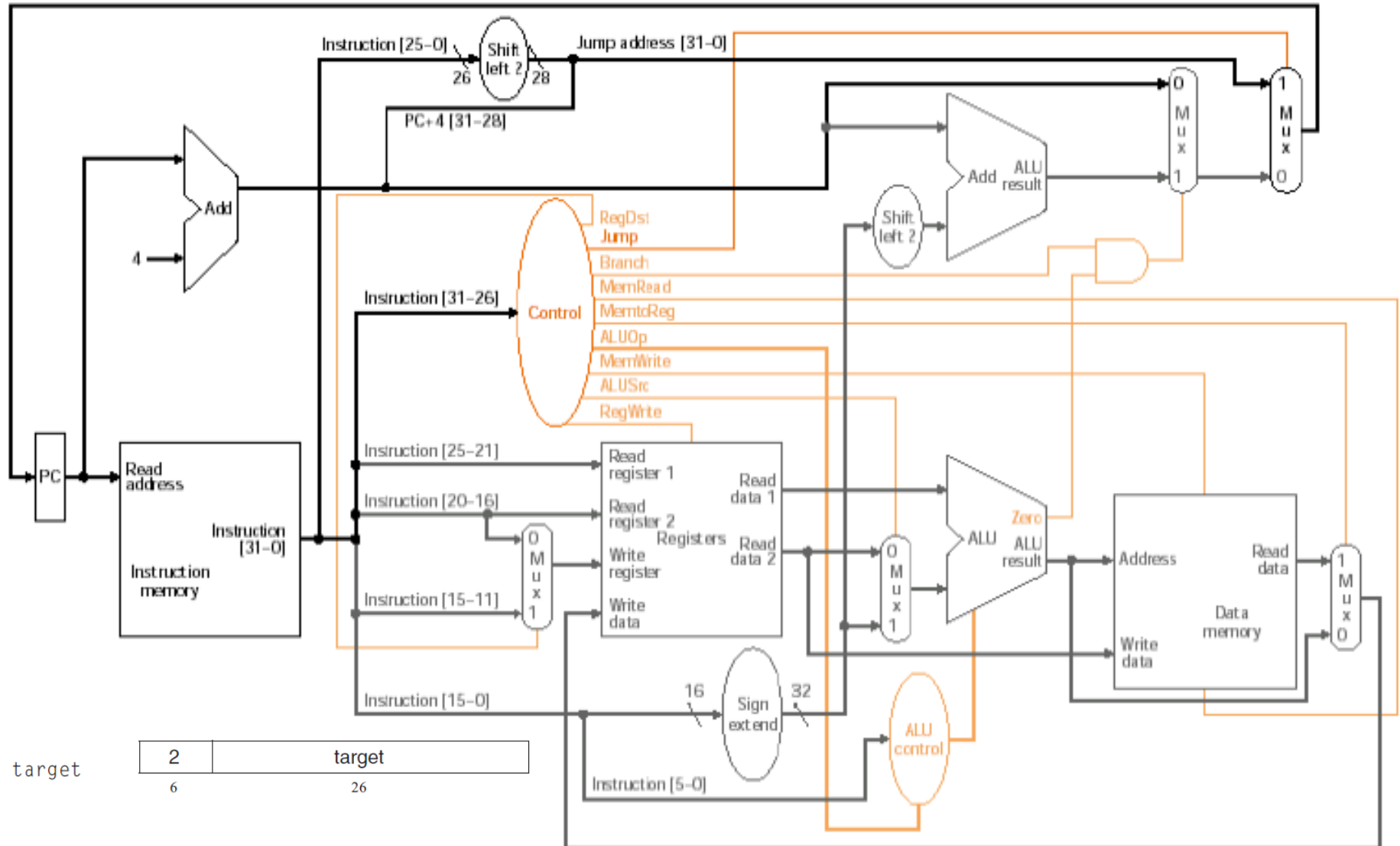
- A arquitetura abaixo não é capaz de executar as instruções j, jal e jr



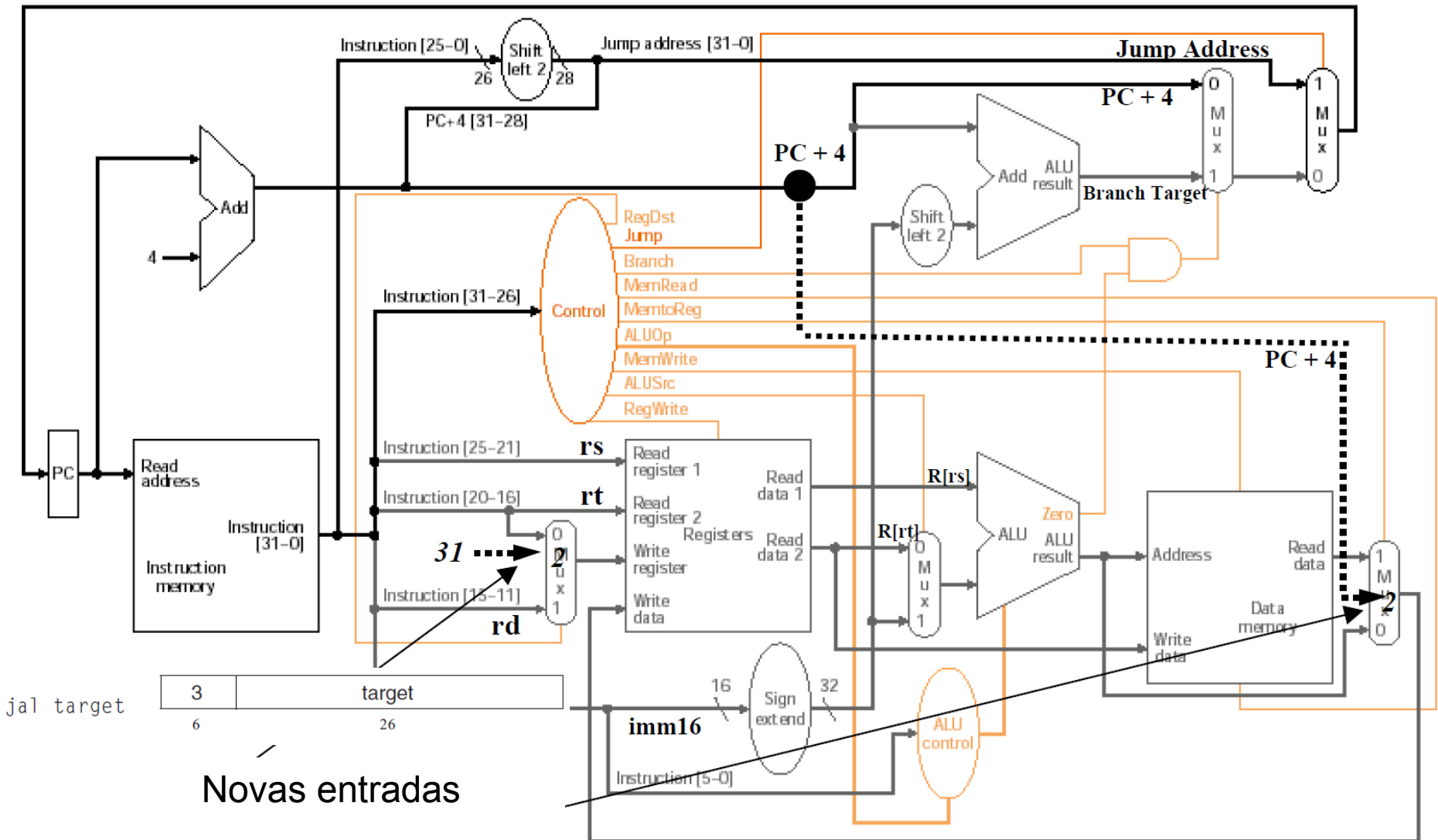
Instruções de Desvio Incondicional



Instrução j

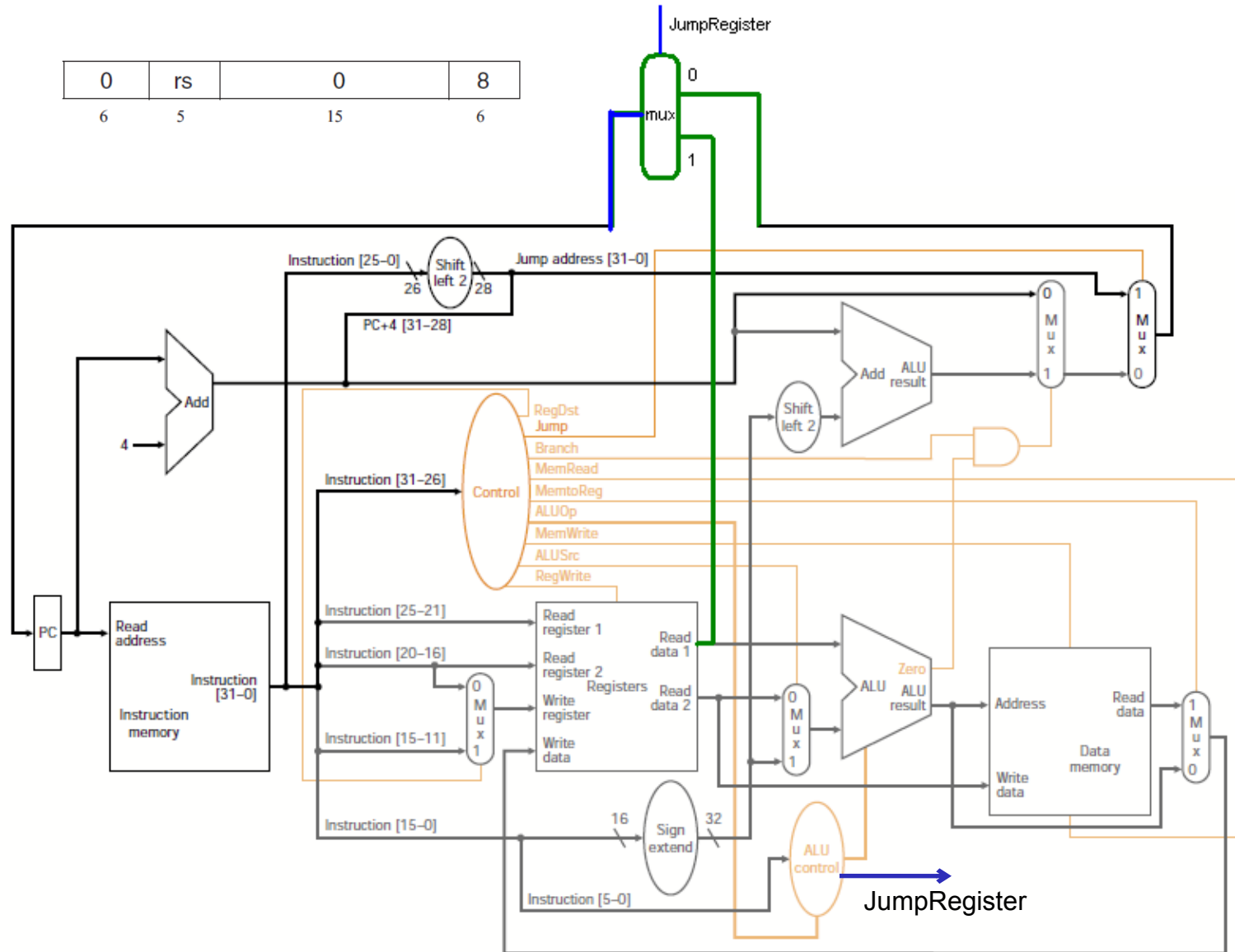


Instrução jal



Instrução jr

jr rs





- Implemente as instruções j, jr e jal
- Os formatos e códigos das instruções podem ser encontrados em:
<http://www.inf.ufes.br/~alberto/APENDICE-A.PDF>
- Você pode usar o Simulador PCspim (
<http://spimsimulator.sourceforge.net/>) para verificar os códigos e o funcionamento correto das instruções (note que este simulador as vezes troca uma instrução por outra equivalente)
- Os trabalhos podem ser feitos em grupos de até 3 alunos e devem ser enviados para sp1@lcad.inf.ufes.br
- **O email deve conter o nome completo dos alunos componentes do grupo**

Category	Instruction	Example	Meaning	Comments
Arithmetic	add	add \$s1,\$s2,\$s3	$\$s1 = \$s2 + \$s3$	Three operands; overflow detected
	subtract	sub \$s1,\$s2,\$s3	$\$s1 = \$s2 - \$s3$	Three operands; overflow detected
	add immediate	addi \$s1,\$s2,100	$\$s1 = \$s2 + 100$	+ constant; overflow detected
	add unsigned	addu \$s1,\$s2,\$s3	$\$s1 = \$s2 + \$s3$	Three operands; overflow undetected
	subtract unsigned	subu \$s1,\$s2,\$s3	$\$s1 = \$s2 - \$s3$	Three operands; overflow undetected
	add immediate unsigned	addiu \$s1,\$s2,100	$\$s1 = \$s2 + 100$	+ constant; overflow undetected
	move from coprocessor register	mfc0 \$s1,\$epc	$\$s1 = \epc	Copy Exception PC + special regs
	multiply	mult \$s2,\$s3	$Hi, Lo = \$s2 \times \$s3$	64-bit signed product in Hi, Lo
	multiply unsigned	multu \$s2,\$s3	$Hi, Lo = \$s2 \times \$s3$	64-bit unsigned product in Hi, Lo
	divide	div \$s2,\$s3	$Lo = \$s2 / \$s3$, $Hi = \$s2 \bmod \$s3$	Lo = quotient, Hi = remainder
Data transfer	divide unsigned	divu \$s2,\$s3	$Lo = \$s2 / \$s3$, $Hi = \$s2 \bmod \$s3$	Unsigned quotient and remainder
	move from Hi	mfhi \$s1	$\$s1 = Hi$	Used to get copy of Hi
	move from Lo	mflo \$s1	$\$s1 = Lo$	Used to get copy of Lo
	load word	lw \$s1,100(\$s2)	$\$s1 = \text{Memory}[\$s2 + 100]$	Word from memory to register
	store word	sw \$s1,100(\$s2)	$\text{Memory}[\$s2 + 100] = \$s1$	Word from register to memory
	load half unsigned	lhu \$s1,100(\$s2)	$\$s1 = \text{Memory}[\$s2 + 100]$	Halfword memory to register
	store half	sh \$s1,100(\$s2)	$\text{Memory}[\$s2 + 100] = \$s1$	Halfword register to memory
	load byte unsigned	lbu \$s1,100(\$s2)	$\$s1 = \text{Memory}[\$s2 + 100]$	Byte from memory to register
Logical	store byte	sb \$s1,100(\$s2)	$\text{Memory}[\$s2 + 100] = \$s1$	Byte from register to memory
	load upper immediate	lui \$s1,100	$\$s1 = 100 * 2^{16}$	Loads constant in upper 16 bits
	and	and \$s1,\$s2,\$s3	$\$s1 = \$s2 \& \$s3$	Three reg. operands; bit-by-bit AND
	or	or \$s1,\$s2,\$s3	$\$s1 = \$s2 \$s3$	Three reg. operands; bit-by-bit OR
	nor	nor \$s1,\$s2,\$s3	$\$s1 = \sim (\$s2 \$s3)$	Three reg. operands; bit-by-bit NOR
	and immediate	andi \$s1,\$s2,100	$\$s1 = \$s2 \& 100$	Bit-by-bit AND with constant
	or immediate	ori \$s1,\$s2,100	$\$s1 = \$s2 100$	Bit-by-bit OR with constant
Conditional branch	shift left logical	sll \$s1,\$s2,10	$\$s1 = \$s2 \ll 10$	Shift left by constant
	shift right logical	srl \$s1,\$s2,10	$\$s1 = \$s2 \gg 10$	Shift right by constant
	branch on equal	beq \$s1,\$s2,25	if ($\$s1 == \$s2$) go to PC + 4 + 100	Equal test; PC-relative branch
	branch on not equal	bne \$s1,\$s2,25	if ($\$s1 != \$s2$) go to PC + 4 + 100	Not equal test; PC-relative
	set on less than	slt \$s1,\$s2,\$s3	if ($\$s2 < \$s3$) $\$s1 = 1$; else $\$s1 = 0$	Compare less than; two's complement
	set less than immediate	slti \$s1,\$s2,100	if ($\$s2 < 100$) $\$s1 = 1$; else $\$s1 = 0$	Compare < constant; two's complement
Unconditional jump	set less than unsigned	sltu \$s1,\$s2,\$s3	if ($\$s2 < \$s3$) $\$s1 = 1$; else $\$s1 = 0$	Compare less than; natural numbers
	set less than immediate unsigned	sltiu \$s1,\$s2,100	if ($\$s2 < 100$) $\$s1 = 1$; else $\$s1 = 0$	Compare < constant; natural numbers
	jump	j 2500	go to 10000	Jump to target address
	jump register	jr \$ra	go to \$ra	For switch, procedure return
	jump and link	jal 2500	$\$ra = PC + 4$; go to 10000	For procedure call



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