

Department of Mathematical Sciences Colloquium

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NUMERIC-SYMBOLIC ALGORITHMS FOR CONTINUOUS CONSTRAINT SOLVING

Continuous constraints are constraints whose variables are defined over continuous domains. This is the only notable difference between discrete and continuous constraints. However, this small difference results in the need for very different solving techniques. Indeed, when enumeration (and fancier, more efficient variations of it) is an option with discrete constraints, it is no longer possible when variables can take an infinite amount of values.

In this talk, I present several approaches to address this problem, and I focus on the approaches that use interval computations to model the continuity of the variables' domains. I also introduce the problem of computations performed by computers and their limitations to floating-point numbers. All of these limitations, along with these of interval computations (dependency of the computations), call for the combination of numeric and symbolic algorithms to solve continuous constraints.

I point out that the numeric part of the solving algorithms is indispensable, since the problems at hand are numeric in essence. The symbolic part of these same solving algorithms is essential if we seek efficiency. I show several attempts to speed up the constraint solving process using symbolic algorithms.

I conclude by pointing out future research directions, among which the use of a different interval arithmetic (namely, circular arithmetic) that proved to be efficient for interval computations, and whose use should be further investigated in the case of constraint solving algorithms. Besides, tensors also appear to constitute an interesting alternative approach for they provide a nice framework to keep track of variables' dependencies between constraints and are expected to speed up the domain narrowing process.

**Friday, February 20, 2009 at 3pm in Bell Hall 143
The University of Texas at El Paso**

Refreshments will be served in front of the colloquium room,
15 minutes before the start of the colloquium.

For further information, please contact Dr. Andrzej Pownuk, Bell Hall 201.

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