Developing an artificial intelligence (AI) for XiangQi

Very recently (end of January 2016), using Artificial Intelligence techniques falling under the category of Deep Learning, Google researchers in Great Britain have developed a Go engine (AlphaGo) able to beat one of the best players in the world, Europe's reining Go champion Fan Hui (http://www.wired.com/2016/01/in-a-huge-breakthrough-googles-ai-beats-a-top-player-at-the-game-of-go/). This was a major breakthrough, as Go is considered by many as the Graal challenge in Artificial Intelligence. At Go, hundreds of possible moves exist for each given position, which makes it completely impossible to use brute force approaches. AlphaGo was successful only thanks to an accurate combination of Deep Learning techniques (https://en.wikipedia.org/wiki/Deep_learning) and Monte Carlo Tree Search (https://en.wikipedia.org/wiki/Monte_Carlo_tree_search).

XiangQi (象棋, pinyin xiàngqí) is also known as the "Chinese chess". It is much simpler a problem than Go and even than Western chess, as usually fewer moves are legal in a given position, and some pieces only have a defensive role and cannot participate in any attack in enemy territory. The aim of this project is to explore how heuristics such as Monte Carlo Tree Search can help design a reasonably good Xiàngqí artificial intelligence.

Breakdown of some of the tasks to be carried out over the course of the project:
(1) analyse the challenges of IA development for 象棋: analyse the characteristics of the game and propose a strategy to assess the strengths and weaknesses of a position on the board
(2) design the class architecture (UML) for this project
(3) try and build a strong position assessment algorithm
(4) use minimax approach to implement the search algorithm
(5) adapt Monte Carlo Tree Seach techniques to improve game tree exploration (alternative path, can be explored on its own)
(6) develop a user interface (also quite independent from the rest)

Necessary skills: good handling of recursive data structures (search trees), ability to understand and harness the power of new algorithmic strategies, ability to work in a group (two or three students required for this project).

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