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**Smoothing power penalty method for nonlinear complementarity problems.** (English)

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**Summary:** We introduce a new penalty method for solving nonlinear complementarity problems, which unifies the existing  $\ell_1$ -penalty method and the natural residual equation-based method. We establish the exponential convergence rate between a solution of the penalized equations and that of the complementarity problem under a uniform  $\xi$ - $P$ -function and study a perturbed  $b$ -regularity condition. Two kinds of numerical algorithms with global and fast local convergence are designed by virtue of the proposed penalty method.

Preliminary numerical experiments conducted on test problems from Software: MATLAB; TRESNEI; MCPLIB show that the proposed method is efficient and robust.

**MSC:**

**90C33** Complementarity and equilibrium problems and variational inequalities (finite dimensions) (aspects of mathematical programming)

**65K15** Numerical methods for variational inequalities and related problems

**49M30** Other numerical methods in calculus of variations (MSC2010)

**Keywords:**

nonlinear complementarity problem;  $\ell_1$ -penalty method; smoothing penalty method; exponential convergence rate; smoothing Newton method

**Software:**

MCPLIB; TRESNEI; Matlab

**Full Text:** [Link](#)