Report

Problem Statement:

Program to minimize a function.

Tubular method is used for function minimization from the given minterms of a function. This method is generally used for function of more than 5 or 6 variables (which is when minimization with the help of k-maps becomes very difficult),

Methodology:

- This program takes the input minterms including the don't cares for a function and store it in the linked list in data [].
- convert it to binary and store it in the linked list in bin [], and store the Don't Cares in the array Dont_Care [].
- arrange it in ascending order (void arrange ()).
- the minterms are grouped according to the number of ones (void group1 ()).
- If two minterms differ by one place in their binary form Then pair the minterms (void further_groupings ()).
- Terms that aren't paired which is prime implicants, are stored in the linked list improot, and then convert it to variables (void convert_Prime ()), then delete repeated prime implicants (void reduce_Imp ()).
- uses the resultant prime implicants to find the minimized function with the help of the prime implicants table which is filled by - but the number in the pair filled with X and checks if there is only one X in a column then it's essential and store the number of the row in the array essential [] ,finally All the columns with the pairings as well as the prime implicants table are displayed (void implicants_table ()).
- the prime implicants table is formed and essential implicants are found
- where small is compliment to capital

Data Structures:

1. Linked list (struct node): that every single node contains its minterm, the binary notation, the number of ones.
2. Array minterms [] contains all the minterms without the don't cares.
3. Array Dont_Care [] contains all the don't cares.
4. 2D Array imptable [] [] contains the Prime implicants table to get the essential.
5. Array essential [] contains the indexes of the row of the essential prime in the imptable [] [] table.

Sample Runs:

Enter the number of variables: 4

Enter the number of minterms: 4

Enter the number of Don't cares, if there is no Don't cares Please Enter 0: 4

Enter all the minterms one by one (Including the Don't cares): 3, 4, 9, 14, 2, 7, 8, 13

Enter the Don't cares terms one by one 2, 7, 8, 13

Column #1		Column #2		Column #3
2	0010	2,3	001-	no further calculation required
4	0100	8,9	100-	
8	1000	3,7	0-11	
3	0011	9,13	1-01	
9	1001			
7	0111			
13	1101			
14	1110			

The prime implicants are: aBcd, ABCd, abC, Abc, aCD, AcD

Prime Implicants Table

3	4	9	14	
-	X	-	-	4
-	-	-	X	14
X	-	-	-	2,3
-	-	X	-	8,9
X	-	-	-	3,7
-	-	X	-	9,13

The minimized function is: - aBcd + ABCd + abC + Abc + aCD + AcD

Enter the number of variables: 5

Enter the number of minterms: 7

Enter the number of Don't cares, if there is no Don't cares Please Enter 0: 6

Enter all the minterms one by one (Including the Don't cares) 0,1,2,4,6,7,8,10,11,12,13,14,15

Enter the Don't cares terms one by one: 10,11,12,13,14,15

Column #1		Column #2		Column #3		Column #4		Column #5
0	00000	0,1	0000-	0,2,4,6	00—0	0,2,4,6,8,10,12,14	0--0	no further calculation required
1	00001	0,2	000-0	0,2,8,10	0-0-0	0,2,4,6,8,12,10,14	0---0	
2	00010	0,4	00-00	0,4,2,6	00--0	0,2,8,10,4,6,12,14	0---0	
4	00100	0,8	0-000	0,4,8,12	0--00	0,2,8,10,4,12,6,14	0---0	
8	01000	2,6	00-10	0,8,2,10	0-0-0	0,4,2,6,8,10,12,14	0---0	
6	00110	2,10	0-010	0,8,4,12	0--00	0,4,2,6,8,12,10,14	0---0	
10	01010	4,6	001-0	2,6,10,14	0--10	0,4,8,12,2,6,10,14	0---0	
12	01100	4,12	0-100	2,10,6,14	0--10	0,4,8,12,2,10,6,14	0---0	
7	00111	8,10	010-0	4,6,12,14	0-1-0	0,8,2,10,4,6,12,14	0---0	
11	01011	8,12	01-00	4,12,6,14	0-1-0	0,8,2,10,4,12,6,14	0---0	
13	01101	6,7	0011-	8,10,12,14	01--0	0,8,4,12,2,6,10,14	0---0	
14	01110	6,14	0-110	8,12,10,14	01--0	0,8,4,12,2,10,6,14	0---0	
15	01111	10,11	0101-	6,7,14,15	0-11-			
		10,14	01-10	6,14,7,15	0-11-			
		12,13	0110-	10,11,14,15	011-			
		12,14	011-0	10,14,11,15	011-			
		7,15	0-111	12,13,14,15	011-			
		11,15	01-11					

The prime implicants are: -abcd, aCD, aBD, aBC, ae

Prime Implicants Table

0	1	2	4	6	7	8	
X	X	-	-	-	-	-	0,1
-	-	-	-	X	X	-	6,7,14,15
-	-	-	-	-	-	-	10,11,14,15
-	-	-	-	-	-	-	12,13,14,15
X	-	X	X	X	-	X	0,2,4,6,8,10,12,14

The minimized function is: - abcd +aCD+ ae

Enter the number of variables: 4

Enter the number of minterms: 6

Enter the number of Don'tcares, If there is no Don'tcares Please Enter 0: 5

Enter all the minterms one by one (Including the Don'tcares): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Enter the Don'tcares terms one by one: 3, 7, 8, 9, 10

Column #1	Column #2	Column #3	Column #4	Column #5
0 0000	0,1 000-	0,1,2,3 00--	0,1,2,3,4,5,6,7 0---	no further calculation required
1 0001	0,2 00-0	0,1,4,5 0-0-	0,1,2,3,4,6,5,7 0---	
2 0010	0,4 0-00	0,1,8,9 -00-	0,1,4,5,2,3,6,7 0---	
4 0100	0,8 -000	0,2,1,3 00--	0,1,4,5,2,6,3,7 0---	
8 1000	1,3 00-1	0,2,4,6 0--0	0,2,1,3,4,5,6,7 0---	
3 0011	1,5 0-01	0,2,8,10 -0-0	0,2,1,3,4,6,5,7 0---	
5 0101	1,9 -001	0,4,1,5 0-0-	0,2,4,6,1,3,5,7 0---	
6 0110	2,3 001-	0,4,2,6 0--0	0,2,4,6,1,5,3,7 0---	
9 1001	2,6 0-10	0,8,1,9 -00-	0,4,1,5,2,3,6,7 0---	
10 1010	2,10 -010	0,8,2,10 -0-0	0,4,1,5,2,6,3,7 0---	
7 0111	4,5 010-	1,3,5,7 0--1	0,4,2,6,1,3,5,7 0---	
	4,6 01-0	1,5,3,7 0--1	0,4,2,6,1,5,3,7 0---	
	8,9 100-	2,3,6,7 0-1-		
	8,10 10-0	2,6,3,7 0-1-		
	3,7 0-11	4,5,6,7 01--		
	5,7 01-1	4,6,5,7 01--		
	6,7 011-			

The prime implicants are: -bc, bd, a

Prime Implicants Table

0	1	2	4	5	6	
X	X	-	-	-	-	0,1,8,9
X	-	X	-	-	-	0,2,8,10
X	X	X	X	X	X	0,1,2,3,4,5,6,7

The minimized function is: - a