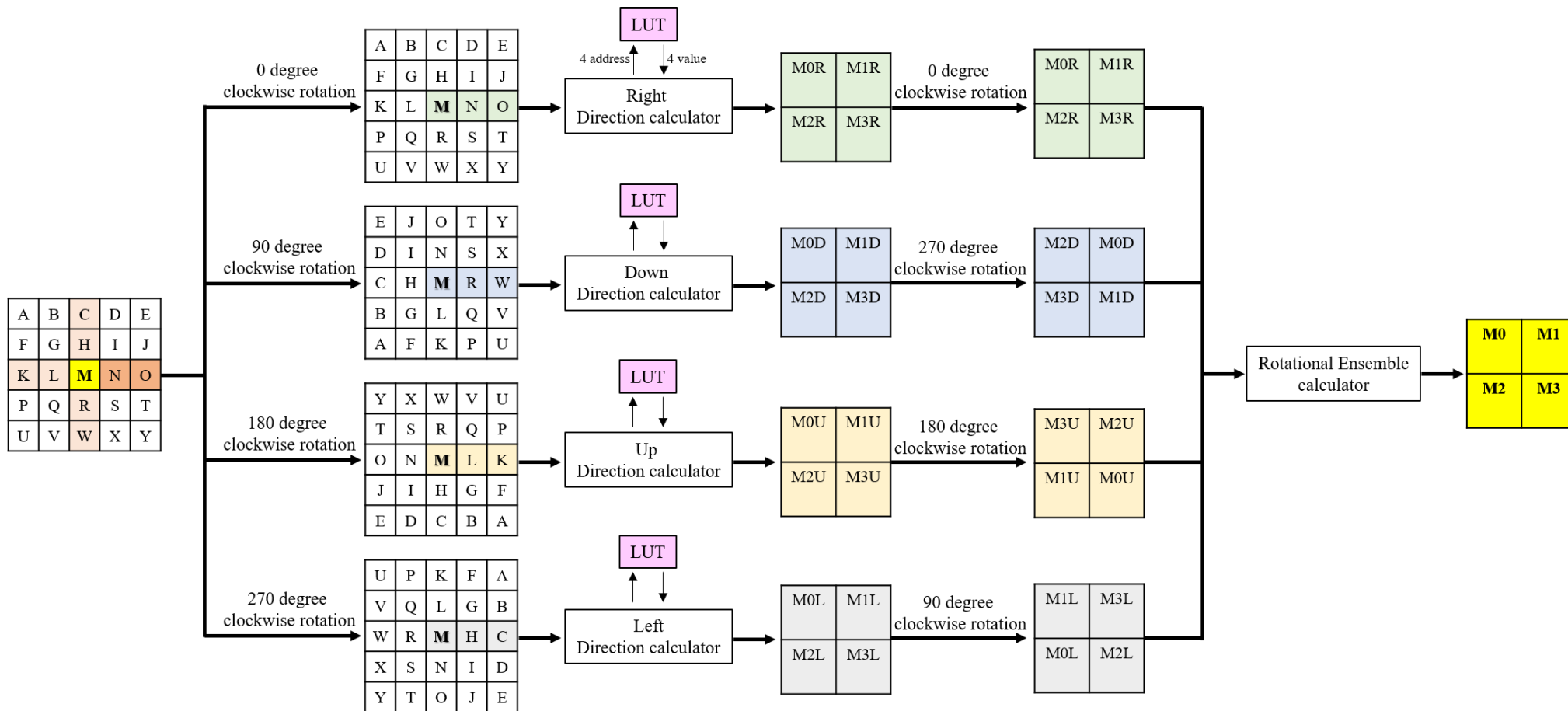


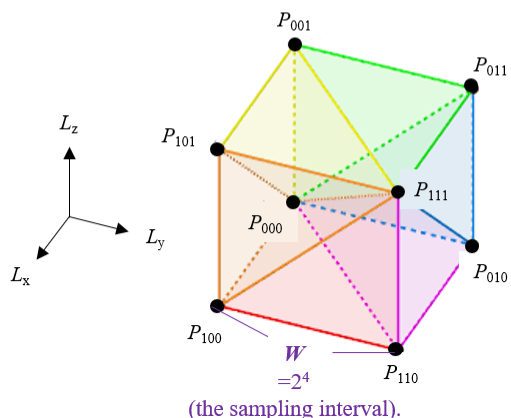
演算法簡單說明 兩倍放大-SRLUT



演算法簡單說明

A	B	C	D	E
F	G	H	I	J
K	L	M	N	O
P	Q	R	S	T
U	V	W	X	Y

M0R	M1R
M2R	M3R



$$M = 24 \quad \begin{array}{|c|c|c|c|c|c|c|c|} \hline 0 & 0 & 0 & 1 & 1 & 0 & 0 & 0 \\ \hline \end{array} \quad \begin{array}{l} M_x = 1 \\ L_x = 8 \end{array}$$

$$N = 60 \quad \begin{array}{|c|c|c|c|c|c|c|c|} \hline 0 & 0 & 1 & 1 & 1 & 1 & 0 & 0 \\ \hline \end{array} \quad \begin{array}{l} M_y = 3 \\ L_y = 12 \end{array}$$

$$O = 3 \quad \begin{array}{|c|c|c|c|c|c|c|c|} \hline 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 \\ \hline \end{array} \quad \begin{array}{l} M_z = 0 \\ L_z = 3 \end{array}$$

$$\begin{aligned} P_{000} &= \text{LUT}[M_x][M_y][M_z] \\ P_{001} &= \text{LUT}[M_x][M_y][M_z+1] \\ P_{010} &= \text{LUT}[M_x][M_y][M_z] \\ P_{011} &= \text{LUT}[M_x][M_y][M_z+1] \\ P_{100} &= \text{LUT}[M_x+1][M_y][M_z] \\ P_{101} &= \text{LUT}[M_x+1][M_y][M_z+1] \\ P_{110} &= \text{LUT}[M_x+1][M_y+1][M_z] \\ P_{111} &= \text{LUT}[M_x+1][M_y+1][M_z+1] \end{aligned}$$

四面體插補，用 L_x, L_y, L_z 大小決定哪個case，決定 $w_0 \sim w_3$ 及要到LUT取的 $O_0 \sim O_3$ 我做的是長寬都x2放大，所以1個像素放大後會得到4個值

$$M0R = \text{out0} = O_0[31:24]*W_0 + O_1[31:24]*W_1 + O_2[31:24]*W_2 + O_3[31:24]*W_3;$$

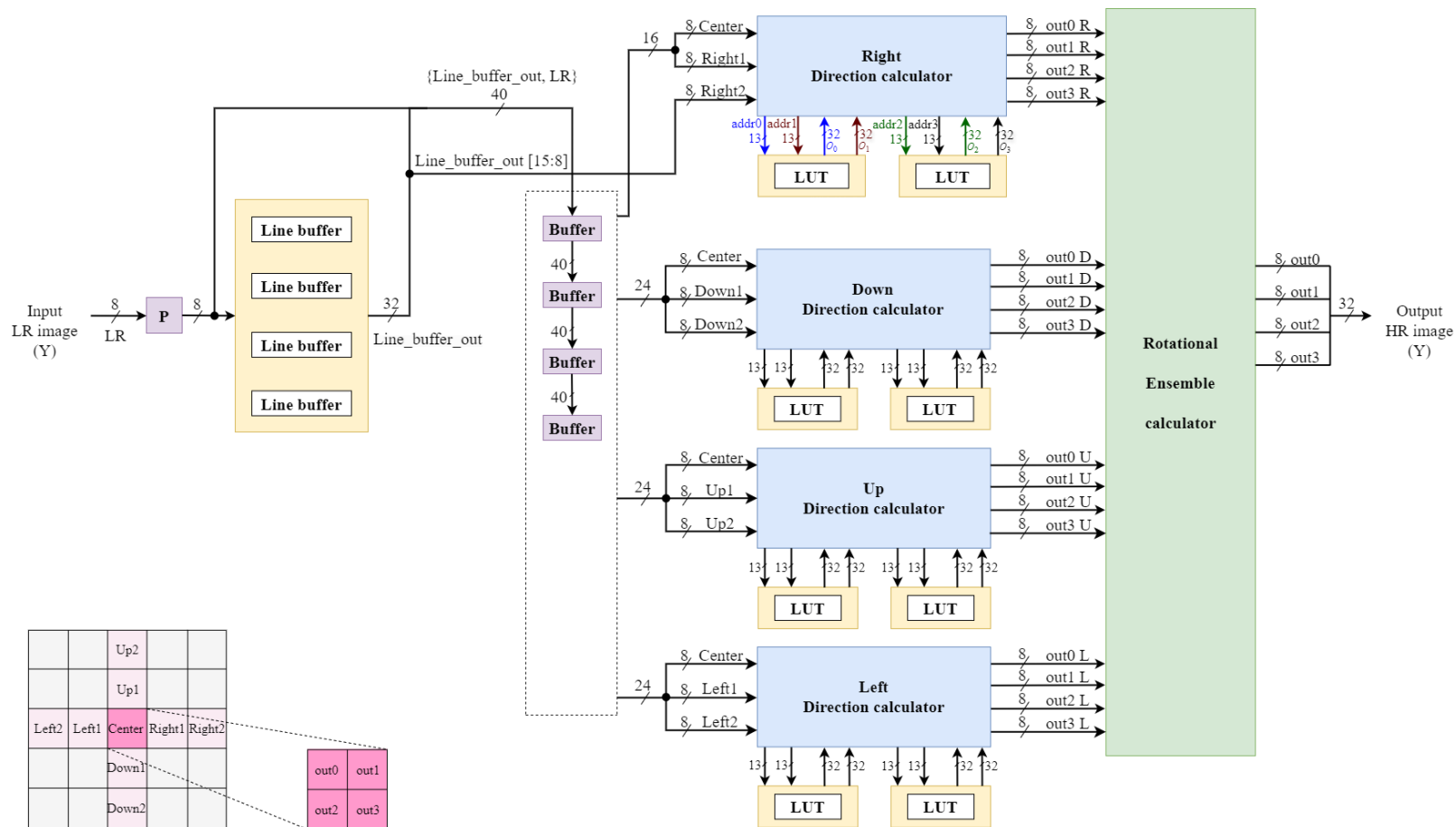
$$M1R = \text{out1} = O_0[23:16]*W_0 + O_1[23:16]*W_1 + O_2[23:16]*W_2 + O_3[23:16]*W_3;$$

$$M2R = \text{out2} = O_0[15:8]*W_0 + O_1[15:8]*W_1 + O_2[15:8]*W_2 + O_3[15:8]*W_3;$$

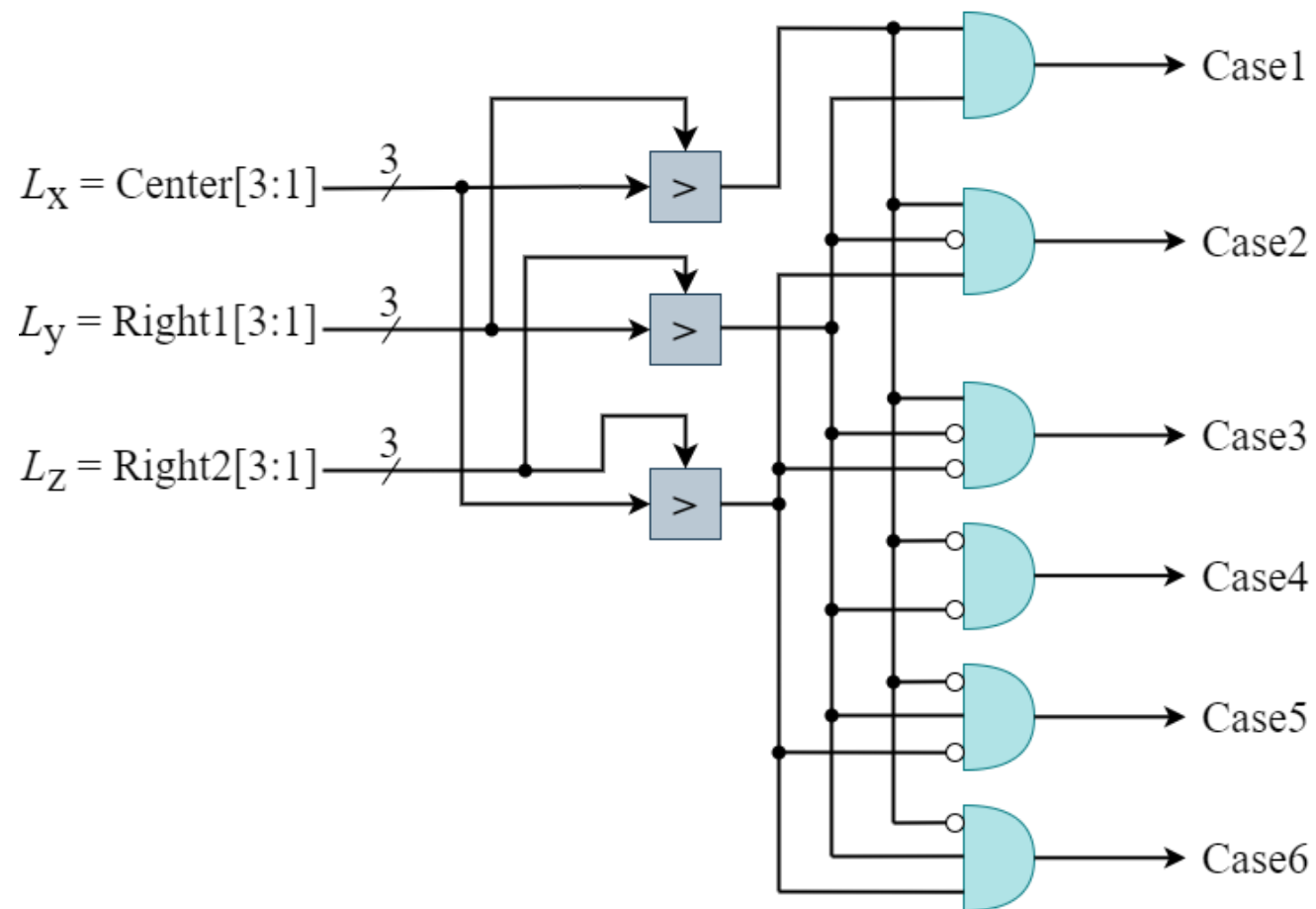
$$M3R = \text{out3} = O_0[7:0]*W_0 + O_1[7:0]*W_1 + O_2[7:0]*W_2 + O_3[7:0]*W_3;$$

Case	Condition	w_0	w_1	w_2	w_3	O_0	O_1	O_2	O_3
1	$L_x > L_y > L_z$	$W - L_x$	$L_x - L_y$	$L_y - L_z$	L_z	P_{000}	P_{100}	P_{110}	P_{111}
2	$L_x > L_z \geq L_y$	$W - L_x$	$L_x - L_z$	$L_z - L_y$	L_y	P_{000}	P_{100}	P_{101}	P_{111}
3	$L_z \geq L_x > L_y$	$W - L_z$	$L_z - L_x$	$L_x - L_y$	L_y	P_{000}	P_{001}	P_{101}	P_{111}
4	$L_z > L_y \geq L_x$	$W - L_z$	$L_z - L_y$	$L_y - L_x$	L_x	P_{000}	P_{001}	P_{011}	P_{111}
5	$L_y \geq L_z > L_x$	$W - L_y$	$L_y - L_z$	$L_z - L_x$	L_x	P_{000}	P_{010}	P_{011}	P_{111}
6	$L_y \geq L_x \geq L_z$	$W - L_y$	$L_y - L_x$	$L_x - L_z$	L_z	P_{000}	P_{010}	P_{110}	P_{111}

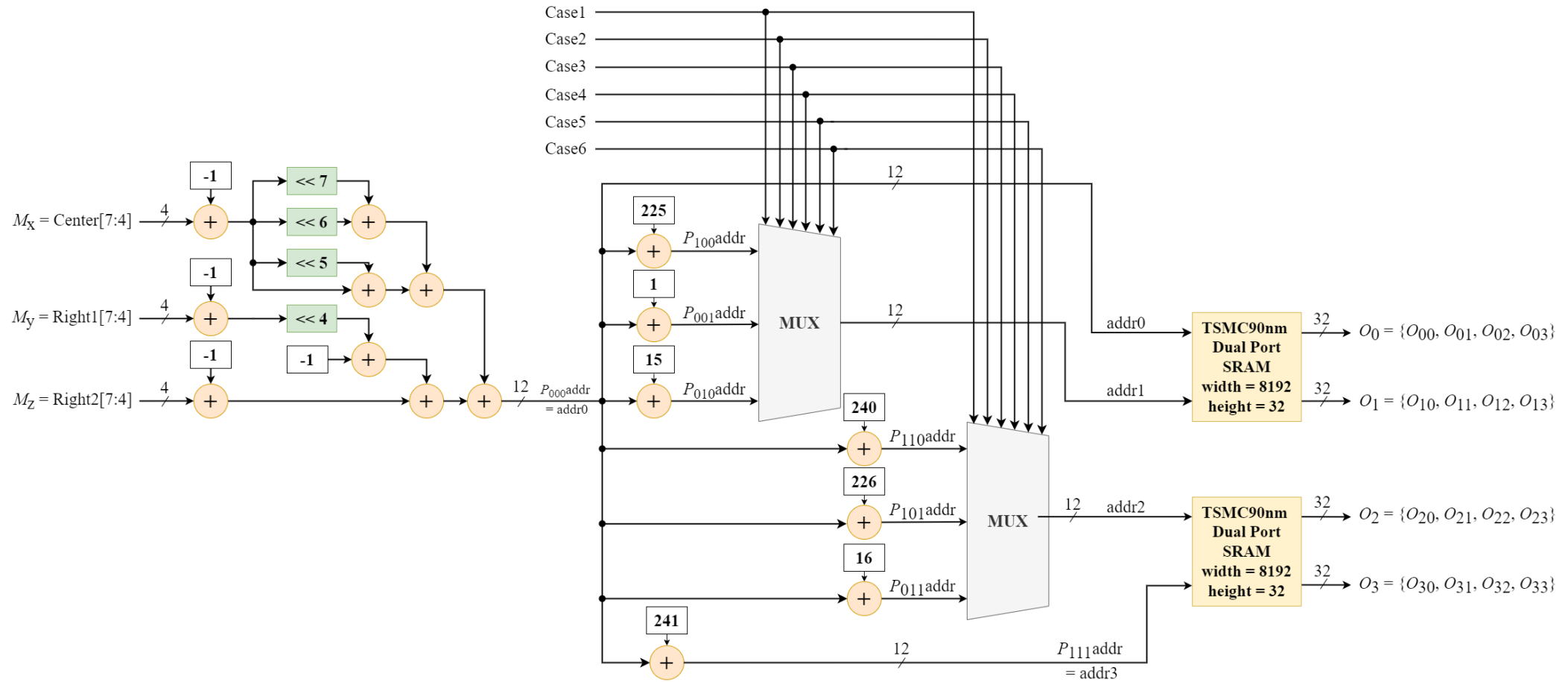
硬體整體架構圖



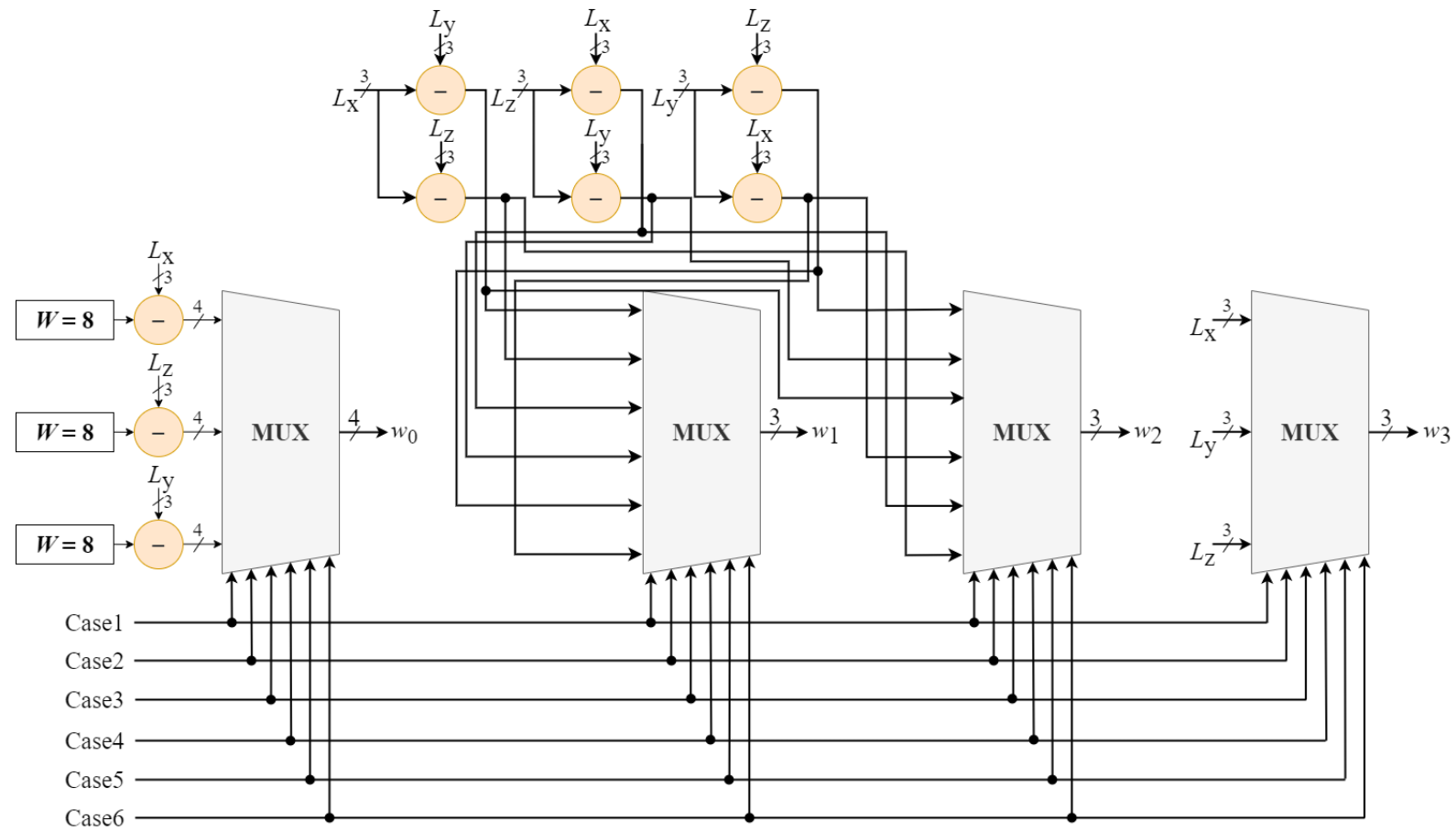
Direction_Calculator_Y_8: 用來作四面體插補



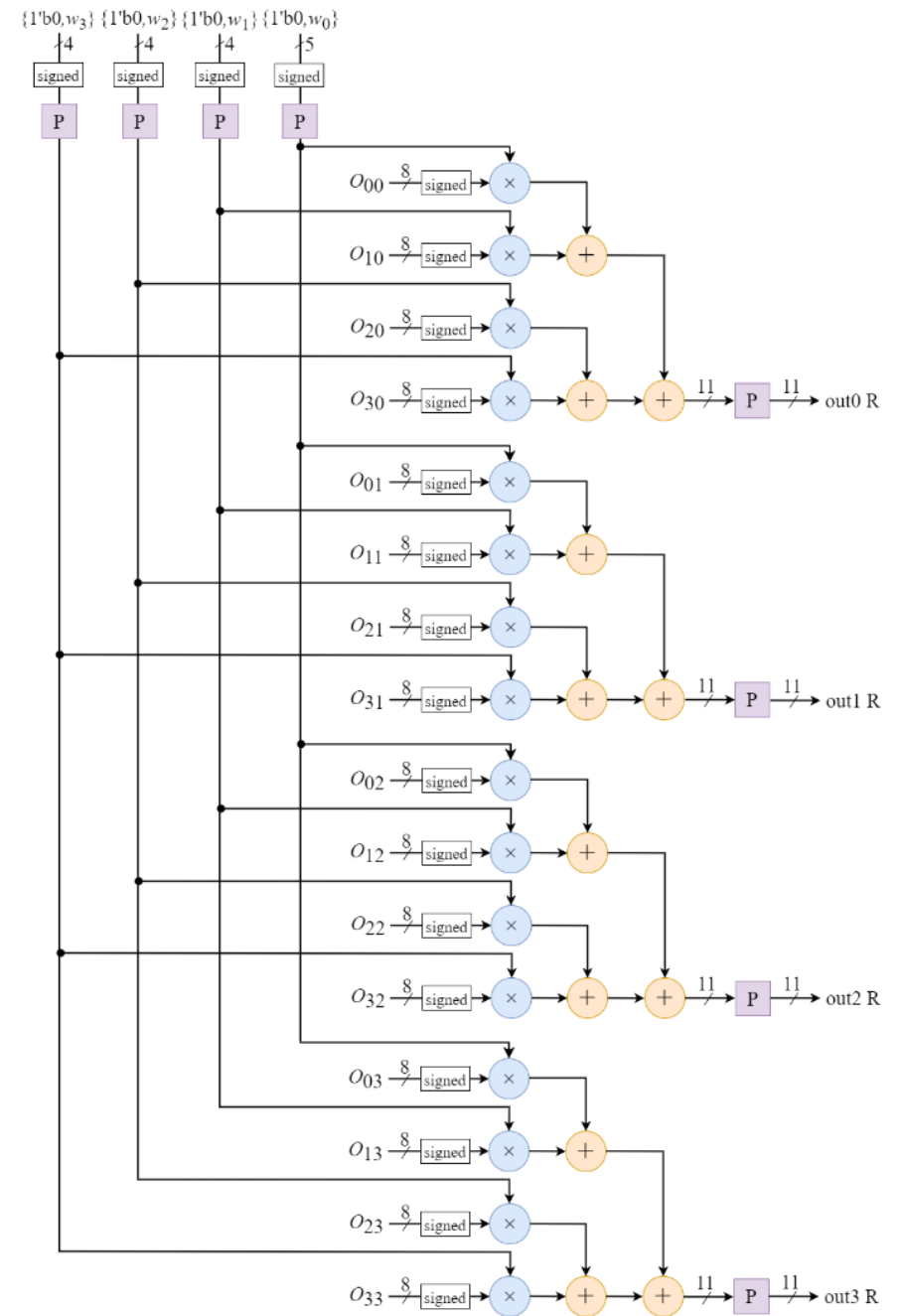
Direction_Calculator_Y_8



Direction_Calculator_Y_8



Direction_Calculator_Y_8



Rotational_Ensemble_calculator_Y_8_C.v

