Málaga, Mes de 2013

Executive Summary

TITLE: **D3.4.2 Techniques to improve the performance in Dynamic Optimization**

PAPERS RELATED:

- H. Ben-Romdhane, E. Alba, S. Krichen, Best Practices in Measuring Algorithm Performance for Dynamic Optimization Problems, Soft Computing, 17(6):1005-1017, 2013. ISSN: 1432-7643
- M. R. Khouadjia, E-G. Talbi, L. Jourdan, B. Sarasola, E. Alba, Multi-Environmental Cooperative Parallel Metaheuristics for Solving Dynamic Optimization Problems, Journal of Supercomputing, 63(3):836–853, 2013. ISSN: 1573-0484
- Y. Bravo, G. Luque, and E. Alba, Migrants Selection and Replacement in Distributed Evolutionary Algorithms for Dynamic Optimization. Distributed Computing and Artificial Intelligence, AISC 217, pp. 155-162, Springer International Publishing Switzerland 2013. ISBN: 978-3-319-00550-8
- Y. Bravo, G. Luque, and E. Alba, Takeover Time in Dynamic Optimization Problems. IEEE Symposium on Computational Intelligence in Dynamic and Uncertain Environments CIDUE 2013. pp.25-30. ISBN: 978-1-4673-5849-1

ABSTRACT: Much work is still to be done in the field of dynamic optimization (DO), motivated from every time bigger real-world challenges. Several approaches have been proposed to date, e.g. using memory or a multi-population, to enhance traditional meta-heuristics in DO.

GOALS:

1. Design and evaluate new metaheuristic algorithms and/or operators to improve the performance in dynamic optimization problems.

CONCLUSIONS:

1. Best practices to analyze and compare DO algorithms require first using both, fitness and behavioral measures. Then, reporting numerical data and aside statistical assessment, in addition to the visual way. Finally, it is important to take care of scalability in the problem to level-up results, since small and large instances can draw different conclusions with the same metrics.
2. Migration policies can balance between search of optima solution and track of environmental changes. Fitness based migration policies are favorable, mainly for unimodal DOPs with small changes, but exhibits the loss of global diversity; distance-based strategies are more robust to track larger number of local optima.
3. An original multi-swarm metaheuristic is designed to solve the dynamic vehicle routing problem, using several migration policies to exchange solutions into the different environments. Our approach was able to find high quality solutions for a comprehensive benchmark, and introduced new best solutions to the state-of-the-art.
4. Theoretical models for the panmictic evolutionary algorithm are proposed. Specifically, we calculate the takeover time and the growth curves, which are two common analytical approaches to measure the selection pressure in metaheuristics. This result is important to build better operators and new self-guiding algorithms.