PUZZLE OF DOOM (ETERNITY II)

M – Artificial Intelligence – Evolution Programs Part II

1. CONTEXT

The Eternity II puzzle is a puzzle competition which was released on 28/07/2007. The competition ended at noon on 31 December 2010. Christopher Monckton, the publisher, offered a $2 million prize for the first complete solution. No one was able to solve it and the money is not available anymore but you are here to try your chance!

The Eternity II puzzle is an edge-matching puzzle which involves placing 256 square puzzle pieces into a 16 by 16 grid, constrained by the requirement to match adjacent edges. It has been designed to be almost impossible to solve by brute-force search. A solution is a board matching all the 480 edges, the best known partial solution being a board with 467 matches.

Every piece of the puzzle has its edges on one side marked with different shape/color combinations (collectively called "colors" here – see archive file given). Each must match precisely with its neighboring side on every adjacent piece when the puzzle is complete.

The number of possible configurations for the Eternity II puzzle, assuming all the pieces are distinct, and ignoring the fixed pieces with pre-determined positions, is $256! \times 4^{256}$, roughly 1.15×10^{661}.
A tighter upper bound to the possible number of configurations can be achieved by taking into account the fixed piece in the center and the restrictions set on the pieces on the edge: $1 \times 4! \times 56! \times 195! \times 4^{195}$, roughly 1.115×10^{557}.

Deal with it!

2. SUBJECT

The goal of this project is to build an Eternity II solver. You will have to base your solution on an evolution program.

2.1. SOLVE

Find the best solution you can! You will be mainly evaluated on this point.

2.2. REPORT

You will be partly evaluated on the quality of your work report:

- Test several approaches to reach your goal and expose your thinking progress.
- Every document you can provide in order to present your work is strongly recommended: charts, design explanations, scientific papers, benchmarks, etc.

Remember to trace EVERY STEP of your work! Be scientific!

3. TOOLS

You have access to an archive file containing a picture of each puzzle piece, identified by a number, in the puzzle. We expect you to use these pieces to design your solver and present your results.