

**Project Proposal**

**Draughts Checkers Game**

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**1. Introduction**

This project aims to develop a digital version of the Draughts (Checkers) game with enhanced features, including artificial intelligence, multiplayer functionality, and an innovative twist called "**Elemental Checkers**". The game will follow standard Draughts rules with the following key mechanics:

* **Heuristic Rules & Constraints:**
  + **Board Setup:** 8x8 grid with alternating light and dark squares.
  + **Piece Movement:** Diagonal movement for normal pieces and multi-directional movement for kings.
  + **Jumping & Capturing:** Mandatory capturing of opponent’s pieces.
  + **King Promotion:** Pieces are crowned upon reaching the last row.
  + **Win/Loss Conditions:** A player wins when the opponent has no valid moves left.
  + **Draw Conditions:** Draw occurs if a repeated state happens too often or no captures occur within a set number of moves.
* **New Elemental Checkers:**
  + **Fire Piece:** Can burn an adjacent opponent’s piece once per game.
  + **Water Piece:** Can move backward once before being promoted to a king.
  + **Earth Piece:** Can block a capture once per game.
  + **Air Piece:** Can jump over an empty space once per game without capturing.

**2. Implementation Strategy**

The game will be implemented using a combination of **game programming, AI techniques, and user interface development.**

* **Core Game Mechanics:**
  + Implementing movement logic, capture rules, and win conditions.
  + Handling draw detection via repeated states or move limits.
* **AI Implementation:**
  + Using **Minimax Algorithm** for optimal AI decision-making.
  + Designing a **Heuristic Function** to evaluate board positions.
  + Providing different **Difficulty Levels** (Easy, Medium, Hard).
  + Incorporating **Predictive Analysis** to anticipate opponent moves.
* **User Interface & Controls:**
  + Developing **Drag & Drop or Click-to-Move** controls for smooth interaction.
  + Implementing **Undo/Redo** functionality.
  + Adding **Game Replay & History** to review past moves.
  + Integrating **Hints & Move Suggestions** for assistance.
* **Multiplayer & Online Features:**
  + Implementing **Local Multiplayer** for two players on the same device.
  + Enabling **Online Multiplayer** with matchmaking capabilities.
  + Setting up a **Leaderboard & Rankings** system to track player performance.

**3. Deliverables**

* **Game Functionalities:** Fully functional Checkers game with core mechanics and rules.
* **AI Integration:** Intelligent opponent with Minimax and difficulty levels.
* **User Interaction Features:** Undo/Redo, Hints, Game History, and smooth controls.
* **Multiplayer Modes:** Local and online gameplay support.
* **Elemental Checkers Feature:** Special elemental abilities for an innovative gameplay experience.
* **Game States:**
  + **Goal State:** Player wins when the opponent has no valid moves.
  + **Points System:** Tracking victories, losses, and draws.
  + **Lifelines:** Special abilities for elemental pieces.
  + **Game States:** Tracking board positions, player turns, and AI decision trees.