Reconnaissance Chess Tournament Evaluation: ImprovedAgent Performance Analysis

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Abstract

This report presents a comprehensive evaluation of an enhanced Reconnaissance Chess agent, ImprovedAgent, through a double round-robin tournament involving four distinct agents. The tournament assessed the performance of ImprovedAgent's advanced sensing strategies against baseline and competitive opponents over 10 rounds. All agents utilized Stockfish 15 for move generation, with variations in sensing strategies representing the primary experimental variable. Each matchup consisted of two games with agents alternating colors. ImprovedAgent demonstrated superior performance with 44 total wins, outperforming the previously dominant TroutBot (43 wins) and significantly surpassing random-based agents. The results validate the effectiveness of information-theoretic sensing combined with context-aware strategies in uncertain game environments, while highlighting computational trade-offs in board state tracking and Stockfish integration.

1 Introduction

Traditional chess operates under conditions of perfect information, where both players have complete knowledge of all piece positions. Reconnaissance Chess fundamentally alters this paradigm by restricting players' visibility to only their own pieces and immediately adjacent squares, creating a game of imperfect information. This constraint introduces a critical new strategic dimension: players must periodically use sensing actions to reveal portions of the board, transforming information acquisition into a resource to be managed alongside material and positional considerations. This report evaluates ImprovedAgent, an enhanced agent implementing sophisticated sensing strategies while utilizing Stockfish 15 for move generation. Through a tournament format, we systematically compare agents representing varying levels of strategic sophistication—from random approaches to established competitive strategies. By standardizing the move generation engine across all agents, we isolate sensing strategy as the experimental variable, enabling clear assessment of how different approaches

to information management impact performance in this imperfect information environment.

2 Overview of Tournament Agents

The tournament featured four distinct agents, all utilizing Stockfish 15 for move generation with different sensing strategies. The primary agent under evaluation was ImprovedAgent, which integrates advanced sensing methods designed to reduce uncertainty and maximize information gain through opening heuristics and probabilistic midgame strategies. Move selection is delegated to Stockfish 15 based on the agent's current board state hypotheses. The RandomBot agent, a baseline from the official ReconChess framework, selects both sensing actions randomly while delegating move generation to Stockfish 15, providing a minimum performance benchmark. The RandomSensingAgent represents a variant of ImprovedAgent that retains strategic move-selection logic through Stockfish 15 but uses random sensing choices, thereby isolating the effectiveness of the sensing component. Finally, TroutBot serves as a competitive baseline, employing strategic sensing methods including capture square detection and central board region monitoring, with move generation handled by Stockfish 15.

3 ImprovedAgent Sensing Methodology

3.1 Opening Strategy: Central Control

During the first five moves, ImprovedAgent prioritizes sensing central squares (d4, d5, e4, e5) based on established chess principles. This information is provided to Stockfish 15 for move generation. Central control provides tactical and positional advantages for Stockfish's evaluation, as central squares frequently involve early piece development considered by Stockfish. These areas are critical for king safety considerations in Stockfish's calculations, and early captures and exchanges often occur in central regions, influencing Stockfish's move choices. Implementation details include employing a fixed sequence of high-priority central squares during opening moves before transitioning to adaptive sensing logic, with all move decisions generated by Stockfish 15.

3.2 Midgame Sensing: Probabilistic King Tracking

After the opening phase, ImprovedAgent leverages internal board state hypotheses to guide sensing, with information passed to Stockfish 15. The agent estimates probable opponent king locations using accumulated move and sense results while maintaining persistent central control emphasis for general board awareness. It utilizes weighted distributions over potential sensing squares and focuses on likely king locations and areas of high uncertainty to inform Stockfish's strategic calculations.

3.3 TroutBot Improvements Incorporated

ImprovedAgent incorporates two key strategies from TroutBot that enhance information provided to Stockfish: sensing squares where pieces have been captured and sensing squares where pieces might be captured.

4 Tournament Format and Constraints

The tournament employed a 10-round double round-robin format where each agent played both White and Black in every pairing. All agents utilized Stockfish 15 for move generation. Stockfish crashes during games were excluded to ensure fairness, and board state tracking was reduced to manage computational load, potentially affecting Stockfish's performance due to time constraints.

5 Tournament Results

5.1 Round-by-Round Performance

The tournament comprised 10 rounds with each round featuring matchups between all four agents. Detailed results for each round are presented in Table 1 (Rounds 1-7) and Table 2 (Rounds 8-10). All move decisions were generated by Stockfish 15 based on each agent's sensing information.
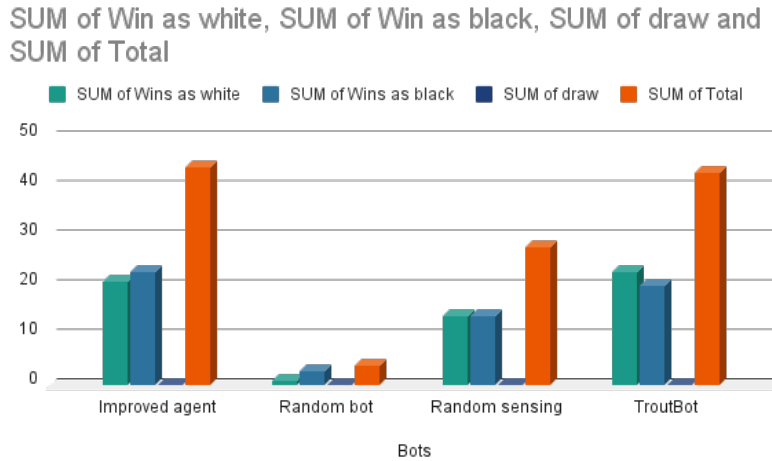

Figure 1: Performance comparison of bots

Table 1: Tournament Results: Rounds 1-7 (All moves generated by Stockfish 15)

Round	Bot	Wins as White	Wins as Black	Draws	Total
Round 1	ImprovedAgent	3	2	0	5
	TroutBot	3	2	0	5
	RandomSensing	0	1	0	1
	RandomBot	0	1	0	1
Round 2	ImprovedAgent	2	3	0	5
	TroutBot	2	2	0	4
	RandomSensing	0	2	0	2
	RandomBot	0	1	0	1
Round 3	ImprovedAgent	3	1	0	4
	TroutBot	3	2	0	5
	RandomSensing	2	1	0	3
	RandomBot	0	0	0	0
Round 4	ImprovedAgent	2	3	0	5
	TroutBot	2	2	0	4
	RandomSensing	2	1	0	3
	RandomBot	0	0	0	0
Round 5	ImprovedAgent	2	1	0	3
	TroutBot	3	2	0	5
	RandomSensing	3	1	0	4
	RandomBot	0	0	0	0
Round 6	ImprovedAgent	1	2	0	3
	TroutBot	2	2	0	4
	RandomSensing	3	2	0	5
	RandomBot	0	0	0	0
Round 7	ImprovedAgent	2	2	0	4
	TroutBot	2	2	0	4
	RandomSensing	2	1	0	3
	RandomBot	1	0	0	1

5.2 Overall Tournament Summary

Table 3 presents the aggregated results across all 10 rounds, providing a comprehensive view of each agent's performance. All move decisions were generated by Stockfish 15.

6 Performance Analysis

6.1 ImprovedAgent vs RandomBot

ImprovedAgent demonstrated complete dominance over RandomBot with 44 wins versus 4 wins despite both using Stockfish 15 for moves. This outcome validates

Table 2: Tournament Results: Rounds 8-10 (All moves generated by Stockfish 15)

Round	Bot	Wins as White	Wins as Black	Draws	Total
Round 8	ImprovedAgent	2	3	0	5
	TroutBot	2	2	0	4
	RandomSensing	0	2	0	2
	RandomBot	0	1	0	1
Round 9	ImprovedAgent	3	3	0	6
	TroutBot	2	2	0	4
	RandomSensing	1	1	0	2
	RandomBot	0	0	0	0
Round 10	ImprovedAgent	1	3	0	4
	TroutBot	2	2	0	4
	RandomSensing	1	2	0	3
	RandomBot	0	1	0	1

Table 3: Overall Tournament Summary (Stockfish 15 move generation)

Bot	Wins as White	Wins as Black	Draws	Total
ImprovedAgent	21	23	0	44
RandomBot	1	3	0	4
RandomSensing	14	14	0	28
TroutBot	23	20	0	43
Grand Total	**59**	**60**	**0**	**119**

the superiority of informed sensing over random approaches when coupled with Stockfish, demonstrating that strategic information gathering provides significant advantage even with identical move generation engines.

6.2 ImprovedAgent vs TroutBot

The competition between ImprovedAgent and TroutBot was closely contested, with ImprovedAgent slightly outperforming TroutBot (44 vs 43 wins) while both utilized Stockfish 15. Both agents demonstrated effective sensing strategies that enhanced Stockfish's performance. ImprovedAgent's losses primarily resulted from computational timeouts affecting Stockfish, and the close margin indicates similar strategic effectiveness when combined with Stockfish.

6.3 TroutBot's Performance

TroutBot performed well against RandomBot and RandomSensingAgent, as expected given its strategic sensing capabilities. However, it failed to maintain

consistent superiority against ImprovedAgent, revealing limitations when facing more refined sensing techniques combined with Stockfish's move generation.

6.4 RandomSensingAgent Performance

RandomSensingAgent's performance, with 28 total wins, demonstrates that strategic move selection through Stockfish alone provides significant advantage over completely random play (RandomBot's 4 wins), but falls short of agents with strategic sensing capabilities.

6.5 Computational Constraints and Stockfish Performance

All agents experienced Stockfish timeouts due to computational overhead, with ImprovedAgent's extensive board state tracking particularly reducing time available for Stockfish calculations. Performance differences resulted from sensing quality rather than move generation capability, and Stockfish crashes were excluded to ensure fair comparison of sensing strategies.

7 Discussion

7.1 Key Findings

The tournament results demonstrate that strategic sensing significantly enhances Stockfish's performance in Reconnaissance Chess. The combination of opening heuristics and probabilistic midgame sensing improves Stockfish's decision-making, though computational constraints can substantially affect Stockfish's move generation quality. Information-theoretic approaches provide measurable advantages even with identical move engines.

7.2 Stockfish Integration Considerations

ImprovedAgent's performance involves important trade-offs with Stockfish integration. Extensive board state tracking reduces time available for Stockfish move calculations, and Stockfish timeouts represent a non-strategic performance limitation across all agents. The quality of sensing information directly impacts Stockfish's effectiveness, and balancing computational resources between sensing and Stockfish execution remains crucial.

8 Conclusion

This evaluation demonstrates that ImprovedAgent's enhanced sensing strategy, when combined with Stockfish 15 for move generation, provides measurable advantages in Reconnaissance Chess. The agent's performance against TroutBot—both utilizing Stockfish—confirms that information-theoretic sensing combined with context-aware strategy yields superior gameplay in uncertain environments.