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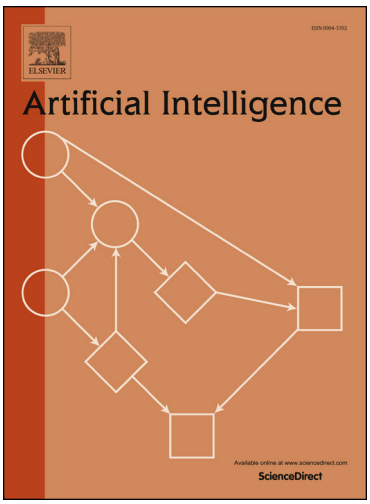

Computing and restoring global inverse consistency in interactive constraint satisfaction

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Computing and Restoring Global Inverse Consistency in Interactive Constraint Satisfaction

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Abstract

Some applications require the interactive resolution of a constraint problem by a human user. In such cases, it is highly desirable that the person who interactively solves the problem is not given the choice to select values that do not lead to solutions. We call this property *global inverse consistency*. Existing systems simulate this either by maintaining arc consistency after each assignment performed by the user or by compiling offline the problem as a multi-valued decision diagram. In this article, we define several questions related to global inverse consistency and analyze their complexity. Despite their theoretical intractability, we propose several algorithms for enforcing and restoring global inverse consistency and we show that the best version is efficient enough to be used in an interactive setting on several configuration and design problems.

Keywords: Constraint Satisfaction Problems, Configuration, Global Inverse Consistency

1. Introduction

Constraint Programming (CP) is widely used to express and solve combinatorial problems. Once the problem is modeled as a constraint network, efficient solving techniques generate a solution satisfying the constraints, if such a solution exists. However, there are situations where the user has strong opinions about the way to build good solutions to the problem but some of the desirable/undesirable combinations will become clear only once some of the variables are assigned. In this case, the constraint solver should be there to assist the user in the solution design and to ensure her choices remain in the feasible space, removing the combinatorial complexity from her shoulders. See the Synthia

[☆] This article is based on material previously presented in CP-13 [1]. This article additionally contains a new section on restoring global inverse consistency after the retraction of a decision from the user. It also contains additional experiments.

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