🧠 ESI-EX-INI Logic Formula Solver

Automated Logical Formula Analysis and Theorem Proving using Resolution

Overview

The **ESI-EX-INI Logic Formula Solver** is a powerful tool for creating, managing, and analyzing logical formulas. It leverages the **resolution by refutation** technique to determine the **satisfiability** of logical expressions written in **Conjunctive Normal Form (CNF)**.

Features

- Create and save logical formulas in CNF
- Test the satisfiability of existing formulas
- View, manage, and test your formula collection
- Intuitive graphical interface (GUI) – beginner-friendly!

Installation Instructions

1. Ensure the following files are in the same directory:
    - `gui_solver.exe` (main application interface)
    - `logic_solver.exe` (core engine)
2. No additional setup is needed. Just double-click to launch!

How to Use

Launching the App

- Double-click on `gui_solver.exe`.

Main Menu Options

1. **Create New Formula**
    - Input a name (e.g., `my_formula`)
    - Choose number of clauses
    - Enter each clause (one by one)
    - The formula is saved as a `.cnf` file
2. **Test Existing Formula**
    - Browse and select a `.cnf` file
    - Click to test
    - Results appear after a few seconds
3. **Show Available Formulas**
    - View saved formulas
    - Preview them in readable logic format
    - Optionally test selected formulas
4. **Show Credits**
    - Displays developer info and acknowledgments

Formula Syntax

- Use **capital letters** for variables: `P`, `Q`, `R`
- Use `!` for **negation**: `!P` = NOT P
- Use **spaces** to separate literals in a clause
- Each **line** represents a clause
- Clauses are connected with **AND (∧)**
- Literals in a clause are connected with **OR (∨)**

Example:

```
P !Q R
!P S
T !U
```

Interpretation:

```
(P ∨ ¬Q ∨ R) ∧ (¬P ∨ S) ∧ (T ∨ ¬U)
```

Testing Formulas

1. Select **“Test Existing Formula”** or go to **“Show Available Formulas”**
2. Choose a file from the list
3. Click “Test Selected Formula”
4. A popup window will show the result:
    - **SATISFIABLE** → A valid interpretation exists
    - **UNSATISFIABLE** → Contradiction detected (empty clause)

Tips for Effective Use

- Give your formulas **meaningful names**
- **Group related clauses** logically
- Use the **preview** feature to double-check before testing
- All formulas are stored automatically in CNF format

👨‍💻 Project Credits

Developed by 2CP06 Students – Advanced Logic Course
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