TemPoRal: Temporal Portfolio Algorithm

Isabel Cenamor
Universidad Carlos III de Madrid
icenamorg@gmail.com

Mauro Vallati
University of Huddersfield.
m.vallati@hud.ac.uk

Lukáš Chrpa
Czech Technical University in Prague &
Charles University in Prague
chrpaluk@fel.cvut.cz

Tómas de la Rosa
Universidad Carlos III de Madrid
trosa@inf.uc3m.es

Fernando Fernández
Universidad Carlos III de Madrid
ffernand@inf.uc3m.es

Abstract

This paper describes *TemPoRal*, a Temporal Planning Portfolio submitted to the satisficing temporal track of the International Planning Competition 2018. This portfolio performs a static equal time assignment of the available time to each of the portfolio components, which where empirically selected from the state-of-the art temporal planners.

Introduction

A planning portfolio is an automated planning system made of a set of individual planners for which one assigns a slot of the available time in order to solve a planning task. In the context of classical planning, the community has shown for several years that planning portfolios are very powerful in exploiting the complementary strength of different automated planners. For instance, portfolio-based approaches delivered outstanding performance in the 2014 edition of the International Planning Competition (IPC) (Vallati et al. 2015; Vallati, Chrpa, and McCluskey 2018). Even a simple equal-time assignment on a diverse set of planners can outperform most of the single planners (Fawcett et al. 2014; Cenamor, de la Rosa, and Fernández 2016). More elaborated approaches create per-instance configurable portfolio mainly based on some form of *Empirical Performance Models* (EPMs), for instance, *AllPaca* (Malitsky, Wang, and Karpas 2014) or *IBaCoP2* (Cenamor, de la Rosa, and Fernández 2016; 2014), the winner of the sequential satisficing track of IPC-2014.

Interestingly, no portfolio-based approach has participated in the temporal track of IPC so far. At the moment, the only work dealing with temporal planning portfolios appears in Cenamor's dissertation (2017). For the temporal track of this competition our proposal consists of a static portfolio with equal-time assignments. The creation of EPMs is less appealing for this case for several reasons. First, the number of temporal planners is fairly low compared to the available planners for the classical setting, therefore it does not make much sense to have a per-instance selection of a subset of planners when they are actually a manageable set in terms time slot assignment. In addition it is still not clear how the PDDL-level features related to temporal annotations will help to generalize across domains without falling in overfitting. Thus, we keep it simple until looking for deeper insights for this regard. In the next section we describe the details of the proposed static portfolio.

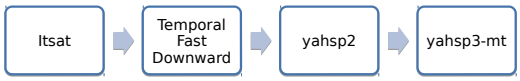

Figure 1: Planner's execution order in the temporal portfolio

TemPoRal Details and Components

For the creation of the portfolio we have considered all the planners that took part in any temporal track of past IPCs. In a first selection we remove planners showing issues during source code compilation, basically due to the use of old or deprecated libraries. Then, after running the candidate planners on a large set of instances, including all the available temporal benchmarks from previous competitions, we discarded the planners that were always dominated by another planner from the group. At the end, the portfolio comprises 4 planners, where each planner has 450 seconds to run in a specific order shown in Figure 1. If a component fails during its execution the remaining time equally re-assigned to the the planners that have not been executed yet.

The TemPoRal portfolio includes the followings component planners:

- *itsat* (Rankooh, Mahjoob, and Ghassem-Sani 2012) translates the problem into a sequence of SAT instances, corresponding to different time horizons.
- *Temporal Fast Downward (TFD)* (Eyerich, Mattmüller, and Röger 2012) is based on the Fast Downward planning system (Helmert 2006) and uses an adaptation of the context-enhanced additive heuristic to guide the search in the temporal state space induced by the given planning problem.
- *yahsp2* and *yahsp2-mt* (Vidal 2011) compute look-ahead plans from delete-relaxed plans and use them in the state-space heuristic search.
- *yahsp3* and *yahsp3-mt* (Vidal 2014) are the latest version of the Yahsp planner, which took part in IPC 2014.

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