Single-Cycle Architecture Instructions

CMPT 250

2002-3

What follows is a brief description of the opcodes used in the machine language for the single-cycle architecture we're building.

Opcode	**Mneumonic**	**Register Transfer**
0000000	TR	$R[DR] \leftarrow R[SA]$
0000001	INC	$R[DR] \leftarrow R[SA] + 1$
0000010	ADD	$R[DR] \leftarrow R[SA] + R[SB]$
0000011		$R[DR] \leftarrow R[SA] + R[SB] + 1$
0000100		$R[DR] \leftarrow R[SA] + \overline{R[SB]}$
0000101	SUB	$R[DR] \leftarrow R[SA] - R[SB]$
0000110	DEC	$R[DR] \leftarrow R[SA] - 1$
0000111	TR	$R[DR] \leftarrow R[SA]$
000100x	AND	$R[DR] \leftarrow R[SA] \wedge R[SB]$
000101x	OR	$R[DR] \leftarrow R[SA] \vee R[SB]$
000110x	XOR	$R[DR] \leftarrow R[SA] \oplus R[SB]$
000111x	NOT	$R[DR] \leftarrow \overline{R[SA]}$
00100xx	TRB	$R[DR] \leftarrow R[SB]$
00101xx	SR	$R[DR] \leftarrow sr\, R[SB]$
00110xx	SL	$R[DR] \leftarrow sl\, R[SB]$
00111xx		undefined
010xxxx	ST	$M[R[SA]] \leftarrow R[SB]$
011xxxx	LD	$R[DR] \leftarrow M[R[SA]]$

Opcode	**Mneumonic**	**Register Transfer**
1000000	TR	$R[DR] \leftarrow R[SA]$
1000001	INC	$R[DR] \leftarrow R[SA] + 1$
1000010	ADDI	$R[DR] \leftarrow R[SA] + CST$
1000011		$R[DR] \leftarrow R[SA] + CST + 1$
1000100		$R[DR] \leftarrow R[SA] + \overline{CST}$
1000101	SUBI	$R[DR] \leftarrow R[SA] - CST$
1000110	DEC	$R[DR] \leftarrow R[SA] - 1$
1000111	TR	$R[DR] \leftarrow R[SA]$
100100x	ANDI	$R[DR] \leftarrow R[SA] \wedge CST$
100101x	ORI	$R[DR] \leftarrow R[SA] \vee CST$
100110x	XORI	$R[DR] \leftarrow R[SA] \oplus CST$
100111x	NOTI	$R[DR] \leftarrow \overline{R[SA]}$
10100xx	TRAI	$R[DR] \leftarrow CST$
10101xx	SRI	$R[DR] \leftarrow sr\ CST$
10110xx	SLI	$R[DR] \leftarrow sl\ CST$
10111xx		undefined
110x000	BRC	$PC \leftarrow PC + OFFSET$ if C, else $PC \leftarrow PC + 1$
110x001	BRN	$PC \leftarrow PC + OFFSET$ if N, else $PC \leftarrow PC + 1$
110x010	BRV	$PC \leftarrow PC + OFFSET$ if V, else $PC \leftarrow PC + 1$
110x011	BRZ	$PC \leftarrow PC + OFFSET$ if Z, else $PC \leftarrow PC + 1$
110x100	BRNC	$PC \leftarrow PC + OFFSET$ if $\overline{C}$, else $PC \leftarrow PC + 1$
110x101	BRNN	$PC \leftarrow PC + OFFSET$ if $\overline{N}$, else $PC \leftarrow PC + 1$
110x110	BRNV	$PC \leftarrow PC + OFFSET$ if $\overline{V}$, else $PC \leftarrow PC + 1$
110x111	BRNZ	$PC \leftarrow PC + OFFSET$ if $\overline{Z}$, else $PC \leftarrow PC + 1$
111xxxx	JMP	$PC \leftarrow PC + OFFSET$

Note: $CST = \mathrm{zf}(SB)$; $OFFSET = \mathrm{se}(DR||SB)$