

Manual of LCP_ReSNA

— ReSNA Plugin for Linear Complementarity Problems —

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1 Problem

`LCP_ReSNA.m` solves (tries to solve) the Linear Complementarity Problem (LCP) expressed as follows:

$$\begin{aligned} \text{Find } (x, y) &\in \mathbb{R}^n \times \mathbb{R}^n \\ \text{such that } x &\geq 0, y \geq 0, x^\top y = 0, \\ y &= Mx + q, \end{aligned} \tag{1.1}$$

where $M \in \mathbb{R}^{n \times n}$ and $q \in \mathbb{R}^n$ are given matrix and vector, respectively.

2 How to use the plugin

Putting `ReSNA.m` in the same folder, you can use `LCP_ReSNA.m` as follows.

Usage 1: `[x,y] = LCP_ReSNA(M,q)`

Usage 2: `[x,y] = LCP_ReSNA(M,q,x0,y0)`

- `M` — implies the matrix $M \in \mathbb{R}^{n \times n}$ in problem (1.1).
- `q` — implies the vector $q \in \mathbb{R}^n$ in problem (1.1).
- `x0` — implies the initial point $x^{(0)}$ for the regularized smoothing Newton algorithm (Algorithm 4.1 in `manual_ReSNA.pdf`). `x0` should be given as a column vector whose length is equal to `length(q)`. If you omit `x0` or let `x0 = []`, then ReSNA chooses a random vector from $[-1, 1]^n$ automatically.
- `y0` — implies the initial point $y^{(0)}$, which can be omitted similarly to `x0`.

Parameters in `ReSNA.m`

- `PROGRESS` — decides whether or not ReSNA displays the detailed progress of the iteration. The default value is `'Y'`.
- `tole` — is used for the termination criterion in Step 1 (Algorithm 4.1 in `manual_ReSNA.pdf`). When $\|H_{\text{NR}}(w^{(k)})\| \leq \text{tole}$, the algorithm terminates normally and the obtained output is guaranteed to be the solution of problem (1.1). The default value is `1e-8`.
- `tole_diff` — is used for approximating the Jacobian matrix by means of the finite difference method. The default value is `1e-8`. (This parameter is not used for this plugin.)

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- `eta`, `eta_bar`, `rho`, `sigma`, `kappa`, `kappa_bar`, `kappa_hat` — are the parameters indicated in Algorithm 4.1 in `manual_ReSNA.pdf`. Some default values are assigned automatically.