SIMULATION ET CALCUL HAUTE PERFORMANCE

DESCARWIN

Evolutionary Planning

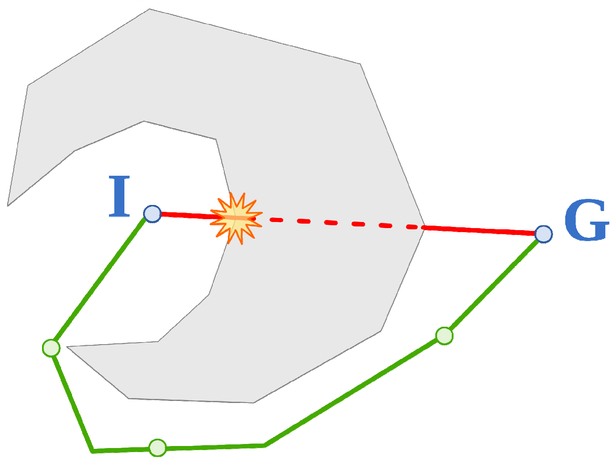
Cosinus 2009

AGENCE NATIONALE DE LA RECHERCHE

ANR

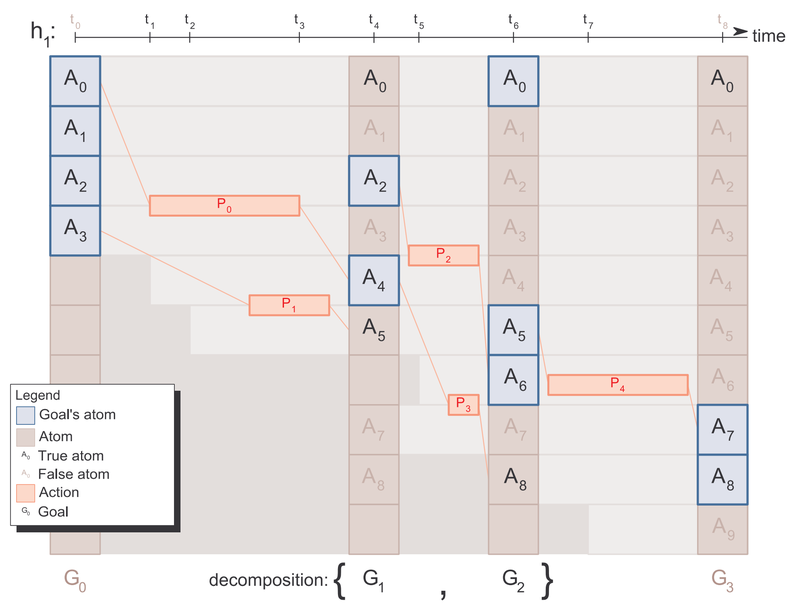
OBJECTIVES

Planning, as the search for the optimal sequence of actions to reach a set of goals, is ubiquitous in critical systems: security (crisis management, surveillance), air traffic management, space missions, industry (supply chain management, logistics and planning), transportation (traffic optimization). This class of problems is usually hard to model and to solve due to the intricacy of constraints and the difficulty of finding the best solutions when multiple objectives are conflicting.



We have developed the domain-independent planner DAE_{YAHSP} based on an evolutionary algorithm which divide the problem into subproblems which are in turn submitted to the embedded solver YAHSP.

The objectives of DESCARWIN are to refine and validate the *Divide-and-Evolve* method w.r.t. state-of-the art planners, and to extend the scope with features required by real-world planning problems.



METHODOLOGY AND RESULTS

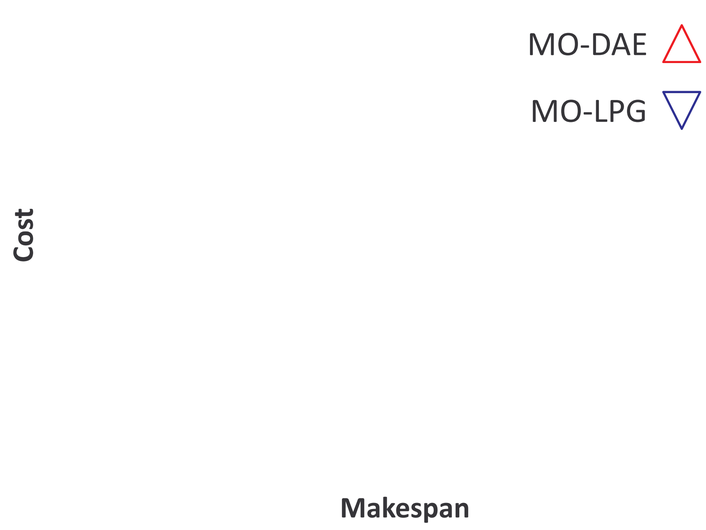
The planner was rewritten and optimized before being submitted to the 7th International Planning Competition where he won the first prize in the deterministic temporal satisficing track.

Two new features were added: a temporal reasoning capability (activity constraints) and multiobjective optimization. With activity constraints, events which occur in the future can be stated in the effects of an action. It is then possible to take a predictable evolving environment into account such as in the crisis emergency use case we have studied.

When solution quality is assessed with multiple criteria which are antagonistic and when in addition the context is such that no aggregation function can be conceived, then we can only build the set of non-dominated solutions: the so-called Pareto front. Several approaches from the Evolutionary Computation field were experimented on a set of brand new multiobjective benchmarks.

We retained the Indicator-Based Evolutionary Algorithm based on the hypervolume indicator.

The resulting planner, MO-DAE, was compared to MO-LPG which it outperforms.



CONCLUSION AND PERSPECTIVES

The new planner will be offered to the open source community and also recommended in Thales for real-life applications. Of course we will defend our title at the next international planning competition to be held in 2014.

COORDINATOR: Thales Research and Technology
PARTNERS: INRIA Saclay, ONERA

ONERA
THE FRENCH AEROSPACE LAB

CONTACT :

Pierre.saveant@thalesgroup.com

THALES

Inria
INVENTEURS DU MONDE NUMÉRIQUE

LES RENCONTRES DU NUMÉRIQUE
17 et 18 avril 2013