AI-Based Board Game: Territory Conquest

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Course: Artificial Intelligence

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1. Project Overview

Project Topic:

This project aims to develop an AI-driven board game based on territory conquest, where two players compete to acquire more tiles and accumulate points. The game will feature an aesthetically appealing display with dynamic animations and engaging gameplay mechanics.

Objective:

• Develop a strategic board game that challenges players to expand their territory.
• Implement AI-based decision-making for different difficulty levels.
• Introduce multiple game modes, including AI vs. AI and AI vs. Human.
• Enhance gameplay experience with dynamic power-ups and speed variations.
• Ensure an engaging and visually appealing UI/UX for an immersive experience.

2. Game Description

Original Game Background:

The game is inspired by the territory conquest genre, where players take turns moving across a board to claim tiles. The objective is to control the most tiles while strategically blocking the opponent.

Innovations Introduced:

• AI-controlled opponents with multiple difficulty levels.
• Dynamic power-ups that influence gameplay mechanics (Freeze, Bonus Points).
• Speed variations affecting AI decision-making and overall game difficulty.
• Enhanced UI with smooth animations and real-time game progress indicators.

3. AI Approach and Methodology

AI Techniques to be Used:
• AI-based decision-making algorithms for adaptive gameplay.
• Minimax algorithm with heuristic evaluation for AI vs. AI mode.
• Adaptive AI logic for difficulty adjustments (Normal, Hard).

Heuristic Design:
AI will evaluate game states based on controlled territory, available moves, and strategic positioning.

Complexity Analysis:
Implementing AI-based decision-making for dynamic difficulty adjustments increases computational complexity. Additional power-ups and real-time interactions further add to the game's complexity.

4. Game Rules and Mechanics

Modified Rules:
• Players take turns moving across the board, acquiring tiles to expand their controlled territory.
• AI difficulty level influences decision-making and reaction times.

Winning Conditions:
The player who controls the most tiles and accumulates the highest points by the end of the game wins.

Turn Sequence:
Players take turns sequentially, while AI dynamically adapts its strategy based on the chosen difficulty level.

5. Implementation Plan

Programming Language:
Python

Libraries and Tools:
• Pygame (for UI and game rendering)
• Math (for trigonometric calculations, geometric positioning)

Milestones and Timeline:

• Week 1-2: Define game rules, mechanics, and AI strategy.

• Week 3-4: Implement board mechanics and player interactions.

• Week 5-6: Develop AI logic for different difficulty levels.

• Week 7: Integrate animations and interactive UI elements.

• Week 8: Final testing and report preparation.

6. References

1. Russell, S. J., & Norvig, P. (2020). *Artificial Intelligence: A Modern Approach* (4th ed.). Pearson.
2. Sutton, R. S., & Barto, A. G. (2018). *Reinforcement Learning: An Introduction* (2nd ed.). MIT Press.