

# Chapter 1.6

## Mobile User Data Mining and Its Applications

**John Goh**

*Monash University, Australia*

**David Taniar**

*Monash University, Australia*

### INTRODUCTION

With the increasing penetration rate of mobile technologies among the marketplace (Goh & Taniar, 2004b; Lim, Wang, Ong, & Hwang, 2003), businesses have adopted various types of mobile products, such as personal digital assistants, mobile phones, and wireless laptop computers, in order to help improve the efficiency of one's daily life. The increasing adoption of such equipment allows the opportunity for the collection of data about their usage and movement that can then be further analyzed (Goh & Taniar, 2004b, 2004d).

The analysis of such data collected from mobile devices and mobile users for determination of patterns is called *mobile user data mining* (Goh & Taniar, 2004a, 2004b, 2004c, 2004d, 2005). In the mobile environment, there are devices offering service to mobile equipments. These are often known as static devices (Goh & Taniar, 2004b, 2004d), as they stay static and provide services

for the mobile devices. These mobile equipment operate in a network where data can be readily transferred and services can be readily rendered (Goh & Taniar, 2004c).

Data mining can be performed in various domains such as the time series domain (Han, Dong, & Yin, 1998, 1999; Han, Pei, & Yin, 2000), Web domain (Christophides, Karvounarakis, & Plexousakis, 2003; Dourish, 2004; Eirinaki & Vazirgaiannis, 2003; Kastaniotis, Zacharis, Panayiotopoulos, & Douligeris, 2004; Kim, Kim, & Kim, 2004), market-basket analysis domain (Agrawal & Srikant, 1994, 1995), geographical information system domain (Koperski & Han, 1995), performance improvement domain (Han et al., 2000; Li, Tang, & Cercone, 2004; Miyahara et al., 2004; Thiruvady & Webb, 2004; Yip, Wu, Ng, & Chan, 2004), security domain (Oliveira, Zaiane, & Saygin, 2004), and mobile domain (Goh & Taniar, 2004a, 2004b, 2004c, 2004d, 2005; Wang, Lim, & Hwang, 2003). The existing methods of data mining include association rules (Agrawal &

Srikant, 1994) and sequential patterns (Agrawal & Srikant, 1995). The existing methods of mobile user data mining include frequency patterns (Goh & Taniar, 2004b), location-dependent mobile user data mining (Goh & Taniar, 2004d), and parallel patterns (Goh & Taniar, 2004c).

The aim of this chapter is to provide an insight on the background of mobile user data mining and potential application areas of mobile user data mining in different industries. The potential application is viewed from the aspects of the banking industry, marketing industry, and retail industry. As the mobile user data mining methods are getting more developed, they could be implemented one day in areas where interactions are required with highly mobile customers.

This chapter is organized as follows. The next section provides a background on mobile user data mining. We then highlight the benefits of adopting mobile user data mining and provide detail about how banking, marketing, and the retail industry could benefit from mobile user data mining. Next we provide an overview of future challenges such as security and privacy, and finally summarize the chapter.

## **MOBILE USER DATA MINING**

Mobile environment (Goh & Taniar, 2004a, 2004d) refers to an environment where free movements of human beings are possible. The mobile environment is an area where a human being carries devices that can be handheld (mobile devices), and seeks information and services from service providers (static devices) that is within the coverage of that area or available through subscription. Mobile environment therefore can also be referred to as the mobile network environment (Goh & Taniar, 2004d).

In the mobile environment, many devices are being used. The static devices are nodes in the mobile that never moves around, but are stationed in the mobile environment just to provide services

such as data, network, and processing to their clients, which are mobile devices (Goh & Taniar, 2004b, 2004c, 2004d). These mobile devices are wirelessly connected together to a server. The mobile devices can come in many forms. Some of the existing forms include mobile phones, personal digital assistants, and laptop computers. Mobile devices are the devices that follow or are being carried by mobile users (Goh & Taniar, 2004b). They generally have less processing, network, and data capacity, and need to request service from static devices to become useful. Mobile users are human beings that carry the mobile devices in the mobile environment for the purpose of finding out location-dependent information about a current locality (Goh & Taniar, 2004d), navigating using mobile devices (Lim et al., 2003), and communicating with other mobile users in the mobile environment (Goh & Taniar, 2005; Lim et al., 2003).

*Mobile user data mining* (Goh & Taniar, 2004a, 2004b, 2004c, 2004d, 2005) is the activity that uses data collected from mobile equipment for analysis. Mobile equipment in this context can include mobile phones, personal digital assistants, and laptop computers. Data mining allows large amounts of data to be analysed in order to find out interesting patterns about the data. Two examples were given:

1. The use of data mining techniques to find out whether consumers tend to visit location *A* immediately after location *B* (Goh & Taniar, 2004d, 2005).
2. The use of data mining techniques to find out whether consumers tend to buy product *A* and product *B* at the same time in one single shopping trip (Goh & Taniar, 2004d).

The prerequisite for mobile user data mining (Goh & Taniar, 2004a, 2004b, 2004c, 2004d, Mar 2005; Lim et al., 2003) to work is the availability of a large amount of dataset collected from the mobile user (Goh & Taniar, 2004b). This prereq-

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