Journal of Network and Computer Applications 68 (2016) 90–113

Contents lists available at ScienceDirect

Journal of Network and Computer Applications

journal homepage: www.elsevier.com/locate/jnca

Review

Fraud detection system: A survey

Aisha Abdallah*, Mohd Aizaini Maarof, Anazida Zainal

Information Assurance and Security Research Group, Faculty of Computing, Universiti Teknologi Malaysia, 81310 Skudai, Malaysia

ARTICLE INFO

Article history:
Received 18 August 2015
Received in revised form
4 January 2016
Accepted 11 April 2016
Available online 13 April 2016

Keywords:
Fraud
Fraud detection systems (FDSs)
Areas of fraud
E-commerce systems
Credit card system
Telecommunication system
Issues and challenges
Concept drift
Skewed distribution
Large amount of data
Support real time detection

ABSTRACT

The increment of computer technology use and the continued growth of companies have enabled most financial transactions to be performed through the electronic commerce systems, such as using the credit card system, telecommunication system, healthcare insurance system, etc. Unfortunately, these systems are used by both legitimate users and fraudsters. In addition, fraudsters utilized different approaches to breach the electronic commerce systems. Fraud prevention systems (FPSs) are insufficient to provide adequate security to the electronic commerce systems. However, the collaboration of FDSs with FPSs might be effective to secure electronic commerce systems. Nevertheless, there are issues and challenges that hinder the performance of FDSs, such as concept drift, supports real time detection, skewed distribution, large amount of data etc. This survey paper aims to provide a systematic and comprehensive overview of these issues and challenges that obstruct the performance of FDSs. We have selected five electronic commerce systems; which are credit card, telecommunication, healthcare insurance, automobile insurance and online auction. The prevalent fraud types in those E-commerce systems are introduced closely. Further, state-of-the-art FDSs approaches in selected E-commerce systems are systematically introduced. Then a brief discussion on potential research trends in the near future and conclusion are presented.

© 2016 Elsevier Ltd. All rights reserved.

Contents

[*] Corresponding author.

http://dx.doi.org/10.1016/j.jnca.2016.04.007
1084-8045/© 2016 Elsevier Ltd. All rights reserved.

1. Introduction

Nowadays, most organizations, companies and government agencies have adopted electronic commerce to increase their productivity or efficiency in trading products or services; in areas such as credit card, telecommunication, healthcare insurance, automobile insurance, online auction, etc. (Bolton and Hand, 2002; Allan et al., 2010; Pejic-Bach, 2010). Electronic commerce systems are used by both legitimate users and fraudsters; hence they become more vulnerable to large scale and systematic fraud. Fraud is a crime where the purpose is to appropriate money by illegal means. The Association of Certified Fraud Examiners (ACFE) defines “fraud” as: the use of one's occupation for personal enrichment through the deliberate misuse or misapplication of the employing organization's resources or assets (ACFE, 2002). Internet Crime Complaint Centre (IC3) is a valuable resource for both victims of Internet crime and law enforcement agencies in identifying, investigating and prosecuting these crimes. In 2014, the IC3 received 269,422 complaints with an adjusted dollar loss of $800,492,073; which is a 2.39 percent increase in reported losses since 2013 ($781,841,611) (IC3, 2014). Table 1 summarizes the number of complaints received by the IC3 between 2011 and 2014 and the corresponding dollar losses. From this table, amount of loss steadily increase while number of complaints decrease; this is because, fraud is causing more loss now compared to the past. These huge number of losses have increased the importance of fraud fighting Kou et al., 2004). The purpose of fraud prevention mechanism is to protect the technological systems against fraud by stopping fraud from occurring in the first place. Nevertheless, this mechanism alone is not enough to halt fraud. Fraud detection is also proposed to improve the technological systems security. Fraud detection detects and recognizes fraudulent activities as they enter the systems and reports them to a system administrator (Behdad et al., 2012). Similar to detection approaches in Intrusion detection system (IDS), FDS also uses misuse and anomaly based approaches to detect fraud (Fawcett and Provost, 1997; Sasirekha et al., 2012). Both misuse based FDSs and anomaly based FDSs utilize data mining techniques to determine fraud from large amount of incoming data stream (Ngai et al., 2011). However, there are issues and challenges that hinder the development of an ideal FDS for E-commerce system; such as concept drift, supports real time detection, earliness of detection, skewed distribution, large amount of data, misclassification cost, etc. The presence of any one of these challenges will lead to high false alerts, low detection accuracy and slow detection. These are the parameters used to characterize the performance of FDS. In this paper, we will survey fraud detection systems in five areas that frauds usually occur which are credit card, telecommunication, healthcare insurance, automobile insurance and online auction.

Table 1
IC3 Report on Internet crime.

Year	Complaints received	Dollar loss
2011	314,246	$485,253,871 Million
2012	289,874	$581,441,110 Million
2013	262,813	$781,841,611 Million
2014	269,422	$800,492,073 Million

The remainder of this paper is outlined as follows. Section 2 presents the definition of fraud. Section 3 contains the related review and survey papers in the fraud detection system. Section 4 addresses approaches and mechanisms used to protect against fraud. Section 5 introduces the challenges and difficulties faced by fraud detection systems. Section 6 further defines the types of fraud, fraud detection system approaches and techniques and introduces the challenges and difficulties faced by the fraud detection system in each area. Section 7 discusses the challenges of fraud detection systems and their impact. Finally, Section 8 concludes the paper.

2. Fraud

There are many definitions of fraud and fraudulent activities. The Association of Certified Fraud Examiners (ACFE) defines “fraud” as: the use of one's occupation for personal enrichment through the deliberate misuse or misapplication of the employing organization's resources or assets (ACFE, 2002). The main reason behind the commitment of fraud is to achieve gain on false ground by an illegal means. This has a dramatic impact on the economy, law and even the human moral values (Alexopoulos et al., 2007). Almost all technological system that involves money and services can be compromised by fraudulent acts; for example the credit card, telecommunication, health care insurance, automobile insurance and online auction system (Almeida, 2009). Therefore, frauds in these systems are considered as cyber-crime, causing huge amount of financial losses.

According to the Basel Committee on Banking Supervision, there are different kinds of fraud: internal/occupational frauds or external frauds. Internal frauds happen when an employee commits frauds against his or her organization. In Phua et al. (2005), internal fraud is layered into two levels, it is a high level fraud if the employee is from the management division, and it is considered low level if the employee is not part of the management division. In contrast, external frauds involve a wide range of schemes, including vendors, customers or thefts by other third parties (Chen and Gangopadhyay, 2013). There are three types of external fraudster: 1) the average offender is called soft fraud, 2) criminal offender, and 3) organised crime offender is called hard fraud (Bhowmik, 2011).

3. Related works

Fraud detection system is important in several significant and sensitive sectors or areas. Therefore, fraud detection has been the topic of various surveys and review articles; that may be based on topics such as fraud areas, fraud types, fraud detection approaches and techniques. Bolton and Hand (2002), Kou et al. (2004), Phua et al. (2005), Allan et al. (2010) and Pejic-Bach (2010) surveyed

Download English Version:

https://daneshyari.com/en/article/459603

Download Persian Version:

https://daneshyari.com/article/459603

Daneshyari.com