User Requirements

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Target user: We assume that the user is familiar with K-maps, truth tables, and Boolean expressions.

Functional Requirements

The system shall allow the user to input data as a Karnaugh map (K-map), Boolean algebra expression, or a truth table. The input data in whichever form shall not contain more than 6 variables, and the method of input shall be initially selected by the user. Once the input has been completely entered, as indicated by pressing a button, the system shall compute a minimal sum-of-products and product-of-sums expression, generate a K-map with circled regions, and produce a truth table if the data provided is valid otherwise it should notify the user with an error. The output expression must use the variable names that were specified by the user and the system should provide the option to see more solutions, if applicable.

The system shall display the K-map with the appropriate gray code labels on the left side of each row and at the top of each column. In addition, the user shall be able to label the variables being represented by the rows and columns. The K-map shall accept 0,1, or X as inputs.

The system shall be able to parse an equation that consists of ANDs, ORs, exclusive ORs (XORs), inverters, multiple character variables, and round brackets. No spaces shall be accepted by the system as part of variable names.

The number of variables shall be decided by the user and the truth table shall be displayed with one column for each variable and one column for the function value. The truth table shall accept only 1, 0, or X as valid input. The system also should be able to import and export data to and from PLA files.

Figure 1 illustrates the data-flow in the system.

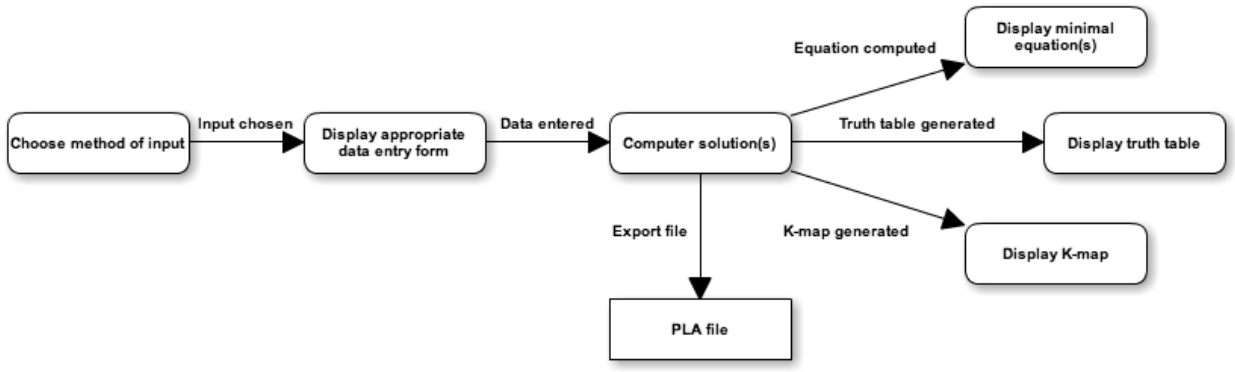

Figure 1

Non-Functional Requirements

The following table highlights the non-functional requirements for our system:

Property	Requirement
Speed	• System shall calculate solution within 1 second
Size	• System shall use no more than 50MB of RAM • System shall use no more than 50MB of hard disk space
Ease of use	• System should be easy to use and a user should be able to fully utilize it within 1 hour of experimentation
Reliability	• System shall be available 100% of the time provided user has appropriate libraries installed (Qt 4.5+)
Robustness	• Upon failing, the system should restart within 30 seconds • Less than 10% of events could cause such failures • Assuming import/export feature of PLA files exists, the probability of data corruption is 10%, and otherwise it's 0%.
Portability	• System is targeted for Linux users running distributions which support Qt 4.5 and is not indented to be portable.

Domain Requirements

The size of an *n* variable Boolean expression is determined by 2^n. The K-map and truth table can only contain values of 0, 1 or X (to indicate don't cares). In addition a gray code sequence must be displayed above the columns and to the left of the rows in the K-map, and variables being represented are labelled on their respective sides.

Boolean expressions shall be formatted as such, to mimic the standard written format:

Operator	Example
AND	a*b
OR	a+b
XOR	a^b
NOT	a'
()	(a+b)(b+c)