*International Journal of Innovative Computing, Information and Control*
Volume **4**, Number **8**, August **2008**

ICIC International ©2008 ISSN 1349-4198
pp. **1853–1859**

# ALMOST SHIFT INVARIANT SET AND DISTRIBUTIONAL CHAOS IN A SEQUENCE

Lidong Wang[1], Na Wang[2] and Zhenyan Chu[1]

[1]College of Science
Dalian Nationalities University
18 Liao He West Road, Dalian, P. R. China
{ wld; chuzhenyan }@dlnu.edu.cn

[2]Mathematical Department
Liaoning Normal University
950 Huang He Road, Dalian, P. R. China
wangna19821203@163.com

Received June 2007; revised November 2007

Abstract. *Let $(X, \rho)$ be a compact metric space , $f : X \to X$ is continuous. Denote the sets of almost periodic points and weakly almost periodic points of $f$ by $A(\cdot)$ and $W(\cdot)$ respectively. In this paper, we prove that $f$ has an uncountably distributively chaotic set in a sequence, in which each point is weakly almost periodic, if $f$ has an almost shift invariant set.*

**Keywords:** Almost shift invariant set, Distributional chaos in a sequence, Weakly almost periodic points

1. **Introduction.** Since Li and Yorke first gave the definition of chaos with strict mathematical language in 1975 (see [1]), the research of chaos has had a great influence in modern science which is not only natural science but also many humanities, such as economics, sociology, philosophy. The chaotic theory convinces scientists that simple certain systems can produce complicated properties and complex systems possibly follow simple laws. However, people of various fields revealed different chaotic connotations from different angles, and then gave different definitions of chaos such as Li-Yorke chaos, distributional chaos, Devaney chaos. There is no doubt that the mathematical definition of Li-Yorke chaos has bigger influence than any other ones. Whereas distributional chaos have some statistical laws besides the uncertainty of long-term behaviors. So comparing distributional chaos and Li-Yorke chaos is meaningful and significant.

In order to reveal the inner relations between Li-Yorke chaos and distributional chaos, the author brought up the definition of distributional chaos in a sequence in [2]. In this paper, we will give a kind of method, which can extend some chaotic properties from the symbolic space to the compact system, thus prove the following theorem.

**Main theorem** Let $(X, \rho)$ be a compact metric system, $f : X \to X$ is continuous. $f$ has an uncountably distributively chaotic set in a sequence, in which each point is weakly almost periodic, if $f$ has an almost shift invariant set.

2. **Basic Definitions and Preparations.** Throughout this paper, $(X, d)$ will denote a compact metric space with metric $d$ and $f : X \to X$ is a continuous map on $X$. $f^n$ will denote the $n - fold$ iterate of $f$.