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CSCI 4950

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Reinforcement Learning for Risk (board game)

For my senior project I propose developing a reinforcement learning agent to play the board game Risk. The agent will only be functional for a single variant of gameplay (“World Domination rules”). The objective is to create an agent that is capability of competitive play. If completed, a fully functional agent may be re-purposed to be a stand alone player in a human game.

The game of Risk is very interesting from an artificial intelligence stand point. It has a very large state space, and requires players to make more than one decision per turn, with the outcome heavily weighing on chance, but can be tilted in your favor to observe some optimal gameplay characteristics (Robinson). This agent will learn using reinforcement learning, and should start off with no knowledge of the strategy of the game. The performance measures of this agent will be how many games it wins out of how many games it plays, and the acceleration of this metric. The environment is the Risk board game using normal (no optional or expanded rules) that can be found in the instructions (Hasbro). The environment will be made from scratch in Python. The actions the agent can take are the same as any human player, and are defined in the rules. And just like a normal game everything in the game is observable, except that the cards owned by other players are face down. I will run it against scripted agents, and various half-scripted half-learning agents developed for other platforms and compare the results.

My expected outcome is that an agent will not perform well against scripted agents for a considerable amount of time, but will conform to their flaws and exploit their inability to adapt. It will be interesting to see how it performs against other kinds of agents, and the results (performance measures) will be published in the final technical report.

**References**

Hasbro. *Risk Instructions*. Web <https://www.hasbro.com/common/instruct/risk.pdf>

Wolf, Michael. *An Intelligent Artificial Player for the Game of Risk*. Web <http://www.ke.tu-darmstadt.de/lehre/arbeiten/diplom/2005/Wolf_Michael.pdf>

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