Dynamics of Continuous, Discrete and Impulsive Systems
Series **B:** *Applications & Algorithms* **17 (2010)** 375-385

http://www.watam.org

COUNTABLY MANY POSITIVE SOLUTIONS FOR NONLINEAR SINGULAR *N*-POINT BOUNDARY VALUE PROBLEMS ON THE HALF-LINE

Peiluan Li[1,2], Yusen Wu[2] and Cheng Liu[2]

[1]Department of Mathematics and Physics
Henan University of Science and Technology, Luoyang 471003, P. R. China

[2]Department of Mathematics
Central South University, Changsha 410075, P. R. China

Corresponding author email: lpllpl_lpl@163.com

Abstract. In this paper, a new fixed point theorem is used to investigate the existence of countable positive solutions of n-point boundary value problem on the half-line. As an application, we give two examples to demonstrate our results.

Keywords. Boundary value problem; Half-line; Existence; Positive solutions; Fixed point theorem.

AMS (MOS) subject classification: 34B15.

1 Introductions

Recently, boundary value problems (BVPs) on the half-line has become a new important branch. The motivation for the present work stems from both practical and theoretical aspects. In fact, boundary value problems (BVPs) on the half-line occur naturally in the study of radially symmetric solutions of nonlinear elliptic equations, see [4,10], and various physical and biological phenomena[2,14,17], such as unsteady flow of gas through a semi-infinite porous media, the theory of drain flows, plasma physics, in determining the electrical potential in an isolated neutral atom. There have been many papers investigated the solutions of boundary value problems on the half-line, see [1,3,7,9,18,19]. However, in all the papers, the authors only studied two-point boundary value problems. By so far, few results are obtained for multi-point boundary value problems on the half-line. Furthermore all the results above are about the existence of no more than five solutions, to the author's knowledge, there are very few papers concerned with the existence of countable positive solutions for multiple point BVPs on the half line. In [11], the authors discussed the existence of countably many positive solutions of n-point boundary value problems for a p-Laplace operator on the half-line, directly inspired by [11], in this paper, by using a new fixed point theorem, we study the existence of countable positive solutions of the following n-point boundary value problem on the half-line

$$u''(t) + a(t)f(u(t)) = 0, \quad t \in J = [0, +\infty], \tag{1}$$