SFB/TR 8 Spatial Cognition / IQN
Video Conference

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Qualitative Constraint Satisfaction Problems: An Extended Framework with Landmarks

Dealing with spatial and temporal knowledge is an indispensable part of almost all aspects of human activity. The qualitative approach to spatial and temporal reasoning, known as Qualitative Spatial and Temporal Reasoning (QSTR), typically represents spatial/temporal knowledge in terms of qualitative relations (e.g., to the east of, after), and reasons with spatial/temporal knowledge by solving qualitative constraints.

When formulating qualitative constraint satisfaction problems (CSPs), it is usually assumed that each variable could be "here, there and everywhere." Practical applications such as urban planning, however, often require a variable to take its value from a certain finite domain, i.e. it is required to be `here or there, but not everywhere.' Entities in such a finite domain often act as reference objects and are called "landmarks" in this talk. We extend the classical framework of qualitative CSPs by allowing variables to take values from finite domains. The computational complexity of the consistency problem in this extended framework is examined for the five most important qualitative calculi, viz. Point Algebra, Interval Algebra, Cardinal Relation Algebra, RCC5, and RCC8. We show that all these consistency problems remain in NP and provide, under practical assumptions, efficient algorithms for solving basic constraints involving landmarks for all these calculi.

This talk is based on the following work: Sanjiang Li, Weiming Liu, Sheng-sheng Wang: Qualitative constraint satisfaction problems: An extended framework with landmarks. Artificial Intelligence, 2013, 201: 32-58.

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