

Simulador Multithreading para Arquiteturas Escalar e Superescalar

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Arquitectura

SIMULADOR

Arquitectura

Escalar

Superescalar

SIMULADOR

Arquitetura
Escalar



Técnica Multithreading



Base

IMT

BMT

SIMULADOR

Arquitetura
Superescalar



Técnica Multithreading



Base

IMT

BMT

SMT

Teste Escalar Base

18	T1: LBU R17, 41(R3)	T1: MULHU R2, R16, R13	T1: MULHU R7, R29, R23	T1: REM R30, R29, R7	T1: AND R11, R0, R7
19	T1: DIV R20, R7, R12	T1: LBU R17, 41(R3)	T1: MULHU R2, R16, R13	T1: MULHU R7, R29, R23	T1: REM R30, R29, R7
20	T1: ADD R16, R22, R15	T1: DIV R20, R7, R12	T1: LBU R17, 41(R3)	T1: MULHU R2, R16, R13	T1: MULHU R7, R29, R23
21		T1: ADD R16, R22, R15	T1: DIV R20, R7, R12	T1: LBU R17, 41(R3)	T1: MULHU R2, R16, R13
22			T1: ADD R16, R22, R15	T1: DIV R20, R7, R12	T1: LBU R17, 41(R3)
23				T1: ADD R16, R22, R15	T1: DIV R20, R7, R12

24	Métricas	Resultado
	CPI	1.2
	Bolhas	0
	Ciclos	24
	Instrucoes	20

Teste Escalar IMT

77	T1: MULHU R25, R0, R22	T4: SLTU R24, R23, R2	T3: SLL R5, R19, R31	T2: ADD R26, R13, R20	T1: LH R13, 029(R1)
78	T2: REMU R31, R31, R15	T1: MULHU R25, R0, R22	T4: SLTU R24, R23, R2	T3: SLL R5, R19, R31	T2: ADD R26, R13, R20
79	T3: LW R20, 823(R26)	T2: REMU R31, R31, R15	T1: MULHU R25, R0, R22	T4: SLTU R24, R23, R2	T3: SLL R5, R19, R31
80	T4: MUL R11, R31, R17	T3: LW R20, 823(R26)	T2: REMU R31, R31, R15	T1: MULHU R25, R0, R22	T4: SLTU R24, R23, R2
81		T4: MUL R11, R31, R17	T3: LW R20, 823(R26)	T2: REMU R31, R31, R15	T1: MULHU R25, R0, R22
82			T4: MUL R11, R31, R17	T3: LW R20, 823(R26)	T2: REMU R31, R31, R15
83				T4: MUL R11, R31, R17	T3: LW R20, 823(R26)
84					T4: MUL R11, R31, R17

Métricas	Resultado
CPI	1.05
Bolhas	0
Ciclos	84
Instrucoes	80

Teste Escalar BMT

80	T4: LW R6, 810(R13)	T4: MULHU R4, R24, R30	T3: BGE R11, R31, 651	T3: SRL R9, R23, R29	T3: BNE R4, R1, 888
81	T4: BNE R23, R26, 196	T4: LW R6, 810(R13)	T4: MULHU R4, R24, R30	T3: BGE R11, R31, 651	T3: SRL R9, R23, R29
82	T4: REMU R15, R10, R24	T4: BNE R23, R26, 196	T4: LW R6, 810(R13)	T4: MULHU R4, R24, R30	T3: BGE R11, R31, 651
83	T4: MULHSU R29, R2, R10	T4: REMU R15, R10, R24	T4: BNE R23, R26, 196	T4: LW R6, 810(R13)	T4: MULHU R4, R24, R30
84		T4: MULHSU R29, R2, R10	T4: REMU R15, R10, R24	T4: BNE R23, R26, 196	T4: LW R6, 810(R13)
85			T4: MULHSU R29, R2, R10	T4: REMU R15, R10, R24	T4: BNE R23, R26, 196
86				T4: MULHSU R29, R2, R10	T4: REMU R15, R10, R24
87					T4: MULHSU R29, R2, R10

Métricas	Resultado
CPI	1.09
Bolhas	3
Ciclos	87
Instrucoes	80

Teste Superscalar Base

8	T0: AND R8, R21, R4	T0: JAL R5, 296	T0: SH R19, R15(492)
		Memória	
		T0: LH R21, 207(R14)	
		ULA	
		T0: SRL R21, R14, R20	T0: SLT R26, R14, R30
		T0: AND R8, R21, R4	T0: SLT R22, R6, R18
		Desvio	T0: JAL R5, 296
		T0: BLTU R11, R23, 972	T0: LH R21, 207(R14)
9		Memória	
		ULA	
		Desvio	T0: SRL R21, R14, R20
		Memória	T0: AND R8, R21, R4 T0: BLTU R11, R23, 972

Métricas	Resultado
IPC	3.33
CiclosExecucao	6
Instrucoes	20

Teste Superscalar IMT

1	T0: SLT R5, R17, R0 T0: ADD R4, R5, R15 T0: SRA R24, R27, R7 T0: SLL R14, R8, R19		Desvio
			Memória
2	T1: ADD R13, R3, R14 T1: XOR R30, R30, R18 T1: OR R4, R10, R10 T1: SB R1, R5(845) T1: AND R27, R28, R8	T0: MULH R9, R30, R22 T0: SLT R5, R17, R0 T0: ADD R4, R5, R15 T0: SRA R24, R27, R7 T0: SLL R14, R8, R19	ULA
			Desvio
			Memória
3	T2: SRL R23, R16, R1 T2: BLT R8, R9, 303 T2: BGEU R12, R27, 790 T2: BLTU R15, R1, 878 T2: BLTU R3, R8, 804	T0: ADD R4, R5, R15 T0: SRA R24, R27, R7 T0: SLL R14, R8, R19 T1: ADD R13, R3, R14 T1: XOR R30, R30, R18 T1: OR R4, R10, R10 T1: SB R1, R5(845) T1: AND R27, R28, R8	ULA
			T0: MULH R9, R30, R22 T0: SLT R5, R17, R0
			Desvio
			Memória

16	T2: BLTU R3, R8, 804	Desvio
		Memória
17		ULA
		Desvio
		T2: BLTU R3, R8, 804
		Memória
18		ULA
		Desvio
		T2: BLTU R3, R8, 804
		Memória

Métricas	Resultado
IPC	1.82
CiclosExecucao	11
Instrucoes	20

Teste Superscalar BMT

8	T3: ADD R26, R8, R27 T3: XOR R4, R5, R2	T2: SLTU R6, R4, R11 T2: ADD R25, R6, R17	T1: SB R1, R3(645)	Memória
	T3: SUB R31, R17, R17 T3: BEQ R17, R24, 191 T3: JAL R27, 612 T3: DIVU R19, R22, R7 T3: BGE R13, R29, 41	T2: BEQ R5, R15, 230 T2: REM R14, R3, R31 T2: ADD R25, R6, R17 T3: SLT R11, R21, R14 T3: LB R23, 635(R13) T3: SB R17, R1(125) T3: ADD R26, R8, R21 T3: XOR R4, R5, R2	T2: SLT R15, R11, R19 T2: SLTU R6, R4, R11 T1: ADD R13, R3, R14 T1: AND R27, R28, R8	ULA Desvio Memória
	T0: SLTU R26, R20, R11 T0: LBU R27, 275(R7) T0: BLTU R11, R23, 972 T0: SH R19, R15(492) T0: DIVU R29, R31, R28	T3: SUB R31, R17, R17 T3: BEQ R17, R24, 191 T3: JAL R27, 612 T3: DIVU R19, R22, R7 T3: BGE R13, R29, 41	T2: REM R14, R3, R31 T2: ADD R25, R6, R17 T2: SLT R15, R11, R19 T2: SLTU R6, R4, R11 T2: BEQ R5, R15, 230	ULA Desvio
18			T3: SB R5, R3(414)	Desvio
			T3: JAL Rk, 257	Memória
			T3: LW Rj, 920(R25)	ULA
19				Desvio
				Memória
			T3: SB R5, R3(414)	ULA
20				Desvio
			T3: SB R5, R3(414)	

Métricas	Resultado
IPC	2.47
CiclosExecucao	17
Instrucoes	42

Teste Superscalar SMT

5	T0: BEQ R24, R4, 632 T0: ADD R1, R26, R5 T0: BLTU R24, R4, 236 T0: BGE R7, R4, 201 T0: JAL Ra, 296	T1: SLT R4, R24, R9 T2: ADD R9, R17, R23 T2: MULHU R3, R31, R14 T2: SLL R15, R26, R4 T2: LBU R6, 8(R24) T3: SLT R11, R21, R14 T3: LB R23, 635(R13) T3: SB R17, R1(125) T3: ADD R26, R8, R21 T3: XOR R4, R5, R2	ULA T0: ADD R4, R5, R15 T1: SLT R19, R26, R28 Desvio T2: BGE R24, R23, 195 Memória T1: LW R19, 84(R7)	T0: SRA R24, R27, R7 T0: SLL R14, R8, R19 T1: BLTU R1, R23, 329 T1: LH R3, 910(R1)
	T1: ADD R13, R3, R14 T1: XOR R30, R30, R18 T1: OR R4, R10, R10 T1: SB R1, R5(845) T1: AND R27, R28, R8	T2: MULHU R3, R31, R14 T2: SLL R15, R26, R4 T3: SLT R11, R21, R14 T3: LB R23, 635(R13) T3: SB R17, R1(125) T3: ADD R26, R8, R21 T3: XOR R4, R5, R2 T0: BEQ R24, R4, 632 T0: ADD R1, R26, R5	ULA T1: SLT R4, R24, R9 T2: ADD R9, R17, R23 Desvio Memória	T0: ADD R4, R5, R15 T1: SLT R19, R26, R28 T2: BGE R24, R23, 195 T1: LW R19, 84(R7)

8		ULA T0: SRL R21, R14, R20 T0: AND R8, R21, R4 Desvio T0: BLTU R11, R23, 972 Memória	T0: SLT R26, R14, R30 T0: SLT R22, R6, R18 T0: JAL R5, 296 T0: LH R21, 207(R14)
	9	ULA Desvio Memória	T0: SRL R21, R14, R20 T0: AND R8, R21, R4 T0: BLTU R11, R23, 972

Métricas	Resultado
IPC	3.33
CiclosExecucao	6
Instrucoes	20

OBRIGADO!!

LINK PARA O PROJETO:

<https://github.com/pdMiranda/AC III/tree/main/Trabalho 02/Arq3>

