Overview

This code is an Extended Boolean Calculator designed to simplify and solve Boolean expressions. It uses the `sympy` library, which is a powerful tool for symbolic mathematics in Python.

Main Functions

1. evaluate\_expression(expression, values):

- This function evaluates the Boolean expression with the provided input values.

- It substitutes the variable values into the expression and returns the result.

2. simplify\_expression(expression):

- This function simplifies the Boolean expression.

- It converts the expression to its simplified form, using Disjunctive Normal Form (DNF).

3. get\_input\_values(variables):

- This function collects user input for variable values.

- It prompts the user to enter values (1 for True, 0 for False) for each variable in the Boolean expression.

4. process\_expression(expr\_str):

- This function processes and analyzes the input Boolean expression.

- It converts custom operators (., +, !) into sympy-compatible operators (&, |, ~).

- It then converts the input string into a sympy Boolean expression.

5. find\_variables(expression):

- This function identifies the variables used in the Boolean expression.

- It extracts all symbols (variables) from the expression.

Main Program Flow

1. boolean\_calculator():

- The main function that handles modes and navigation.

- It welcomes the user and prompts them to enter a Boolean expression using variables (A, B, C, etc.).

- The user can choose between two modes:

- Simplify the expression: Simplifies the Boolean expression.

- Solve the expression: Solves the expression by providing input values.

How to Use

1. Select a mode:

- Enter '1' to simplify the Boolean expression.

- Enter '2' to solve the Boolean expression by providing input values.

- Enter 'exit' to quit the calculator.

2. Enter the Boolean expression:

- Input the expression using variables and operators (., +, !).

3. Simplify Mode:

- The program simplifies the Boolean expression and displays the simplified result.

- Optionally, the user can choose to solve the simplified expression with input values.

4. Solve Mode:

- The program identifies the variables in the expression.

- The user enters values for each variable.

- The program evaluates the expression with the provided values and displays the result.

Example

1. Input:

- Boolean expression: `A . B + C`

- Mode: Simplify (1)

2. Output:

- Simplified Expression: `A & B | C`

- (Optional) Solve the simplified expression with input values: `A=1, B=0, C=1`

- Result after solving: `1`