



Executive Summary

TITLE: **D2.3.2: Relationship between the autocorrelation measures and the difficulty for trajectory-based methods.**

PAPERS RELATED:

- F. Chicano, F. Daolio, G. Ochoa, S. Vérel, M. Tomassini, E. Alba, Local Optima Networks, Landscape Autocorrelation and Heuristic Search Performance, PPSN 2012, LNCS 7492, pp. 337-347, Taormina, Italy

ABSTRACT:

Recent developments in fitness landscape analysis include the study of Local Optima Networks (LON) and applications of the Elementary Landscapes theory. This work represents a first step at combining these two tools to explore their ability to forecast the performance of search algorithms. We base our analysis on the Quadratic Assignment Problem (QAP) and conduct a large statistical study over 600 generated instances of different types. Our results reveal interesting links between the network measures, the autocorrelation measures and the performance of heuristic search algorithms.

GOALS:

1. Combine Landscape Theory and Local Optima Networks to analyze their ability to forecast the performance of search algorithms.

CONCLUSIONS:

1. Our study confirms that the real-like instances are easier to solve by heuristic search algorithms. Clearly, in these problems, the number of local optima in the landscape is a much better predictor of search difficulty than the size of the search space.
2. Overall, the GA was a stronger algorithm to solve all the studied classes of QAP instances. Moreover, the GA is more robust to the increase in problem size. Interestingly, the performance of SA and GA is correlated for the uniform instances, but this is not the case for the real-like instances. Which suggests that the GA is better at exploiting the more clustered structure of the real-like instances.
3. Our study provides supporting evidence of the correlation length conjecture indicating that the number of local optima is inversely correlated to the correlation length.

RELATION WITH PAST

DELIVERABLES:

PRE: D2.3.1 (advisable reading)

PRE: D2.4.1 (advisable reading)

OTHERS:

- E. Angel, V. Zissimopoulos, On the landscape ruggedness of the quadratic assignment problem, Theoretical Computer Science 263 (2000) 159–172
- F. Daolio, M. Tomassini, S. Vérel, and G. Ochoa. Communities of minima in local optima networks of combinatorial spaces. Physica A: Statistical Mechanics and its Applications, 390(9):1684 – 1694, 2011