National University of Computer & Emerging Sciences
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Snake and Ladder Game

Project Report
Artificial Intelligence
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1. Introduction

This project is a modern reinterpretation of the classic board game *Snake and Ladder*, developed as part of the Artificial Intelligence course. The game introduces new elements such as power-ups and penalties, an interactive graphical user interface (GUI), and voice-assisted gameplay. It is implemented using Python with an emphasis on user experience and interactive design.

2. Objectives

- ❖ To develop a visually rich and interactive version of Snake and Ladder.
- ❖ To enhance the gameplay experience using power-ups and penalties.
- ❖ To incorporate audio feedback for game events using speech synthesis.
- ❖ To implement a fully functional GUI using Python libraries.

3. Technologies Used

- ❖ **Python:** Used as the core programming language for implementing game logic and functionality.
- ❖ **Tkinter:** Used for developing the graphical user interface (GUI) and managing window-based events.
- ❖ **Pillow (PIL):** Used for processing and rendering images, such as the board and dice.
- ❖ **gTTS (Google Text-to-Speech):** Used to convert text messages into speech for interactive feedback.
- ❖ **playsound:** Used to play the audio files generated by gTTS.

4. Game Features

4.1. Graphical User Interface (GUI)

The game features a custom-designed board rendered using Tkinter's Canvas widget, providing a visually structured layout for gameplay. Player tokens are represented as colored circles, allowing for clear identification and movement across the board. Dice rolls are visually depicted using images of dice faces, enhancing the realism and engagement of the experience. Additionally, interactive buttons are provided for each player's turn and to exit the game, ensuring smooth and intuitive user control.
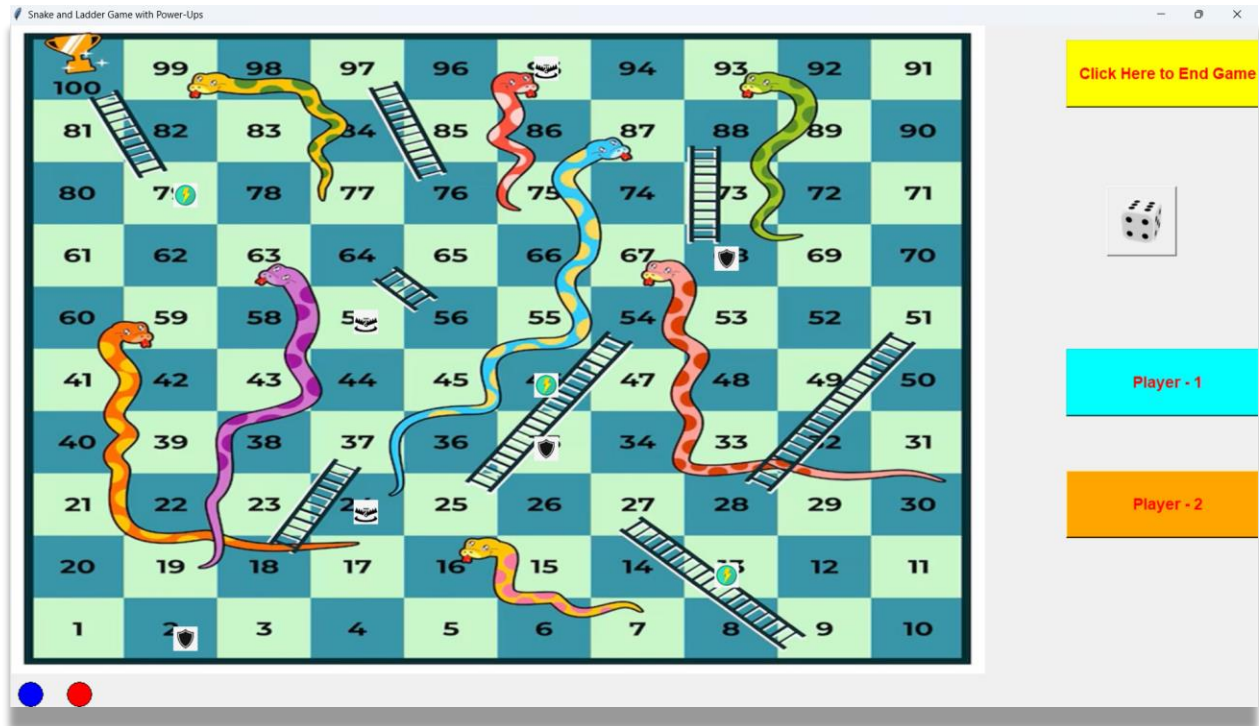
4.2. Power-Ups and Penalties

Three types of special tiles are introduced on specific board positions:

- ❖ **Shield** – Grants protection from snake bites (used once).

- ❖ **Boost** – Allows the player to roll the dice again immediately.

- ❖ **Trap** – Causes the opponent to skip their next turn.

These are visually marked on the board and enhance strategic gameplay.

4.3. Game Logic and Flow

- ❖ Each player rolls a virtual dice (1–6) and moves accordingly.
- ❖ Ladders move players forward to higher positions.
- ❖ Snakes pull players down to lower positions unless protected by a shield.
- ❖ Boosts and traps trigger additional effects.
- ❖ Players alternate turns unless affected by a trap or given a boost.
- ❖ A player wins by reaching exactly square 100.
- ❖ The game resets after declaring a winner.

4.4. Audio Feedback

Using gTTS and playsound, the game provides audio feedback by announcing key events during gameplay. These include the results of dice rolls, the activation of power-ups, encounters with snakes or ladders, player turn notifications, and the final winner announcement. This voice interaction enhances user engagement and accessibility.

5. Implementation Overview

- ❖ **Board Mapping:** Each board position is mapped to specific (x, y) coordinates using a dictionary for accurate token placement.
- ❖ **Game State:** Variables track the position of each player and the status of their shield/trap.
- ❖ **Turn Logic:** The game automatically switches turns unless a player receives a boost or is trapped.
- ❖ **Visual Enhancements:** Icons for shield, boost, and trap are loaded and displayed over corresponding tiles.

6. User Experience Flow

i. Game starts with a welcome voice message.
ii. Player 1 clicks their button to roll the dice and move.
iii. Based on landing position, the game triggers ladder, snake, or power-up effects.
iv. Audio feedback announces all events.
v. Turn alternates or is influenced by boost/trap.
vi. First player to reach 100 wins.
vii. A victory message is displayed and announced, and the game resets.

7. Conclusion

The project successfully implements an engaging and feature-rich version of Snake and Ladder. The integration of a GUI and power-ups introduces a modern and strategic layer to the game. The use of voice feedback enhances accessibility and player immersion. Overall, the game meets its design goals and demonstrates effective use of Python for interactive application development.