

Lista teórica 2 - Parte 1 - Felipe Campolini Soares de Paula

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①
 $\#S0 = A$
 $\#S1 = B$
 $\#S2 = C$

 $ADDI \ \$S0, \ \$zero, 10$
 $ADDI \ \$S1, \ \$zero, -1$
 $ADDI \ \$S0, \ \$0, L$
 $ADD \ \$S2, \ S1, S0$

②
 $\#S0 = X$
 $\#S1 = Y$

 $ADDI \ \$S0, \ \$zero, 3 \ #X=3$
 $ADD \ \$t0, \ \$S0, \$S0 \ #t0=2X$
 $ADD \ \$S1, \ \$t0, \$t0 \ #S1=4X$

③
 $\#S0 = X$
 $\#S1 = Y$

 $ADDI \ \$S0, \ \$zero, 3 \ #X=3$
 $ADD \ \$t0, \ \$S0, \$S0$
 $ADD \ \$t0, \ \$t0, \$t0 \ #t0 = X^2$
 $ADD \ \$S1, \ \$t0, \$S0 \ #S1 = 10XSX$

④
 $\#S0 = X$
 $\#S1 = Y$

 $ADDI \ \$S0, \ \$zero, 3 \ #X=3$
 $SRL \ \$S1, \ \$S0, 2 \ #Y = X/4$

⑤
 $\#S0 = X$

 $ADDI \ \$S0, \ \$zero, 0x12345678$

⑥
 $\#S0 = X$
 $\#S1 = Y$

 $ADDI \ \$S0, \ \$zero, -1$
 $SRL \ \$S1, \ \$S0, 5$

⑦
 $ADDI \ \$S0, \ \$zero, 100$
 $ADDI \ \$S2, \ \$zero, 1 \ #h=L=S2$

 $LUI \ \$t0, 0x1001$
 $SW \ \$S0, 8(\$t0)$
 $LW \ \$t1, 8(\$t0)$
 $ADD \ \$t1, \$t1, \$S2$
 $SW \ \$t1, 12(\$t0)$

⑧
 $\#S0 = h$
 $\#S1 = k$
 $\#S2 = l$

 $ADDI \ \$S1, \ \$zero, 0$
 $ADDI \ \$S3, \ \$zero, 1$
 $LUI \ \$t1, 0x1001$
 $LW \ \$t1, 4(\$t1)$
 $ADD \ \$S0, \$S1, \$t1$

⑨
 $\#S0 = h$
 $\#S1 = k$
 $\#S2 = l$

 $ADDI \ \$S1, \ \$zero, 0$
 $ADDI \ \$S3, \ \$zero, 1$
 $LUI \ \$t0, 0x1001$
 $LW \ \$t1, 4(\$t0)$
 $ADD \ \$S0, \$S1, \$t1$
 $SW \ \$S0, 12(\$t0)$

⑩

 $LUI \ \$t0, 0x1001$
 $LW \ \$t0, 0(\$t0)$
 $ADDI \ \$t0, \$t0, 4$
 $LW \ \$t1, 0(\$t0)$
 $MOVE \ \$t2, \$t0$
 $SW \ \$t2, 0(\$t0)$
 $MOVE \ \$t3, \$t1$
 $SW \ \$t3, 0(\$t0)$

⑪
 $\#S0 = 0$
 $\#S1 = 1$

 $ADDI \ \$S0, \ \$zero, 0$
 $ADDI \ \$S1, \ \$zero, 10$

 $LOOP:$
 $ADDI \ \$S0, \ \$S0, L$
 $BNE \ \$S0, \$S1, LOOP$

⑫
 0 test:
 $LUI \ \$t0, 0x1001$
 $LW \ \$S1, 0(\$t0)$
 $SLTI \ \$S2, \$S1, 0 \ #Negative \ or \ 0 \ for \ L$

 $0 \ Data$
 $Value: \ \text{mored } 10$

(5)

(3)

• DATA

TEMP: .WORD 0

FLAG: .WORD 0

• TEXT

LW \$t0, TEMP

ADDI \$t1, \$zero, 30

ADDI \$t2, \$zero, 50

BLE \$t1, \$t0, CHECA-LIMITE-SUPERIOR

▷ FLAG_ZERO

CHECA-LIMITE-SUPERIOR:

BLE \$t0, \$t2, FLAG-UM

FLAG-UM:

ADDI \$t3, \$zero, 1

SW \$t3, FLAG

▷ FIM

FLAG_ZERO:

SW \$zero, FLAG

FIM:

(14)

• DATA

ARRAY: .WORD 5, 2, 9, 1, 7, 3, 8, 6, 4, 10

• TEXT

MAIN:

LUI \$t0, 0x0000

ADDI \$t1, \$zero, 100 #tamarray = 100

ADDI \$t2, \$zero, 1 #SWAP = 1

LOOP-EXTERNO:

LW \$t3, 0

LI \$t4, 1

LOOP-INTERNO:

LW \$t5, (\$t0)

LW \$t6, 4(\$t0)

BGT \$t5, \$t6, SWAP

ADDI \$t0, \$t0, 4

ADDI \$t4, \$t4, 1

BGT \$t4, \$t1, LOOP-INTERNO

▷ FIM-LOOP-INTERNO

SWAP:

SW \$t6, (\$t0)

SW \$t5, 4(\$t0)

LI \$t3, 1

ADDI \$t0, \$t0, 4

ADDI \$t4, \$t4, 1

BGT \$t4, \$t1, LOOP-INTERNO

FIM-LOOP-INTERNO:

BGT \$t3, LOOP-EXTERNO

FIM-LOOP-EXTERNO:

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DATA

VALUE: .WORD 10

TEXT

MAIN:
LUI \$t0, 0x1001

ADDI \$t1, \$zero, 2

LW \$t2, 1(\$t0) \$t2 = x

CONFERE PARIDADE:

DIV \$t2, \$t1

MFHI \$t3

BEQZ \$t3, PAR

> IMPAR

PAR:

MUL \$s1, \$t2, \$t2

MUL \$t4, \$s1, \$s1 \$t4 = t^4

MUL \$s1, \$t2, \$t2

MUL \$t5, \$s1, \$t2 \$t5 = t^3

ADD \$t6, \$t2, \$t2

MUL \$t7, \$t6, \$t6 $t^2 = 17$

ADD \$s2, \$t4, \$t3

ADD \$s2, \$s2, \$s2 $s2 = \text{somma de tudo}$

IMPAR:

MUL \$s1, \$t2, \$t2

MUL \$t5, \$s1, \$t2 \$t5 = t^3

MUL \$s1, \$t2, \$t2

MUL \$t4, \$s1, \$s1

MUL \$t4, \$t4, \$t2 \$t4 = t^5

SUB \$s2, \$t3, \$t4

ADDI \$s2, \$s2, 1

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DATA

x: .WORD 0

y: .WORD 0

TEXT

MAIN:

LW \$t0, x

BEQZ \$t0, MAIOR0

ADDI \$t1, \$t0, -1

> ESCREVE Y

MAIOR 0:

MULT \$t2, \$t0, \$t0

MUL \$t2, \$t2, \$t0

ADDI \$t1, \$t2, 1

ESCREVE y:

SW \$t1, y

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• DATA

FIB FIBONACCI ; • SPACE 400

• TEXT

MAIN :

LA \$t0, FIBONACCI

LI \$t1, 100

LI \$t2, 1

LI \$t3, 1

SW \$t2 (\$t0)

SW \$t3 (\$t0)

ADDI \$t0, \$t0, 8

LI \$t4, 2

LOOP:

ADDI \$t4, \$t4, 1

ADD \$t5, \$t2, \$t3

SW \$t5, (\$t0)

ADDI \$t0, \$t0, 4

MOVE \$t2, \$t3

MOVE \$t3, \$t5

CLT \$t4, \$t4, LOOP

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• DATA

NUMERO ; • 4000 0

FLAG ; • 4000 0

• TEXT

MAIN:

LW \$t0, NUMERO

LI \$t1, 50

LI \$t2, 100

LI \$t3, 150

LI \$t4, 200

SLT \$t5, \$t0, \$t1

SLT \$t6, \$t2, \$t0

SLT \$t7, \$t3, \$t0

SLT \$t8, \$t4, \$t0

OR \$t9, \$t5, \$t6

OR \$t10, \$t9, \$t7

OR \$t11, \$t9, \$t10

GEQZ \$t11, FLAGZERO

LI \$t12, 1

SW \$t12, FLAG

FLAGZERO:

SW \$ZERO, FLAG

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• DATA

A: .WORD 0
B: .WORD 0
C: .WORD 0
MED: .WORD 0

• TEXT

MAIN:

LW \$t0, A
LW \$t1, B
LW \$t2, C

BLT \$t0, \$t1, CHECKA2
BGT \$t0, \$t1, CHECKA3
J SET-MED

CHECKA2

CHECKA2:

BLT \$t1, \$t2, SET-MED
BGT \$t0, \$t2, SET-MED
J SET-MED

CHECKA3:

BGT \$t1, \$t2, SET-MED
BLT \$t0, \$t2, SET-MED
J SET-MED

SET-MED:

SW \$t0, MED

20 VI

• DATA

ARRAY .WORD 0, 1, 2, 3

• TEXT

LUI \$t0, 0x1001

LOOP:

LW \$t1, (\$t0)

ADDI \$t0, \$t0, 4

ADDI \$t2, \$t2, 1

ADDI \$t1, \$t1, \$t2

BEQ \$t2, 99, FIN

J LOOP

FIN:

CALCULOS (VANT16)

9 INST

4 - ALU - 0.571°

1 - MEM - 0.143°

4 - DESVIO - 0.286°

CPI MEDIO = $3 \cdot 0.571 + 4 \cdot 0.143 + 5 \cdot 0.286 = 3.87$

$6.154 + 0.1504 \cdot 38.7 = 10.20$

T.E = $3167 \cdot 7 \cdot 10 = 256.9 \text{ us}$

CALCULO V NOVA

9 INST

6 - ALU - 0.667°

1 - MEM 0.143°

2 - DESVIO = 0.286°

CPI $3 \cdot 0.667 + 4 \cdot 0.11$

$+ 5 \cdot 0.286 = 3.55$

T.E = $3155 \cdot 9 \cdot 10 = 319.5 \text{ us}$

SPEED UP

$\frac{319.5}{256.9} = 1.24x$

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ANT160

Inst 2

ALU 4 - 0,1591

DESV 1 - 0,11410

MEM 2 - 0,1281

$$CPI = 300,59 + 400,14 + 200,128 = 283$$

$$TE = 7 \cdot 283 \cdot 10 = 1981$$

NOVO

Inst 9

ALU 6 - 0,69

DESV 1 - 0,11

MEM 2 - 0,122

$$CPI = 300,69 + 400,11 + 200,122 = 289$$

$$TE = 9 \cdot 289 \cdot 10 = 2601$$

$$SP = \frac{2601}{1981} = 1,31X$$

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• DATA

RESULTADO 5. WORD 0

• TEX

• GLOBAL MAN

MAIN:

LI \$A0, 0x1001

LI \$A1, 10

JAL SOMA-VECTOR

MOVE \$T0, \$V0

LI \$V0, 10

SOMA-VECTOR:

LI \$T0, 0

LI \$T1, 0

LOOP:

MOVE \$T2, \$T0

ANDI \$T3, \$T2, 1

BEQZ \$T3, PAR

IMPAR:

ADDU \$T4, \$T1, \$T2

ADD \$T1, \$T1, \$T4

5 PROX

PAR:

SLL \$T2, \$T2, 1

SUB \$T4, \$T2, 1

ADD \$T1, \$T1, \$T4

PROX:

ADDI \$A0, \$A0, 4

ADDI \$T0, \$T0, 1

BNE \$T0, \$A1, LOOP

SW \$T1, RESULTADO

MOVE \$V0, \$T1

JR \$RA

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4

• DATA

RESULTADO : .WORD 0

• TEXT

MAIN:

LI \$V0, 5

MOVE \$t0, \$V0

LI \$V0, 5

MOVE \$t1, \$V0

JAL POTENCIA

MOVE \$t2, \$V0

SW \$t2, RESULTADO

POTENCIA:

LI \$t2, 1

LOOP:

GEQ2 \$t1, FIMLOOP

ADD \$t2, \$t2, \$t0

SUBI \$t1, \$t1, 1

J LOOP

FIMLOOP:

MOVE \$V0, \$t2

JR \$RA

Parte 2

①

• DATA

ARRAY: .WORD 0,0,0...

• TEXT

• GLOBAL MAIN

MAIN:

LA \$t0, ARRAY

LI \$t1, 0

JAL CRIAVECTOR

LI \$V0, 5

MOVE \$t0, \$V0

LI \$V0, 5

MOVE \$t1, \$V0

JAL SOMA

MOVE \$t2, \$V0

LI \$V0, 10

CRIVECTOR.

LI \$t3, 30

SLTU \$t4, \$A1, \$t3

MOVZ \$A1, \$t3, \$t4

LI \$t0, 0

MOVE \$t1, \$t0

LOOPVECTOR:

MOVE \$t2, \$t0

ANDI \$t3, \$t3, 1

BEQZ \$t3, IPAR

IPAR:

MULT \$t4, \$t2, \$t2

SW \$t4, (\$t1)

PROXVET

PAR:

MUL \$t4, \$t2, \$t2

SLL \$t5, \$t2, 1

ADD \$t5, \$t5, \$t2

ADDI \$t5, \$t5, 1

ADD \$t4, \$t4, \$t5

SW \$t4, (\$t1)

PROXVET:

ADDIU \$t1, \$t1, 4

ANDI \$t0, \$t0, 1

SLTU \$t3, \$t0, \$A1

BEQZ \$t3, LOOPVECTOR

OR \$RA

SOMA:

LI \$t2, 0

LOOPSOMA:

LI \$t3, 1(\$A0)

ADD \$t2, \$t2, \$t3

ADDIU \$A1, \$A1, -1

SLTU \$t4, \$A1, 1

BEQZ \$t4, LOOPSOMA

MOVE \$V0, \$t2

OR \$RA

(2)

(3)

• LW $\$S1, \text{NUM}(\$S2)$ - Realiza leitura da memória

- Unidade de memória: Guarda os endereços de memória, além de realizar a leitura ou escrita

- Contrab: O contrabole envia sinais p/ indicar leitura ou escrita

• SW $\$S1, \text{NUM}(\$S2)$ - Realiza a escrita de $S1$ na memória

Unidade de memória: já decorria anteriormente

Contrab: já decorria anteriormente

• BEQ $\$S1, \$S2, \text{PUCOS}$ - Comparação entre registradores <
caso true realiza pula

Unidade de contrab: Decide qual instrução executar com base no resultado

Contrab: Determina qual instrução será executada

• ADD $\$S1, \$S2, \$S3$ - soma entre valores de $S2$ e $S3$ e
resultado armazenado em $S1$

Unidade lógica Aritmética: Soma, Subtração, divisão, multiplicação e
AND

Contrab: Decide qual operação da ALU

3

2

$$LW \$S1, NUM($S0) = 4 + 1 + 2 + 4 = 11$$

$$SW $S1, NUM($S0) = 4 + 1 + 2 + 4 + 1 = 12$$

$$BEQ $S1, $S2, ALUOS = 4 + 1 + 2 + 1 = 8$$

$$ADD $S1, $S2, $S3 = 4 + 1 + 2 = 7$$

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$$LW = 5$$

$$SW = 4$$

$$ALU = 3$$

$$BCP = 2$$

$$C = 2$$

$$MULTICICLO = 0,2205 + 0,1104$$

$$+ 0,4903 + 0,1602 +$$

$$0,100202 = 3,37 \text{ CICLOS}$$

$$UNI = 100$$

$$100 / 3,37 = 29,7$$

Multiplica e 29,7 vezes mais rápido

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IF - Instruction Fetch

ID - Instruction Decode

EX - Execution

MEM - Memory

WB - Write Back

