Exact penalty methods for generalized Nash problems

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Abstract: A generalized Nash problem (GNP) is a Nash problem where the the feasible set of each player depends on the other players' variables. This kind of problems can not be reduced to a variational inequality (VI) directly, as it is usually done for Nash problems, and very few solution algorithms have been proposed to date. We propose an exact penalty approach to the GNP whereby the GNP is reduced to a (unconstrained) nonsmooth Nash problem. An updating scheme for the penalty parameter is studied that, when used in conjunction with any algorithm for the solution of the nonsmooth penalized Nash problem, guarantess that a correct value of the penalty parameter is found in a finite number of steps. We also propose a smoothing method for the solution of the nonsmooth Nash problem derived from the application of the penalty technique.