



Málaga, February 2013

Updated: November 2014

## Executive Summary

TITLE: **D2.1.2: Impact of the variation operators in the mathematical models for takeover calculation**

PAPERS RELATED:

- Y. Bravo, G. Luque, and E. Alba, **Takeover Time in Evolutionary Dynamic Optimization: From theory to practice**, Applied Mathematics and Computation, Volume 250, 1 January 2015, Pages 94-104, ISSN 0096-3003

ABSTRACT:

Making theoretical has been a hard task for researchers in the field of Evolutionary Dynamic Optimization (EDO), as only a few approaches have appeared in recent years. In EDO, problems change over time, requiring from the solver, an Evolutionary Algorithm (EA), to continuously adapt to new conditions. Mathematical tools such as the takeover time models, extensively used to characterize and compare EAs in static problems, become much more difficult to understand when the problem changes over time. A preliminary takeover time model have been recently introduced for tournament selection and diversity-generating approaches. In this deliverable, we propose a new enhanced model that takes into account important scenarios that were not initially considered, such as considering several problem parameter and algorithmic operators. We use predictive modeling to describe the EAs performance and statistical analysis to validate our equations. Finally, we show how these theoretical models can be used to build novel techniques in EDO.

GOALS:

1. Build a completely new predictive equations to also take the new scenarios into account.
2. Use a comprehensive test-bed benchmark and perform statistical analysis to validate the new approaches
3. Use these mathematical models to enhance the reactive approach for EDO by showing how new solvers can be created.

CONCLUSIONS:

1. A new model of takeover time for EDO has been proposed, which overcomes the limitations over an initial previous model.
2. This new model is very accurate over a comprehensive set of test-bed functions.
3. We also used them to build a new reactive EA for EDO. It uses the takeover time model to finely-tune the non-uniform mutation and thus to control the convergence time along the run according to the DOP features.

RELATION WITH PAST

DELIVERABLES:

PRE: D2.1.1 (advisable reading)

PRE: D3.5.1 and D3.5.2 (advisable reading)