User Instructions for Truth Table Generator Plus

Welcome to **Truth Table Generator Plus**! This guide will walk you through the main features and how to use them.

1. Launching the Application

1. Open a terminal or command prompt.
2. Navigate to the project directory:
   cd Computability-and-Logic-Final
3. Run the program:
   python3 finalproject.py
   On Windows, you may use:
   python finalproject.py

2. Main Window Overview

- **Formula Entry**: At the top, enter your logical expression.
  - Examples: A AND B -> C, XOR(A,B), NAND(A,B), NOR(A,B), (A OR B) <-> C.
- **Toolbar Buttons**:
  - **Generate**: Builds and displays the full truth table in the grid below.
  - **Tautology?**: Checks if the formula is true for every combination of inputs.
  - **Contradiction?**: Checks if the formula is false for every combination.
  - **Show DNF**: Opens a dialog showing the Disjunctive Normal Form.
  - **Show CNF**: Opens a dialog showing the Conjunctive Normal Form.
  - **Show K-Map**: Visualizes a Karnaugh map. Supported only when exactly 2 variables are used.
- **Truth Table Grid**: Displays columns for each variable and a **Result** column with 0/1 values.
- **Status Bar**: At the bottom, shows messages like row counts, copy/save confirmations, and errors.

3. Entering Formulas

- Use **single-letter** uppercase variables (A, B, C, etc.).
- Supported operators:
  - AND, OR, NOT
  - XOR(A,B) for exclusive OR
  - -> for implication (a → b)
  - <-> for equivalence (a ↔ b)

    - NAND(A,B), NOR(A,B) functions
- Parentheses can group subexpressions: (A AND B) OR NOT C.

Tip: Make sure to include spaces around AND, OR, and NOT for parsing consistency.

4. Generating the Truth Table

1. Type your formula in the entry field.
2. Click **Generate**.
3. The grid updates to show each combination of inputs and the corresponding output.
4. If there's a syntax error, you'll see an error dialog with details.

5. Analyzing Logical Properties

- **Tautology Check**: Select **Tautology?** to see if every row's result is 1.
- **Contradiction Check**: Select **Contradiction?** to see if every row's result is 0.
- These checks pop up an information dialog with the outcome.

6. Viewing DNF and CNF

- After generating a table, click **Show DNF** to view the Disjunctive Normal Form.
- Click **Show CNF** to view the Conjunctive Normal Form.
- Each opens a dialog with the formula expressed in its normalized form.

7. Karnaugh Map (K-Map)

- Only available when your formula uses exactly **2 variables**.
- Click **Show K-Map** to open a new window with a 2×2 grid.
- Rows and columns correspond to variable assignments; cells show result bits.

8. Copying and Saving Tables

- **Copy Table** (Edit → Copy Table): Copies the grid as tab-delimited text to your clipboard.
- **Save CSV** (File → Save CSV): Opens a dialog to save the current table as a .csv file.

9. Clearing and Exiting

- **Clear All** (Edit → Clear All): Clears the formula entry and table grid.
- **Exit** (File → Exit): Closes the application.

10. Troubleshooting

- **Empty Formula**: You'll be prompted to enter a formula.
- **Syntax Errors**: Double-check operator names, spaces, and parentheses.
- **Unsupported K-Map**: Ensure exactly two variables are present.

If further issues arise, refer to the README.md or open an issue on the project's GitHub repository.

Repository

Find the project on GitHub: https://github.com/yvemula/Computability-and-Logic-Final