Constraint Retraction in Dynamic CSPs over Disjoint Real Intervals

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Abstract: Sometimes the constraints in a constraint satisfaction problem (CSP) over continuous domains are not basic and therefore the variable domains are not convex. The variable domains have to be split into unions of disjoint real intervals. Dealing with unions of disjoint real intervals makes constraint solving more complex since the task will require detailed domain analysis.

In a dynamic CSP, we can add a new constraint to the constraint network (a restriction) or delete an old constraint (a relaxation) at any time. Therefore, incrementality is very crucial for solving a dynamic CSP since we do not want to resolve the whole constraint system from scratch whenever a restriction or a relaxation occurs. In this paper, we investigate dynamic CSPs over disjoint real intervals, and propose an algorithm that can handle incremental removal of a constraint. Basing on the hierarchical arc-consistency technique for disjoint real intervals developed by G. Sidebottom and W.S. Havens, the proposed algorithm follows the chain of dependencies among constraints and by doing so it updates only the part of the constraint network which is affected by the deletion, but maintains the rest of the network untouched. This algorithm makes constraint deletion in a dynamic CSP over disjoint real intervals a feasible task that can be efficiently implemented.

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