

**Hybrid International-Turkish Checkers: A Strategic Board Game Innovation**

**Project Proposal Submitted By:**

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1. **Project Overview**

* **Project Topic:** We propose a hybrid board game combining Turkish Draughts and International Draughts. This innovative version merges orthogonal and diagonal movement mechanics, introducing a fresh strategic challenge.
* **Objective:** The goal is to develop a playable and AI-interactive version of the Hybrid International-Turkish Checkers game, incorporating unique rule sets, and utilizing AI techniques like Minimax and Alpha-Beta Pruning to simulate intelligent gameplay and strategy.

1. **Game Description**

* **Original Game Background:** International Draughts is played on a 10x10 board where pieces move diagonally, with flying kings and mandatory captures. Turkish Draughts is an 8x8 game with orthogonal moves and straight captures.
* Innovations Introduced:
  + Combined movement: Normal pieces move both orthogonally (forward/sideways) and diagonally forward. Kings move unlimited distance in all directions.
  + Mandatory capturing in both orthogonal and diagonal directions.
  + Larger 10x10 board to accommodate mixed strategies.
  + Multiple and backward captures for men and kings.
  + These innovations increase game complexity, requiring deeper strategic planning and foresight.

1. **AI Approach and Methodology**

* AI Techniques to be Used:
  + Minimax Algorithm for optimal move calculation in two-player settings.
  + Alpha-Beta Pruning to enhance Minimax efficiency.
  + Optional Reinforcement Learning for self-play and AI training.
* Heuristic Design:
  + Piece value (assigning higher value to kings).
  + Positional advantage (control of center, mobility).
  + Capturing potential and multi-jump opportunities.
* Complexity Analysis:
  + Due to the 10x10 board and flexible movement/capture mechanics, time complexity increases significantly.
  + AI must evaluate a broad set of possible moves, making optimization essential.

1. **Game Rules and Mechanics**

* Modified Rules:
* Board: 10x10 with dark and light squares.
* Pieces: 20 per player, starting on the first 4 rows.
* Men move 1 square orthogonally or diagonally forward.
* Kings move any distance orthogonally or diagonally.
* Capturing is mandatory and includes orthogonal/diagonal jumps.
* Multiple and backward captures allowed.
* Maximum possible captures rule enforced.
* Winning Conditions: Capture all opponent pieces or block all their legal moves.
* Turn Sequence: Players alternate turns, making one move or capture sequence per turn.

1. **Implementation Plan**

* Programming Language: Python
* Libraries and Tools:
* Pygame (GUI)
* NumPy (data handling)
* Optional: TensorFlow/Scikit-learn (for AI training)

1. **References**

* "The Rules of Draughts" - World Draughts Federation
* Turkish Draughts Rules - Turkish Mind Sports Federation
* Russell, S., & Norvig, P. (2020). Artificial Intelligence: A Modern Approach.
* Online resources and checkers AI implementations for reference.