CS 6374 – Final Project Report

Wordle Game

We created a guessing game similar to Wordle using Prolog, a programming language great for making rule-based games. In this game, players try to guess a five-letter word within six tries, receiving hints about which letters are correct or misplaced after each guess.

The game is structured around several Prolog predicates that collectively handle the game's logic, user interaction, and state management:

- **Game Initialization (start/0)**: This predicate kicks off the game, displaying a welcome message and invoking the knowledge base construction followed by the game loop.
- **Knowledge Base Construction (build_kb/0)**: User is prompted to enter words along with their categories until they type 'done'. Each word and its category are stored in Prolog's dynamic knowledge base using the **assert/1** predicate.
- **Gameplay (play/0)**: This core component manages the gameplay. It retrieves all available categories for the user to choose from and then directs the game through word selection, guess submission, and feedback provision.
- **Word Selection (pick_word/3)**: Filters the words based on the chosen category and desired word length, ensuring that gameplay is aligned with user preferences.
- **Guess Submission and Feedback (guess_word/3)**: Processes each user guess, comparing it to the target word, and provides detailed feedback about the accuracy of the guess.

We used Prolog’s features like recursion to handle game flow and user interactions smoothly.

Game Winning Case:

```
?- start.
----------------------
Wordle!
----------------------
Please enter a word:
|: juice.
Please enter the category for the word:
|: drinks.
Please enter a word:
|: water.
Please enter the category for the word:
|: drinks.
Please enter a word:
|: piano.
Please enter the category for the word:
|: music.
Please enter a word:
|: flute.
Please enter the category for the word:
|: music.
Please enter a word:
|: daisy.
Please enter the category for the word:
|: flower.
Please enter a word:
|: daisy.
Please enter the category for the word:
|: flower.
Please enter a word:
|: done.
Done building the words database...
The available categories available are: [drinks,flower,music]
Choose a category:
|: flower.
Choose a length:
|: 7.
There are no words of this length.
Choose a length:
|: 5.
Game started. You have 6 guesses.

Enter a word composed of 5 letters:
|: lotus.
Correct letters are: [s]
Correct letters in correct positions are: []
Remaining Guesses are 5

Enter a word composed of 5 letters:
|: rose.
Word is not correct. Try again.
Remaining Guesses are 4

Enter a word composed of 5 letters:
|: tulip.
Correct letters are: [i]
Correct letters in correct positions are: []
Remaining Guesses are 3

Enter a word composed of 5 letters:
|: daisy.
You won!
true .
```

Game Losing Case:

```
?- start.
----------------------
Wordle!
----------------------
Please enter a word:
|: storm.
Please enter the category for the word:
|: weather.
Please enter a word:
|: rainy.
Please enter the category for the word:
|: weather.
Please enter a word:
|: truck.
Please enter the category for the word:
|: vehicle.
Please enter a word:
|: train.
Please enter the category for the word:
|: vehicle.
Please enter a word:
|: happy.
Please enter the category for the word:
|: emotion.
Please enter a word:
|: done.
Done building the words database...
The available categories available are: [emotion,vehicle,weather]
Choose a category:
|: vehicle.
Choose a length:
|: 12.
There are no words of this length.
Choose a length:
|: 5.
Game started. You have 6 guesses.

Enter a word composed of 5 letters:
|: optima.
Word is not correct. Try again.
Remaining Guesses are 5

Enter a word composed of 5 letters:
|: mercedes.
Word is not correct. Try again.
Remaining Guesses are 4

Enter a word composed of 5 letters:
|: nissan.
Word is not correct. Try again.
Remaining Guesses are 3

Enter a word composed of 5 letters:
|: forte.
Correct letters are: [r,t]
Correct letters in correct positions are: []
Remaining Guesses are 2
```

```
Word is not correct. Try again.
Remaining Guesses are 5

Enter a word composed of 5 letters:
|: mercedes.
Word is not correct. Try again.
Remaining Guesses are 4

Enter a word composed of 5 letters:
|: nissan.
Word is not correct. Try again.
Remaining Guesses are 3

Enter a word composed of 5 letters:
|: forte.
Correct letters are: [r,t]
Correct letters in correct positions are: []
Remaining Guesses are 2

Enter a word composed of 5 letters:
|: mazda.
Correct letters are: []
Correct letters in correct positions are: []
Remaining Guesses are 1

Enter a word composed of 5 letters:
|: camry.
Correct letters are: [c,r]
Correct letters in correct positions are: []
Remaining Guesses are 0

You lost!
true .

?-
```

Throughout this project, we significantly deepened our understanding of Prolog's declarative programming style, particularly its use of recursion and backtracking, which were essential for managing game flow and state in a language that inherently lacks traditional state management.

Key difficulties included:

- **Persistent Game State Management**: We were unable to implement features that allow for saving the game state or resuming a paused game. Prolog's stateless nature made it challenging to develop functionalities typical in more stateful environments, like most game development platforms.
- **Advanced Gameplay Features**: Incorporating advanced features such as replayability without restarting, dynamic hint systems, and a scoring mechanism proved difficult. The lack of built-in support for handling varying game states and session data in Prolog restricted our ability to enhance game complexity and user engagement.
- **Edge Case Management**: We struggled with comprehensive input validation, such as ensuring all entries were alphabetic and managing different cases (uppercase vs. lowercase). These issues underscored the need for more robust error handling and user input processing in our game design.

Division of Labor

- **Revanth Chenna(RXC210069):** Focused on the game logic, developing the core algorithms for word validation, user input handling, and feedback mechanisms.
- **Varsha Sai Kuppala(KXV210037):** Responsible for input validation and integrating the game control and replay functionalities.