Dynamics of Continuous, Discrete and Impulsive Systems
Series **B:** *Applications & Algorithms* **13 (2006)** 361-370

COMPLEX NETWORK TOPOLOGY MINING AND COMMUNITY DETECTION

Bao-hua Cao[1], De-yi Li[2], Bing Li[1] and Gui-sheng Chen[3]

[1]The State Key Laboratory of Software Engineering,
Wuhan University, Wuhan, 430072, China

[2]China Institute of Electronic System Engineering,
Beijing, 100039, China

[3]Department of Computer Science and Technology,
Tsinghua University, Beijing, 100084, China

Emails: cao_baohua@yahoo.com.cn; zinqinli@public.bta.cn

Abstract. Recently,various heterogeneous complex networks featured as "small-world" and "scale-free" have become a common research area of different disciplines. Especially, network topology mining and community detection have become focal topics. Through the investigations of typical features in complex networks, we propose a network nodes evaluation model based on a multivariate hierarchy method. With this model, network core nodes are extracted and a new algorithm about network topology reconstruction is put forward to implementing network backbone topology mining, which provides a new way for data mining and information retrieval. Furthermore, we propose two approaches for network community detection: broken edge clustering and center point diffusing. Experiments show that the methods presented in this paper are of high accuracy with good performance.

Keywords. Complex network, topology mining, community detection, node evaluation, topology reconstruction

1 Introduction

Complex network exists almost everywhere in the real world, from Internet to WWW, from aerial routes to large electric grids, from very large to inter-personal relationship networks, from cell neuron networks to epidemic processes[1]. Even the parasynonym relationship in linguistics can be analyzed as a complex network problem[7].

However, because the research objects of complex networks are often complicated topology networks consisting of thousands of nodes, analysis is time consuming, if the whole complicated topology network is treated as a process object. Therefore, how to reduce the complex network topology, evaluate the core node, and extract backbone topology efficiently and accurately becomes