

数字世界精彩无限

# Fundamentals of Logic Design

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# Unit 4

## ——Karnaugh Maps

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# 更多变量的卡诺图化简

## \* 展开定理

一个  $n$  变量的逻辑函数可以对变量  $x_i$  展开为两个  $n-1$  变量的逻辑函数

$$1. \quad f(x_1 x_2 \dots x_i \dots x_n)$$

$$= x_i \cdot f(x_1 x_2 \dots 1 \dots x_n) + \bar{x}_i \cdot f(x_1 x_2 \dots 0 \dots x_n)$$

.....对  $x_i$  展开为与或式

$$2. \quad f(x_1 x_2 \dots x_i \dots x_n)$$

$$= [\bar{x}_i + f(x_1 x_2 \dots 0 \dots x_n)] \cdot [x_i + f(x_1 x_2 \dots 1 \dots x_n)]$$

.....对  $x_i$  展开为或与式

# 更多变量的卡诺图化简

$$F = f(x_1 x_2 x_3 x_4 x_5)$$

$X_2X_3 \backslash X_4X_5$		$X_4X_5$			
		00	01	11	10
00	0	1	3	2	
01	4	5	7	6	
11	12	13	15	14	
10	8	9	11	10	

$$x_1 = 0$$

$X_4X_5 \backslash X_2X_3$		$X_4X_5$			
		00	01	11	10
$X_2X_3$	00	16	17	19	18
	01	20	21	23	22
	11	28	29	31	30
	10	24	25	27	26

$$x_1 = 1$$



化简:  $F(ABCDE) = \sum m(0, 1, 4, 5, 6, 11, 12, 14, 16, 20, 22, 28, 30, 31)$

$x_1 = 0$

$x_4x_5$		00	01	11	10
$x_2x_3$	00	0	1	3	2
	01	4	5	7	6
	11	12	13	15	14
	10	8	9	11	10

$x_1 = 1$

$x_4x_5$		00	01	11	10
$x_2x_3$	00	16	17	19	18
	01	20	21	23	22
	11	28	29	31	30
	10	24	25	27	26

$A = 0$

$DE$		00	01	11	10
$BC$	00	1	1	0	0
	01	1	1	0	1
	11	1	0	0	1
	10	0	0	1	0

$A = 1$

$DE$		00	01	11	10
$BC$	00	1	0	0	0
	01	1	0	0	1
	11	1	0	1	1
	10	0	0	0	0

$$F = \bar{A}\bar{B}\bar{D} + \bar{B}\bar{D}\bar{E} + ABCD + \bar{A}B\bar{C}DE + C\bar{E}$$

# 更多变量的卡诺图化简

ABC \ DEF		DEF							
		000	001	011	010	100	101	111	110
000	1	0	0	1	1	0	0	1	
001	0	1	1	0	0	0	0	0	
011	0	0	0	1	0	0	0	1	
010	1	0	0	1	1	0	0	1	
100	1	0	0	1	1	0	1	1	
101	0	1	1	0	0	0	0	0	
111	0	1	1	0	0	0	0	0	
110	1	0	0	1	1	0	0	1	

$$F = C'F' + B'CD'F + ACD'F + A'BD'EF' + A'BDE'F' + ABC'DE'$$