

# A SIMPLICIAL ALGORITHM FOR COMPUTING AN INTEGER ZERO POINT OF A MAPPING WITH THE DIRECTION PRESERVING PROPERTY

收稿日期 2005-11-1 修回日期 网络版发布日期 2006-11-6 接受日期

摘要

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# A SIMPLICIAL ALGORITHM FOR COMPUTING AN INTEGER ZERO POINT OF A MAPPING WITH THE DIRECTION PRESERVING PROPERTY

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## Abstract

A mapping  $f: Z^n \rightarrow R^n$  is said to possess the direction preserving property if  $f_i(x) > 0$  implies  $f_i(y) \geq 0$  for any integer points  $x$  and  $y$  with  $|x_i - y_i| \leq 1$ . In this paper, a simplicial algorithm is developed for computing an integer zero point of a mapping with the direction preserving property. We assume that there is an integer point  $x^0$  with  $c \leq x^0 \leq d$  satisfying that  $\max_{1 \leq i \leq n} (x_i - x^0_i) f_i(x) > 0$  for any integer point  $x$  with  $f(x) \neq 0$  on the boundary of  $H = \{x \in R^n; |c - e \leq x \leq d + e\}$ , where  $c$  and  $d$  are two finite integer points with  $c \leq d$  and  $e = (1, 1, \dots, 1)^{\top} \in R^n$ . This assumption is implied by one of two conditions for the existence of an integer zero point of a mapping with the preserving property in van der Laan et al. (2004). Under this assumption, starting at  $x^0$ , the algorithm follows a finite simplicial path and terminates at an integer zero point of the mapping. This result has applications in general economic equilibrium models with indivisible commodities.

**Key words** [Integer Zero Point](#) [Direction Preserving](#) [Simplicial Algorithm](#) [Triangulation](#) [Existence](#).

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