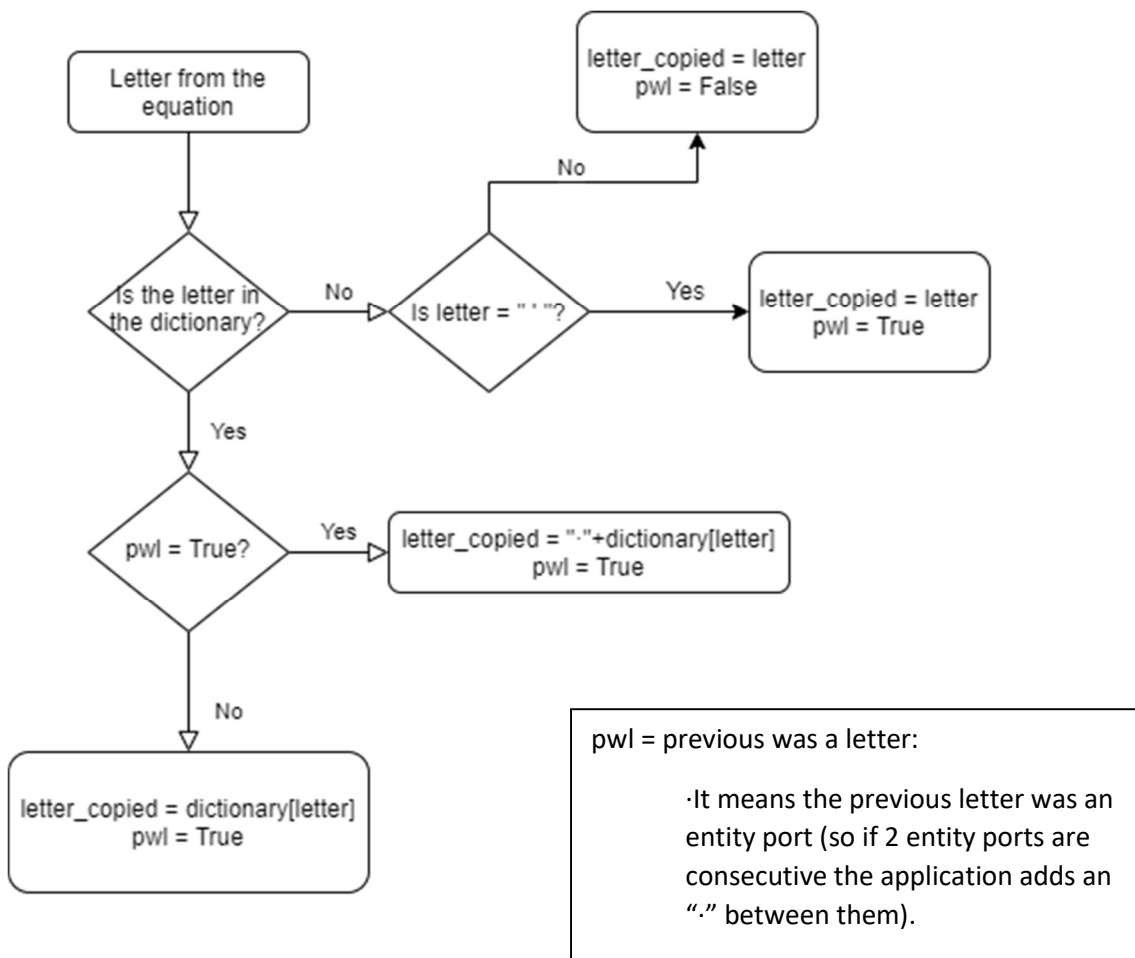# Equation Converter - Report

1 SPECIFICATIONS

When minimizing the truth table using Minilog.exe equation output format, there is a problem, it changes the input and output names instead of keeping the names of the entity.

This application fixes this problem analyzing the .equ file and generates a .txt file with the equations, where names given by minilog have been changed into the real ones in the entity.

2 PLANNING

The application must correct the names from minilog, so first the app does a dictionary that relate the name from minilog and the real name from the entity, then this is the flowchart:

pwl = previous was a letter:

·It means the previous letter was an entity port (so if 2 entity ports are consecutive the application adds an "·" between them).

3 DEVELOP

The language used in this application is Python 2.7.8.

First of this project uses these libraries:

- Tkinter and tkFileDialog: this makes the application easier to use, by means of a window to select the file.
- Os: to change temporarily the extension of the .equ file into a .txt so python is able to read it.

Then the app should open the input file and create the output file .txt in the same directory with the input file name + "_corrected" where it will write the equations.

The algorithm used to change the name of the ports is the one explained with a flowchart at planning section. For this a dictionary is required, and the application takes it from .equ file, so it's important to don't change anything of this file.

4 TESTING

To test we use examples from https://digsys.upc.edu/csd/index.html

Example from P2 tutorial

The minilog equation output format returns:

```
MINIMIZATION RESULT STATISTICS
===============================
FOUND 28 ESSENTIAL FACTORS IN PRODUCT OF SUMS MODE
MAXIMUM FANIN:          28
TOTAL LITERAL COUNT:        130
MAXIMUM FACTOR SIZE:     4
MAXIMUM OUTPUT FUNCTION SIZE: 6

INPUT SIGNAL  |  OUTPUT SIGNAL  REPRESENTATION

A : BI_L    E : X_IN0    |    T : A_L    X : E_L
B : X_IN3              |    U : B_L    Y : F_L
C : X_IN2              |    V : C_L    Z : G_L
D : X_IN1              |    W : D_L

MINIMIZED EQUATIONS

T = (A'+B'+C+D).(A'+B+C'+E').(A'+C+E).(A'+B'+E).(A'+B+D').(A'+C'+D')
U = (A'+C+E).(A'+B+C).(A'+B'+D+E').(A'+B+D'+E').(A'+B+D+E)
V = (A'+B+D).(A'+B+E').(A'+B'+C).(A'+B+C').(A'+D+E')
W = (A'+C+D+E).(A'+B+D'+E).(A'+B'+C'+E).(A'+C'+D+E').(A'+C+D'+E')
X = (A'+C+E).(A'+B'+C').(A'+D'+E).(A'+B'+D')
Y = (A'+B'+C).(A'+B'+D').(A'+B+C'+D).(A'+D+E).(A'+C'+E)
Z = (A'+B'+C).(A'+D'+E).(A'+B+C'+D).(A'+B'+E').(A'+C+D')
```

And when we use Equation_converter.exe, the .txt file contains the next data:

This is the list of output equations minimized by minilog.exe in PoS or SoP format from the output format logic equations:

```
        A_L =
(BI_L'+X_IN3'+X_IN2+X_IN1).(BI_L'+X_IN3+X_IN2'+X_IN0').(BI_L'+X_IN2+X_IN0).(BI_L'+X_IN3'+X_IN0).(BI_L'+X_IN3+X_IN1).(BI_L'+X_IN2'+X_IN1')
        B_L = (BI_L'+X_IN2+X_IN0).(BI_L'+X_IN3+X_IN2).(BI_L'+X_IN3'+X_IN1+X_IN0').(BI_L'+X_IN3+X_IN1'+X_IN0').(BI_L'+X_IN3+X_IN1+X_IN0)
        C_L = (BI_L'+X_IN3+X_IN1).(BI_L'+X_IN3+X_IN0').(BI_L'+X_IN3'+X_IN2).(BI_L'+X_IN3+X_IN2').(BI_L'+X_IN1+X_IN0')
        D_L =
(BI_L'+X_IN2+X_IN1+X_IN0).(BI_L'+X_IN3+X_IN1'+X_IN0).(BI_L'+X_IN3'+X_IN2'+X_IN0).(BI_L'+X_IN2'+X_IN1+X_IN0').(BI_L'+X_IN2+X_IN1'+X_IN0')
        E_L = (BI_L'+X_IN2+X_IN0).(BI_L'+X_IN3'+X_IN2').(BI_L'+X_IN1'+X_IN0).(BI_L'+X_IN3'+X_IN1')
        F_L = (BI_L'+X_IN3'+X_IN2).(BI_L'+X_IN3'+X_IN1').(BI_L'+X_IN3+X_IN2'+X_IN1).(BI_L'+X_IN1+X_IN0).(BI_L'+X_IN2'+X_IN0)
```

$G\_L = (BI\_L'+X\_IN3'+X\_IN2).(BI\_L'+X\_IN1'+X\_IN0).(BI\_L'+X\_IN3+X\_IN2'+X\_IN1).(BI\_L'+X\_IN3'+X\_IN0').(BI\_L'+X\_IN2+X\_IN1')$

Example Tank Level Meter

The minilog equation output format returns:

MINIMIZATION RESULT STATISTICS
=============================
FOUND 13 ESSENTIAL PRODUCT TERMS
MAXIMUM FANIN: 5
TOTAL LITERAL COUNT: 36
MAXIMUM PRODUCT TERM SIZE: 2
MAXIMUM OUTPUT FUNCTION SIZE: 6

INPUT SIGNAL | OUTPUT SIGNAL REPRESENTATION

A : S6   E : S2 | W : Y2
B : S5   F : S1 | X : Y1
C : S4   G : S0 | Y : Y0
D : S3 | Z : E

MINIMIZED EQUATIONS

W = D
X = D'F + B
Y = F'G + A + D'E + B'C
Z = FG' + EF' + DE' + CD' + BC' + AB'

And when we use Equation_converter.exe, the .txt file contains the next data:

This is the list of output equations minimized by minilog.exe in PoS or SoP format from the output format logic equations:

Y2 = S3
Y1 = S3'·S1 + S5
Y0 = S1'·S0 + S6 + S3'·S2 + S5'·S4
E = S1·S0' + S2·S1' + S3·S2' + S4·S3' + S5·S4' + S6·S5'