Chapter 16
Evaluation of the Attack Effect Based on Improved Grey Clustering Model

Chen Yue
School of Information Technology and Network Security, People's Public Security University of China, Beijing, China

Lu Tianliang
Collaborative Innovation Center of Security and Law for Cyberspace, People's Public Security University of China, Beijing, China

Cai Manchun
Collaborative Innovation Center of Security and Law for Cyberspace, People's Public Security University of China, Beijing, China

Li Jingying
School of Information Technology and Network Security, People's Public Security University of China, Beijing, China

ABSTRACT

There are a lot of uncertainties and incomplete information problems on network attack. It is of great value to access the effect of the attack in the current network attack and defense. This paper examines the characteristics of network attacks, there are problems with traditional clustering that index attribution is not clear and the cross of clustering interval. A two-stage grey synthetic clustering evaluation model based on center-point triangular whitenization weight function was proposed for the attack effect. The authors studied the feasibility of applying this model to the evaluation of network attack effect. Finally, an example is given, which showed the model could evaluate the effect of the denial-of-service attack precisely. It is also shown that the model is viable to evaluate the attack effect.

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1. INTRODUCTION

With the rapid development of modern computer technology, the dependence of people on the computer network is deepening. The network attack is the main way to tamper with people's networks, access to confidential information threatening the people's privacy and security. Because of the wide range of design and complex factors, the research of assessing the research of assessing the effect of network attack is a very important part of network attack and defense.

In 1982, Professor Deng had put forward the grey clustering method (Deng, 1982), which is widely used in many fields now, such as teaching evaluation, ecological evaluation and so on, which provides a great help for researchers. There are many uncertainties in the network attack bringing great difficulties to the evaluation work. The authors have improved the grey clustering method based on the selection of whitenization weight function and use it to evaluate the effect. At the same time, in order to solve the problem that traditional whitenization weight function has a certain overlapping in grey judgment that affects the result of evaluation, this paper proposed two-stage grey synthetic clustering evaluation model that based on center-point triangular whitenization weight function.

2. RELATED WORKS

2.1. Research on Network Attack Effect

The main research method of network attack effect evaluation is to evaluate the network attack effect through the designed model. Wang, Xian, and Wang (2005) presented a network effect evaluation model based on network entropy, which is based on the concept of entropy in information theory. In order to solve the problem of inaccurate data of some evaluation indexes, Cao, Zhang, and Wu (2009) proposed a network attack effect evaluation system based on fuzzy set, which makes the results more reasonable and effective. Wang, Jiang, and Xian (2009) proposed a method based on the attribute importance of rough set to reduce the subjectivity in the process of determining the weight of evaluation index. There is research work related to the effects of specific network attacks, such as denial of service attack and other evaluation methods (Wang, 2013) (Li, Zhang, & Zhu, 2015).

2.2. Research on Grey Theory

Grey theory is a kind of method to study the problem which has a little and uncertain information (Liu, 2014). Wang (2012) evaluated teachers' professional ability based on grey absolute degree to decide the rank of the teachers' professional training. Zhao, Zheng, and Zhao (2012) proposed an evaluation mode of the 3G network attack effectiveness based on AHP and grey relational analysis and use grey correlation analysis method to reduce the subjective effects brought by the AHP. Gao, Xu, and Wang (2011) used grey clustering to build a hierarchical network security evaluation system for power enterprises, and divided the network attacks into different levels through clustering. The evaluation system improved the display capabilities of the network security situation, and solved the human disturbance problem existed in the original system. Zhao (2013) presented a network protection capability evaluation model from information protection and defense to analyze the ability of target network protection. The application