11f Global Optimization of Mixed-Integer Nonlinear Problems Using Interval Analysis

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Novel deterministic global optimization algorithms for nonconvex mixed-integer problems are proposed. Techniques for extending an interval-Newton approach to handle integer variables have been implemented. Further techniques for handling equality and inequality constraints in mixed-integer optimization with interval-Newton have also been implemented.

Several examples from [1] are used as tests, with the results compared to those obtained with the alpha-BB algorithm. It has been found that the newly extended interval-Newton approach keep the smoothness of the function derivatives over the integer dimensions, and the more the integer variables involved in the optimization problem, the more effective the new approach shown. Finally, an example arising in the determination of phase stability is used to show the practical value of the new interval-based methodology, extending previous work [2,3].

[1] C. S. Adjiman, I. P. Androulakis, and C. A.Floudas, "Global Optimization of Mixed-Integer Nonlinear Problems", AIChE J. Vol.46, No.9, 2000.

[2] G. Xu, W. D. Haynes, M. A. Stadtherr, "New Approach for Reliable Phase Stability Analysis with Asymmetric Models", AIChE Annual Meeting, Austin, TX, 2004.

[3] G. Xu, W. D. Haynes, M. A. Stadtherr, "Reliable Phase Stability Analysis for Asymmetric Models", submitted to Fluid Phase Equilibria, 2005.