

EE6094 CAD for VLSI Design
Programming Assignment 3 (Due: 23:59:59, 2021/04/13-)
Due: 23:59:59 2021/05/04

You are asked to implement the Quine-McCluskey and Petrick_Method logic minimization approach by C++. The program reads a non-minimized Boolean function in the AND-OR format. Then, try to use the Quine-McCluskey and Petrick_Method logic minimization approach to optimize the Boolean function as mini as possible. Finally, it outputs the minimized Boolean function in the SOP form.

Input file format: First line describes the variables of input, there may be up to 26 variables (a-z), the second line describes the output of the circuit, the third line describes the Boolean function of the non-minimized function, try to minimize the function.

“!” Means the complement, “*” means AND and “+” means OR.

Output file format: The first two lines are the same as input, and the third line represents the minimized Boolean function.

“!” Means the complement, “*” means and “+” means or.

Algorithm: Try to implement the minimization in Quine-McCluskey and Petrick_Method. The details of the algorithm are mentioned at the class. Try to minimize the Boolean function in least terms. Make sure the function is equivalence to the original function.

Requirement: You have to write this program in C or C++. You also need to write a makefile which can compile and execute your program directly. I will verify your program on our workstation. You should also write a report which should at least include a description of the data structure and algorithm you used and how to execute your program. Name you file as PA3_studID.cpp. Upload your code and report to ee-class. Some test input files will be announced on the ee-class soon.

Score: Your assignment will be ranked and scored according to (1) the correctness of your solution, (2) the quality of your solution, (3) the runtime of your program, (4) the readability of your source code, (5) the report you wrote, and (6) the demo session.

If you have any question, please send Email to both me and TA 劉承軒

Example: Below is a sample input file and a sample output file with Boolean function.

Fig. 1 is the input file, Fig. 2 is the output file .

Sample input file:

```
INORDER = a b c d;    //input variables

OUTORDER = output;    //output

output = (!a*!b*!c*!d)+(!a*b*!c*d)+(!a*b*c*!d)+(a*!b*!c*d)+(a*!b*c*!d)+(a*b*!c*d)+
(a*b*c*!d)+(a*b*c*d)+(!a*b*c*d)    //non-minimized Boolean function
```

$$f(A,B,C,D)= \bar{A}\bar{B}\bar{C}\bar{D}+ \bar{A}\bar{B}\bar{C}D+ \bar{A}\bar{B}C\bar{D}+ \bar{A}\bar{B}CD+ \bar{A}B\bar{C}\bar{D}+ \bar{A}B\bar{C}D+ \bar{A}BC\bar{D}+ \bar{A}BCD+ \bar{A}BCD$$

Fig.1

Sample output file:

```
INORDER = a b c d;

OUTORDER = output;

output = (!a*!b*!c*!d)+(a*!c*d)+(a*c*!d)+(b*d)+(b*c)
```

$$f(A,B,C,D)= \bar{A}\bar{B}\bar{C}\bar{D}+ \bar{A}\bar{C}D+ \bar{A}C\bar{D}+ BD+ BC$$

Fig.2