

Constraint Solving Based Scheduler In Laboratory Automation *

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Abstract

The presented work implements a scheduler for laboratory automation; it focuses on the special requirements of the field and makes use of an elaborated constraint solving system.

On top of performing experiments, increasing precision and traceability and thereby cutting costs are the major objectives of laboratory automation by replacing manual work through automatization. A well-elaborated plan, which allocates the limited resources to the activities by scheduling, is essential to initiate and coordinate the workflow activities.

Scheduling problems are np-complete and assignable onto constraint satisfaction problems. Solving a problem by constraint programming means, formulating the problem as a set of restrictions which has to be satisfied by a solution. This solution is found by efficient constraint solving algorithms, which are independent of the problem. ECLiPSe is a constraint solving system especially designed for planning.

The presented cscheduler consists of three parts:

1. The **workflow manager** allows editing and extending a workflow as a data representation in XML. With the assistance of the order module, data about a set of samples is assigned to a workflow. In addition, the result of the scheduling process can be shown optionally as i. g. a gantt chart.
2. The **workflow translator** transfers the XML description into a set of constraints. In this step, a workflow is duplicated for each sample; and the result is retranslated to XML.
3. The **scheduler** searches a solution meeting both the constraints and the optimizing criteria.

The system on display is implemented and already working for examples with a small amount of samples. Further work has to be done to cover all requirements of scheduling in laboratory automation

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and to include the system into existing applications i. g. laboratory information management systems.

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