Tales of Tribute AI Competition COG 2024

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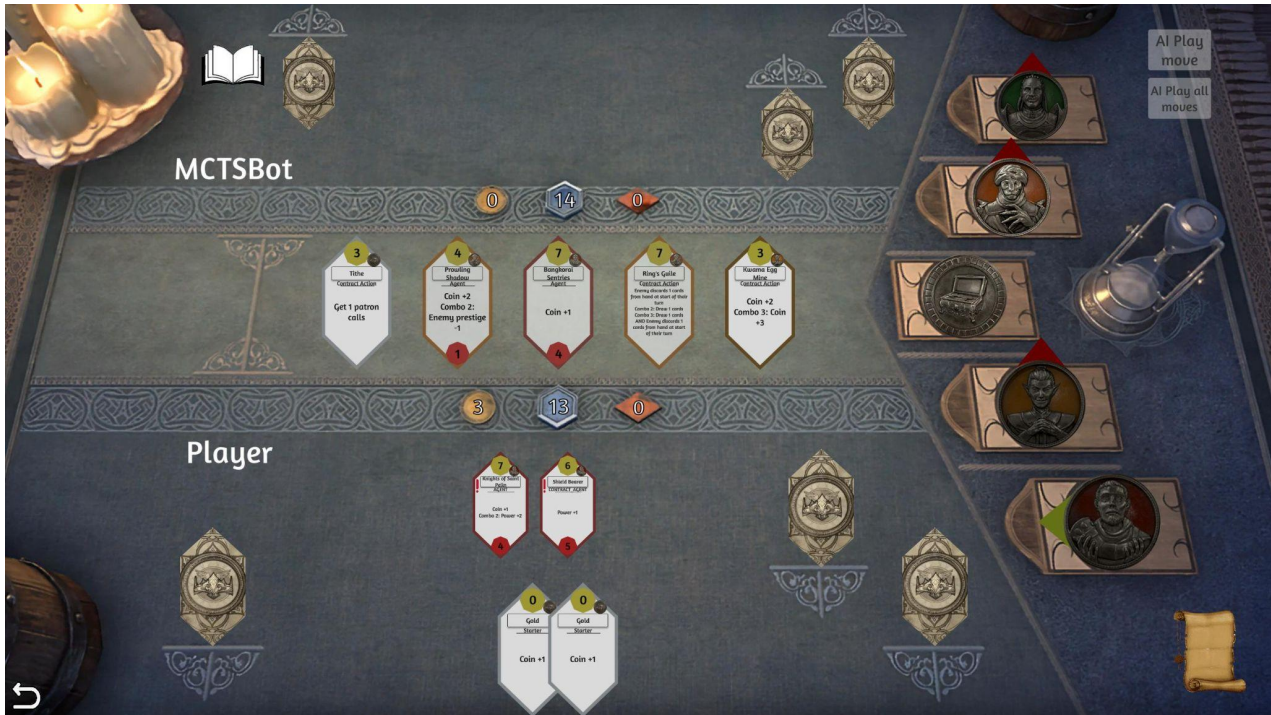
Scripts of Tribute framework

- ★ Based on The Elder Scrolls Online deck-building minigame Tales of Tribute
- ★ Reimplementation of the game in C# .NET Core
- ★ Allows writing agents, and playing games human vs AI, and AI vs AI



Scripts of Tribute framework

GUI

★ GUI for human vs open hand AI play (in Unity, builds for different OS's provided)
★ Shows agents logs and detailed play history
★ Suitable for debugging your bot

Game Runner

★ Console Game Runner for AI vs AI play
★ Allows large-scale testing
★ Logging options available

Engine features

★ Seeded simulation mechanism for handling hidden information
★ Logging functions

Scripts of Tribute framework

Programming Languages Allowed

- ★ C# – native to the framework: access to game methods, forward model available
- ★ External Language Adapter – via stdio with json-based communication

Available Agents

- ★ 8 Sample agents:
  Random, Max Prestige, Patron Favors, Max Agent, Decision Tree,
  Flat Monte Carlo, MCTS, Beam Search
- ★ All agents from previous competitions

Environment Setup

- ★ Dockerfile provided
- ★ Video with instructions

Submitted Agents (1)

BestMCTS3 by Adam Ciężkowski, Artur Krzyżyński (University of Wroclaw)

[Previous competition winner, updated to handle new patron deck]
MCTS-based agent with multiple optimizations to reduce branching factor and nondeterminism.
Search is one turn deep, and uses evaluation function with handmade features and evolutionary-tuned weights.
The algorithm handles three MCTS trees at once.
The details of the agent are described in the bachelor thesis.

HQL_BOT, by Rafał Stochel (University of Wroclaw)

Heuristic Q-Learning Bot.
Q-Learning is used to compute strength of each card.
These values, alongside other statistics are used in heuristic evaluation function.
Game tree search is handled by a Beam Search algorithm.

Submitted Agents (2)

Sakkirin, by Katsuki Ohto

Rule based agent with move scoring.

SOISMCTS, by Anthony Owen (University of Bath),
Joshua Kritz, Raluca Gaina, Simon Lucas (Queen Mary University of London)

Information Set Monte Carlo Tree Search.
Agent heavily based on previous year's winner (BestMCTS3)
Various improvements like MAST, node reuse, determinisations, budget allocation, have been tested.

ToT-BoT, by Sebastian Lashmet (Byram Hills High School),
Alexander Dockhorn (University of Hannover)

Reinforcement Learning agent in Python (using External Language Adapter).
Game state is encoded into a vector (of size 14,079).
Run through Proximal Policy Optimization from Stable Baselines 3, outputting 105 dimensions weight vector, from which maximum value action is taken.

Evaluation

Given 5 submissions, we did not include any example agents in the evaluation.

Every two submitted agents were compared against each other using ~600 games*, and all games were performed with the same seeds, each seed repeated 10 times.

Overall, each agent played ~1,900 games*, and we score them based on the average winrate.

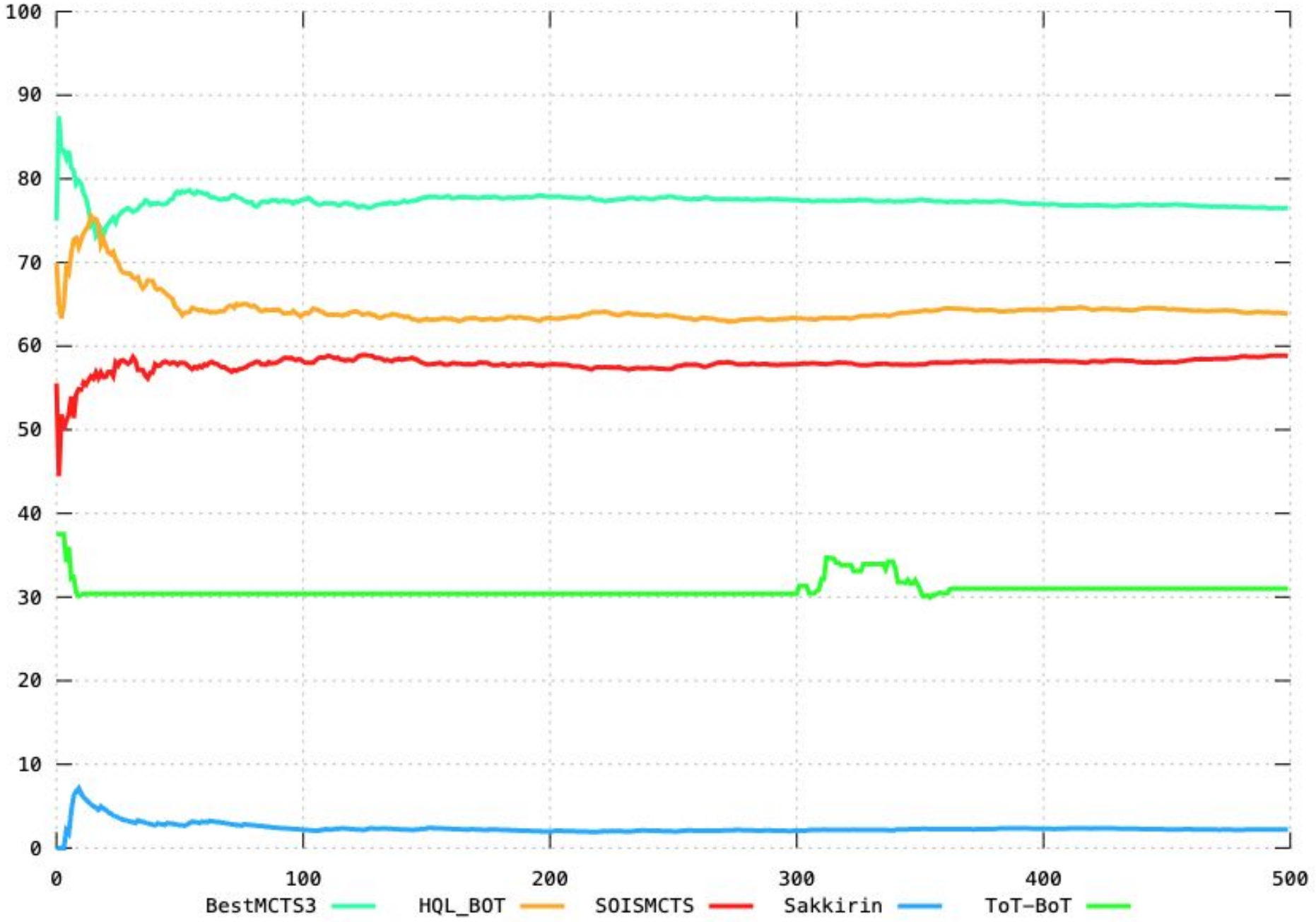
Running setup: Ubuntu 22.04, .Net 7.0, Premium Intel, 1vCPU, 2GiB RAM

All participants source code, competition data, and running scripts are available at https://github.com/ScriptsOfTribute/ScriptsOfTribute-CompetitionsArchive

* With the exception of ToT-Bot, which due to multiple restarts had played much less games.

Results

	Player	Wins
1	**BestMCTS3**	**76.59%**
2	**HQL_BOT**	**63.83%**
3	**SOISMCTS**	**58.83%**
4	ToT-BoT	31.03%
5	Sakkirin	2.20%



Detailed Results

vs.	**BestMCTS3**	**HQL_BOT**	**SOISMCTS**	ToT-BoT	Sakkirin
BestMCTS3		67.75%	62.07%	96.25%	98.72%
HQL_BOT	32.25%		60.34%	83.13%	97.84%
SOISMCTS	37.94%	39.66%		75.64%	97.92%
ToT-BoT	3.75%	16.87%	24.36%		80.77%
Sakkirin	1.28%	2.16%	2.08%	19.23%	

Future editions

Planned for **COG 2025**

- ★ Framework improvements:
  - External Language Adapter
  - QoL changes according to users' input
  - GUI improvements
  - More setup options
- ★ Balance changes according to ESO patches
- ★ Changed decks pool
- ★ Example agents in other languages (using External Language Adapter)

- ★ Whatever we can improve to make YOU participate

github.com/ScriptsOfTribute
discord.gg/RSZjNHuHGm

Winners

Prizes sponsored by

IEEE Computational Intelligence Society

BestMCTS3
Adam Ciężkowski, Artur Krzyżyński

HQL_BOT
Rafał Stochel

SOISMCTS
Anthony Owen, Joshua Kritz, Raluca Gaina, Simon Lucas

Resources

Sources of information regarding the framework and competition rules

- ➔ Webpage and repositiory:

  github.com/ScriptsOfTribute

- ➔ Introductory video:

  youtu.be/3FxBlZ40l6o

- ➔ Discord channel:

  discord.gg/RSZjNHuHGm

- ➔ *Introducing Tales of Tribute AI Competition*, COG 2024 Article:

  arxiv.org/abs/2305.08234

- ➔ Mail:

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Thank You