Logic System Assignment 1

A simple CAD tool based on K-map

Due date: 2016/04/15

1. Description

In this homework, you will write a program to implement a (2 ~ 4-Variable) K Map simplification process. The prime implicants and the essential prime implicants of the K Map should be indicated, too. Finally, your program should show the Minimum SOP (Sum of Product).

2. Requirement

i. **Read the input file**

Your program will read the input file for the minterm information and don't care information:

eg. $F(A, B, C, D) = \sum m(0,1,5,10,14) + \sum d(4,7,11,15)$

The format of the information are followed by Input/Output Specification.

ii. **Initialize the terms in the K Map, and do the simplification**

You can create one or two-dimensional arrays to allocate all the terms of K Map. For example, under the left-hand diagram, the decimal notation of K Map may be the order of your arrays. Right-hand diagram shows the K Map which is initialized.

AB\CD	00	01	11	10
00	0	1	3	2
01	4	5	7	6
11	8	9	11	10
10	12	13	15	14

AB\CD	00	01	11	10
00	1	1	0	0
01	x	1	x	0
11	0	0	x	1
10	0	0	x	1

Fig1. The index of minterm   Fig2. Example value of minterm

iii. **Write the output file**

When the program starts execution, print the initial contents of K-Map at first. Also, you must print the prime implicants, the essential prime implicants and the boolean algebra to show the Minimum SOP.
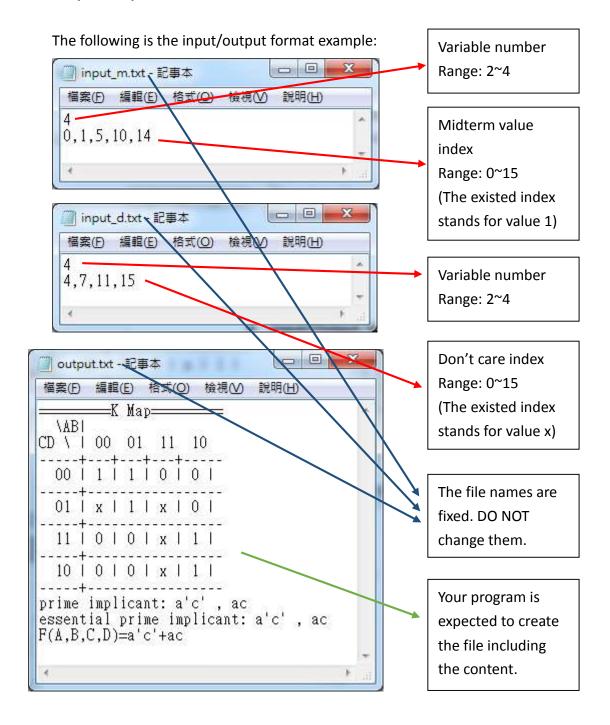
3. Input/Output Specification

You can finish your program in C, C++, or Java.

Your program should read input file, and put these terms into K-map. After program execution, output file should be created to dump the information for the simplification results.

Input: input_m.txt, input_d.txt

Output: output.txt

The following is the input/output example:

input_m.txt - 記事本

檔案(F) 編輯(E) 格式(O) 檢視(V) 說明(H)

```
4
0,1,5,10,14
```

input_d.txt - 記事本

檔案(F) 編輯(E) 格式(O) 檢視(V) 說明(H)

```
4
4,7,11,15
```

output.txt - 記事本

檔案(F) 編輯(E) 格式(O) 檢視(V) 說明(H)

```
============K Map============
   \AB|
CD \ | 00   01   11   10
-----+---+---+---+-----
  00 | 1 | 1 | 0 | 0 |
-----+-------------------
  01 | x | 1 | x | 0 |
-----+-------------------
  11 | 0 | 0 | x | 1 |
-----+-------------------
  10 | 0 | 0 | x | 1 |
-----+-------------------
prime implicant: a'c' , ac
essential prime implicant: a'c' , ac
F(A,B,C,D)=a'c'+ac
```

- Variable number Range: 2~4

- Midterm value index Range: 0~15 (The existed index stands for value 1)

- Variable number Range: 2~4

- Don't care index Range: 0~15 (The existed index stands for value x)

- The file names are fixed. DO NOT change them.

- Your program is expected to create the file including the content.

4. Hint

You can reference the flow chart below to design your program.