CS396 Project Proposal
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1. Project Title and Summary

Multi-Paradigm Board Game Engine with AI

This project builds a small game engine that combines three programming paradigms, imperative (C++), logic (Prolog), and functional (Scheme), to create a playable two-player game. The goal is to show how languages with very different strengths can work together in one system. The project will start with a Tic-Tac-Toe prototype and may later expand toward Checkers to test scalability and AI depth.

2. Languages Used

- C++ (Imperative/OOP): Controls the main game loop, board state, and input/output.
- Prolog (Logic): Validates moves, checks for wins or draws, and enforces the rules.
- Scheme (Functional): Acts as the AI, generating and evaluating moves using search and recursion.

Each language plays to its strengths. C++ provides structure and performance, Prolog expresses logical relationships clearly, and Scheme handles strategic reasoning through functional abstraction.

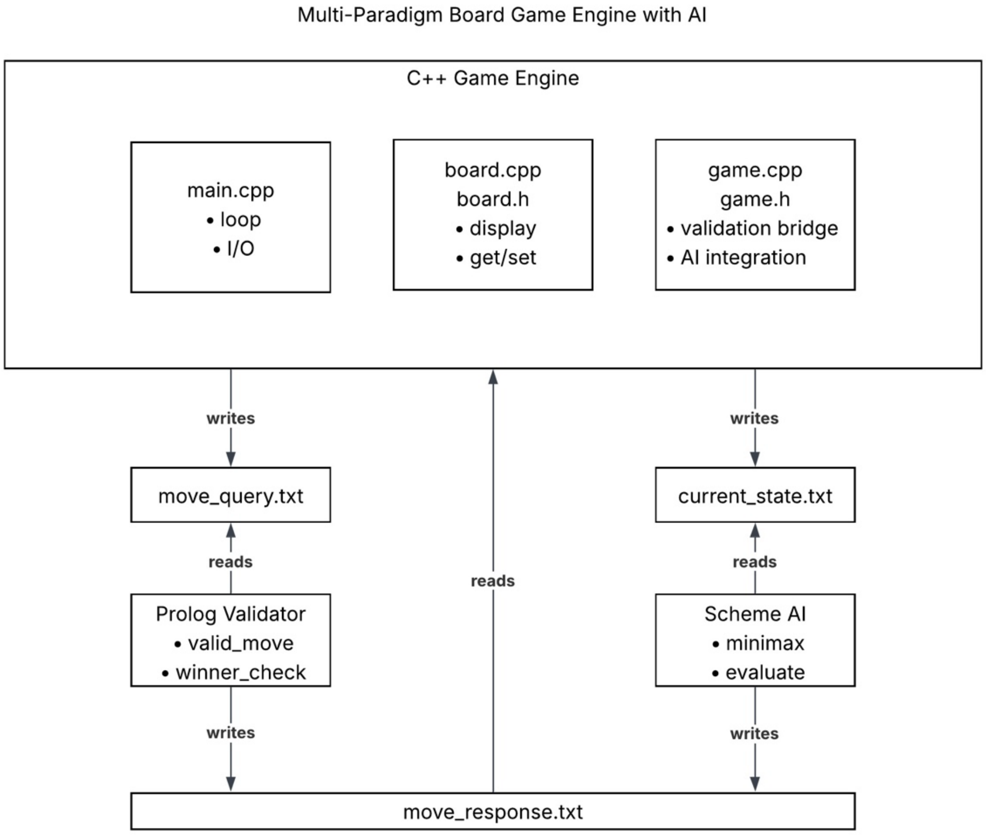
3. Planned Integration Method

All components communicate through plain-text files for simplicity and transparency.

- For human moves, C++ writes to *move_query.txt* and runs Prolog, which validates the move and returns *valid* or *invalid* in *move_response.txt*.
- For AI turns, C++ writes the current board to *current_state.txt*, runs Scheme, and reads the AI’s chosen move from *move_response.txt*.

This file-based system avoids complex linking or APIs and will allow for easy debugging between the languages.

4. Technical Sketch



5. Anticipated Challenges

Key challenges include coordinating file-based communication, learning the unique syntax of Prolog and Scheme, and managing timing between separate processes. Debugging across multiple interpreters may also require extra care. To manage these issues, we’ll build and test one language component at a time, keep file formats minimal, and secure a fully working Tic-Tac-Toe MVP before pursuing Checkers or more advanced AI features.