Astor Prieto Dehghan Pour

Optimización de Procesadores
Ejercicio para Entregar

Resuelve: $a \cdot x^2 + b \cdot x + c = 0$, Soluciones: $x = \dfrac{-b \pm \sqrt{b^2 - 4 \cdot a \cdot c}}{2 \cdot a}$

Dirección	Instrucción	Que hace?
100	LOAD R1, R8, Offset-A	CR[R1] <= Mem[Base + Offset-A]
101	LOAD R2, R8, Offset-B	CR[R2] <= Mem[Base + Offset-B]
102	LOAD R3, R8, Offset-C	CR[R3] <= Mem[Base + Offset-C]
103	SQR R4, R2	CR[R4] <= b^2
104	MUL R5, R1, R3	CR[R5] <= a*c
105	**No-Op**	
106	**No-Op**	
107	MUL R5, R5, #4	CR[R5] <= #4*(a*c)
108	**No-Op**	
109	**No-Op**	
110	BGE R4, R5, #13	If (b^2 > 4*a*c): PC <= PC + #13; Else: PC++;
111	SUB R6, R4, R5	CR[R6] <= [b^2] - [4*a*c]
112	MUL R1, R1, #2	CR[R1] <= 2*a
113	**No-Op**	
114	SQRT R6, R6	CR[R6] <= sqrt([b^2]-[4*a*c])
115	**No-Op**	
116	**No-Op**	
117	SUB R7, R6, R2	CR[R7] <= [sqrt(b^2-4*a*c)] - [b]
118	**No-Op**	
119	**No-Op**	
120	DIV R3, R7, R1	CR[R3] <= [sqrt(b^2-4*a*c)- b] / [2*a]
121	**No-Op**	
122	**No-Op**	
123	STORE R3, R8, Offset-X	Mem[Base + Offset-X] <= CR[R3]

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Tiempo	0	1	2	3	4	5	6	7	8	9
Read PC / **Write IR**	100 LOAD	101 LOAD	102 LOAD	103 SQR	104 MUL	105 No-Op	106 No-Op	107 MUL	108 No-Op	109 No-Op
Write R_A					R2	R1				
Write R_B		R8	R8	R8		R3			R5	
Write AR / **Write DR**			R8+Off A	R8+Off B	R8+Off C	R2^2	R1*R3			R5 * #4
Write CR				R1	R2	R3	R4	R5		
Write Mem										
Write PC	101	102	103	104	105	106	107	108	109	110

Tiempo	10	11	12	13	14	15	16	17	18	19
Read PC / **Write IR**	110 BGE	111 SUB	112 MUL	113 No-Op	114 SQRT	115 No-Op	116 No-Op	117 SUB	118 No-Op	119 No-Op
Write R_A		R4	R4						R2	
Write R_B		R5	R5	R1		R6			R6	
Write AR / **Write DR**			R4>R5	R4-R5	R1 * #2		sqrt(R6)			R6-R2
Write CR	R5				R6	R1				
Write Mem										
Write PC	111	112	113	114	115	116	117	118	119	120

Tiempo	20	21	22	23	24	25	26
Read PC / **Write IR**	120 DIV	121 No-Op	122 No-Op	123 STORE	124	125	126
Write R_A		R1					
Write R_B		R7			R8		
Write AR / **Write DR**			R1/R7			R8+Off X	
Write CR	R7			R3			
Write Mem							DIR
Write PC	121	122	123	124	125	126	127

Sin Pipeline: $T_{\sin}=13\cdot 4\,Tc=52\,Tc$ Ganancia con No-Op: $S_{con}=\dfrac{52\,Tc}{27\,Tc}=1.93$

Pipeline, Con No-Op: $T_{con}=27\,Tc$

Pipeline, Sin No-Op: $T_{con}=17\,Tc$ Ganancia sin No-Op: $S_{\sin}=\dfrac{52\,Tc}{17\,Tc}=3.06$