Master Thesis - Academic year 2015-2016

Parallel local search algorithms for the Eternity II Puzzle Problem

Description



This master thesis aims at developing a parallel local search algorithm to tackle the Eternity II (E2 or E II) puzzle problem. The problem was presented as a 256-tile puzzle competition in 2007 by Christopher Monckton with a $2 million prize for the first complete solution. Nevertheless, the competition ended in December 2010 without winners.

The problem consists of a puzzle with n^2 tiles that must be placed on a regular n by n grid. Each tile contains four color patterns, one in each edge. The goal is to rotate and place these tiles such that the shared edge between any two adjacent tiles have the same color, i.e. the patterns of adjacent tiles at the shared edge must be the same. The corner tiles contain grey edges that must match the border of the puzzle.

For more details on the puzzle, we direct the reader to:

(1) Android App, developed by CODeS group: https://play.google.com/store/apps/details?id=be.kahosl.cs.demo

(2) Wikipedia page: http://en.wikipedia.org/wiki/Eternity_II_puzzle

Several algorithms were applied to the Eternity II problem. However, only instances with up to 100 tiles could be solved so far. This master thesis focuses on the investigation of different strategies, data structures and synchronization approaches towards developing competitive parallel algorithms for the problem. Initially, the student will develop a simple parallel backtracker to solve the problem. It is expected that this first solver will be able to solve small instances of the puzzle. During the development, different implementation alternatives should be analyzed. Afterwards, the parallel solver will be improved by incorporating heuristic rules and other optimization techniques, such as alternative graph representations of the problem.

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