1 吳東霖

A_2	A_1	A_0	D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0
0	0	0	0	0	0	0	0	0	0	1
0	0	1	0	0	0	0	0	0	1	0
0	1	0	0	0	0	0	0	1	0	0
0	1	1	0	0	0	0	1	0	0	0
1	0	0	0	0	0	1	0	0	0	0
1	0	1	0	0	1	0	0	0	0	0
1	1	0	0	1	0	0	0	0	0	0
1	1	1	1	0	0	0	0	0	0	0

D_0

A_0 \ A_1A_2	00	01	11	10
0	1			
1				

D_1

A_0 \ A_1A_2	00	01	11	10
0				
1	1			

... etc.

$\Rightarrow D_0 = A_2'A_1'A_0'$ $\Rightarrow D_1 = A_2'A_1'A_0$

$\Rightarrow D_2 = A_2'A_1A_0'$, $D_3 = A_2'A_1A_0$, $D_4 = A_2A_1'A_0'$

$D_5 = A_2A_1'A_0$, $D_6 = A_2A_1A_0'$, $D_7 = A_2A_1A_0$

$\because \overset{\text{and}}{(xyz)} = ((xyz)')' = \overset{\text{nor}}{(x'+y'+z')'}$

$\therefore D_0 = (A_2+A_1+A_0)'$, $D_1 = (A_2+A_1+A_0')'$, $D_2 = (A_2+A_1'+A_0)'$

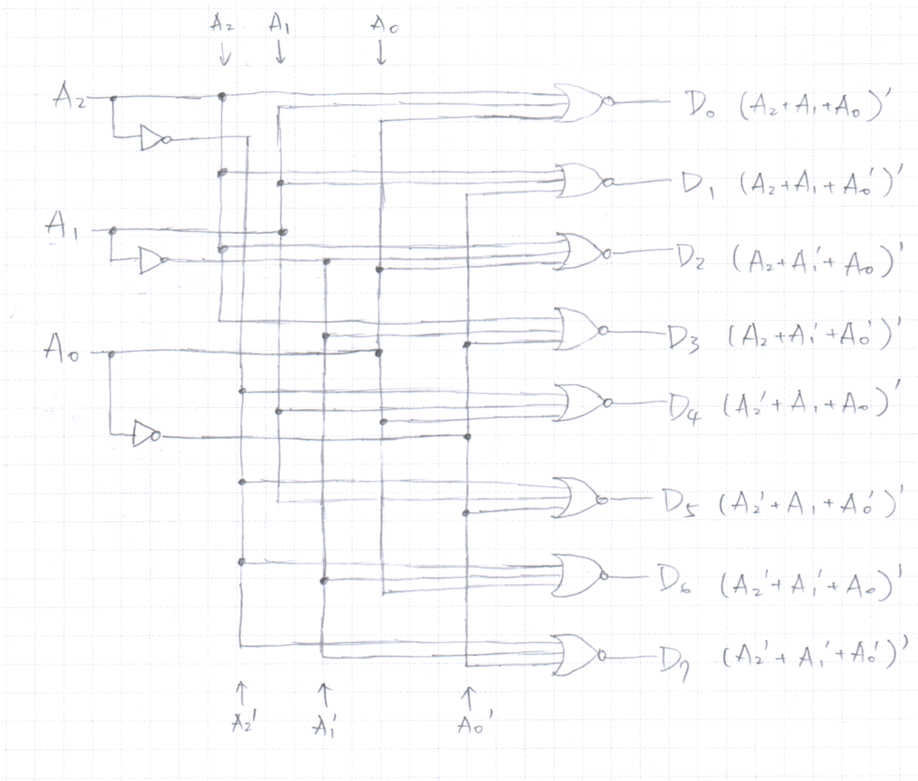
$D_3 = (A_2+A_1'+A_0')'$, $D_4 = (A_2'+A_1+A_0)'$, $D_5 = (A_2'+A_1+A_0')'$

$D_6 = (A_2'+A_1'+A_0)'$, $D_7 = (A_2'+A_1'+A_0')'$

$\Rightarrow$ ≡ $\Rightarrow$ 可用 來取代所有 minterms,

再把 中 inputs 的三個 bubbles 與 A_0, A_1, A_2 合併,

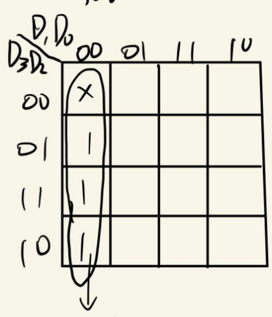
就可以變成 nor gate



2 徐浩庭

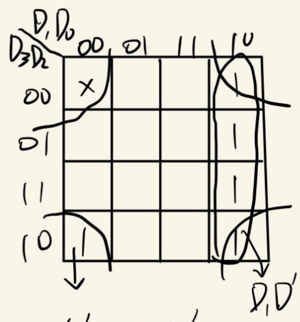
Input				Output		
D_3	D_2	D_1	D_0	A_1	A_2	V (vaild)
0	0	0	0	X	X	0
X	X	X	1	0	0	1
X	X	1	0	0	1	1
X	1	0	0	1	0	1
1	0	0	0	1	1	1

① for A_1



$A_1 = D_1'D_0'$

② for A_2



$A_2 = D_2'D_0' + D_1D_0'$

③ $V = D_3 + D_2 + D_1 + D_0$

3 徐浩庭

Decimal	2's complement		
−4	1	0	0
−3	1	0	1
−2	1	1	0
−1	1	1	1
0	0	0	0
1	0	0	1
2	0	1	0
3	0	1	1

For $a<b$

$a_2a_1a_0$	$b_2b_1b_0$	
1 X X	0 X X	$\Rightarrow a_2b_2'$
1 0 X	1 1 X	$\Rightarrow a_2a_1'b_2b_1$
0 0 X	0 1 X	$\Rightarrow a_2'a_1'b_2'b_1$
1 0 0	1 0 1	$\Rightarrow a_2a_1'a_0'b_2b_1'b_0$
1 1 0	1 1 1	$\Rightarrow a_2a_1a_0'b_2b_1b_0$
0 0 0	0 0 1	$\Rightarrow a_2'a_1'a_0'b_2'b_1'b_0$
0 1 0	0 1 1	$\Rightarrow a_2'a_1a_0'b_2'b_1b_0$

$(a_2b_2+a_2'b_2')a_1'b_1=(a_2\oplus b_2)'a_1'b_1$

$(a_2b_2+a_2'b_2')(a_1b_1+a_1'b_1')a_0'b_0$

$=(a_2\oplus b_2)'(a_1\oplus b_1)'a_0'b_0$

$\Rightarrow F(a,b)=a_2b_2'+(a_2\oplus b_2)'\cdot a_1'b_1+(a_2\oplus b_2)'\cdot(a_1\oplus b_1)'\cdot a_0'b_0$

$a<b<c \Rightarrow (a<b)$ AND $(b<c)$

$a<b = F(a,b)=a_2b_2'+(a_2\oplus b_2)'\cdot a_1'b_1+(a_2\oplus b_2)'\cdot(a_1\oplus b_1)'\cdot a_0'b_0$

$b<c = F(b,c)=b_2c_2'+(b_2\oplus c_2)'\cdot b_1'c_1+(b_2\oplus c_2)'\cdot(b_1\oplus c_1)'\cdot b_0'c_0$

$\therefore$ Output $F=F(a,b)\cdot F(b,c)$

$\underline{=\left(a_2b_2'+(a_2\oplus b_2)'\cdot a_1'b_1+(a_2\oplus b_2)'\cdot(a_1\oplus b_1)'\cdot a_0'b_0\right)\cdot\left(b_2c_2'+(b_2\oplus c_2)'\cdot b_1'c_1+(b_2\oplus c_2)'\cdot(b_1\oplus c_1)'\cdot b_0'c_0\right)}$ #