Interactive Web Interface for Contrastive Explanation of Plans in Hybrid Domains: User Manual

Introduction
In this user manual, we will introduce the features and usage of an interactive web interface designed to provide contrastive explanations of plans in hybrid domains. The tool aims to address the need for understanding why specific plans are chosen over alternatives, allowing users to explore contrastive questions and analyze plan characteristics. We will outline the key components of the tool, including the framework for contrastive explanations and the iterative re-modeling and re-planning algorithm. Additionally, we will discuss the provision for experimenting with different planning domains and using various hybrid system planners. Finally, we will highlight the experimental results obtained using two state-of-the-art planners on different planning domains.

System Requirements
Before running the application, ensure that your device meets the following requirements:
-Ubuntu 20.04 or later
- Node.js version 12.x or later
- npm package manager
- SMTPLAN+ AI Planner
- ENHSP AI Planner
- Python 3.6 or higher

Getting Started
1. Clone the repository to your local machine.
2. Open your terminal and navigate to the project directory.
3. Run the command "npm install" to install the required dependencies.
4. Download and install Node.js using the command "sudo apt-get install -y nodejs" (for Ubuntu).
5. Verify the successful installation of Node.js and npm by querying their version numbers using "node --version" and "npm --version".
6. Ensure that SMTPLAN+ is installed in the common location and copy it to the /usr/local/bin directory using the command "sudo cp -r /path/to/your/file /usr/local/bin/".
7. Once the dependencies are installed, start the application by running "npm start" in the terminal.
8. The application will launch, and you can access it through your web browser at http://localhost:3000.

Troubleshooting
If you encounter any issues while running the application, try the following steps:
1. Close the application and restart it.
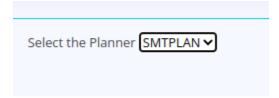2. Ensure that all the required dependencies are correctly installed and up to date.

3. Double-check that the SMTPLAN+ and ENHSP AI Planners are properly configured.
4. If the problem persists, refer to the documentation or contact the developers through the provided GitHub repository for assistance.
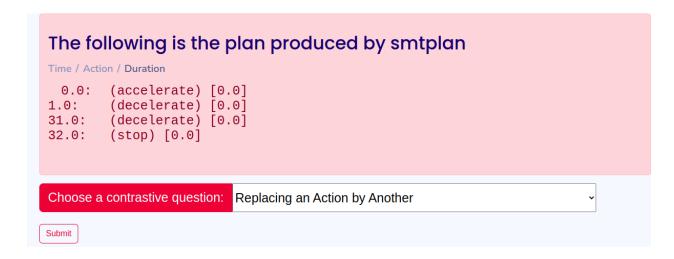
Usage

1. *Domain and Problem Selection*:
  - Choose the domain and enter the corresponding domain and problem files.

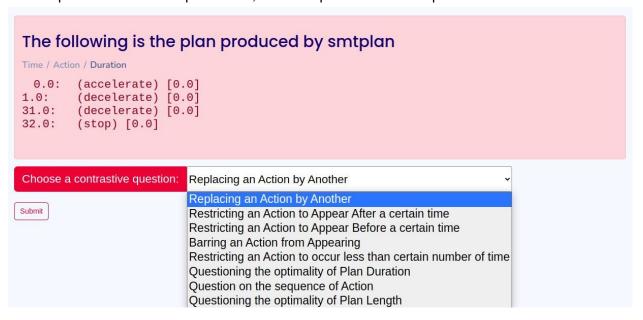 - Select the desired planner (say, SMTPLAN+) for generating the initial plan.

-The original Plan

The following is the plan produced by smtplan

Time / Action / Duration

```
  0.0:   (accelerate) [0.0]
1.0:     (decelerate) [0.0]
31.0:    (decelerate) [0.0]
32.0:    (stop) [0.0]
```

Choose a contrastive question: Replacing an Action by Another

Submit

2. *Contrastive Questions*:

- To explore contrastive explanations, select a question from the provided menu.

The following is the plan produced by smtplan

Time / Action / Duration

```
  0.0:   (accelerate) [0.0]
1.0:     (decelerate) [0.0]
31.0:    (decelerate) [0.0]
32.0:    (stop) [0.0]
```

Choose a contrastive question: Replacing an Action by Another

Submit

Replacing an Action by Another
Restricting an Action to Appear After a certain time
Restricting an Action to Appear Before a certain time
Barring an Action from Appearing
Restricting an Action to occur less than certain number of time
Questioning the optimality of Plan Duration
Question on the sequence of Action
Questioning the optimality of Plan Length

- For example, choose the question "Restricting an Action to Appear Before a particular Time."
- Complete the input form, specifying the relevant action and time to bind with the placeholders in the question.

The selected contrastive quesion is: Restricting an Action to Appear Before a Certain Time

action   decelerate

appears before
time(sec)   1

Submit Form

- Submit the form to proceed.

3. *Contrastive Plan and Analysis*:
  - The tool will present the contrastive plan (HPlan) that addresses the selected question.

☆
action is *decelerate*, appears BEFORE *1* seconds

```
0.0:     (accelerate) [0.0]
0.75:    (decelerate_new) [0.0]
40.75:   (decelerate) [0.0]
41.5:    (stop) [0.0]
```

ⓘ **original plan is better in terms of number of actions**
ⓘ **original plan is better in terms of makespan**

Show optimal Length   Show optimal

  - The plan will highlight the differences between the original plan and the alternate plan.

  - Use the "show optimal" and "show optimal length" buttons to generate near-optimal plans based on makespan and length, respectively.

The following is the optimal plan produced by smtplan

Time / Action / Duration

```
 0.0:    (accelerate) [0.0]
0.5:     (decelerate_new) [0.0]
0.609375:      (accelerate) [0.0]
5.359375:      (decelerate) [0.0]
5.814453125:   (decelerate) [0.0]
11.064453125:  (stop) [0.0]
```

  - Analyze the generated plans to gain insights into the decision-making process and understand the trade-offs made by the planner.

Conclusion
This user manual has provided an overview of the interactive web interface for contrastive explanation of plans in hybrid domains. The tool offers a framework for addressing contrastive questions and supports experimentation with different planning domains and