Chapter IX

Mining Walking Pattern from Mobile Users

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Abstract

Mining walking pattern from mobile users represents an interesting research area in the field of data mining which is about extracting patterns and knowledge out from a given dataset. There are a number of related works in knowledge extraction from mobile users, but none have previously examined the situation of how mobile users walks from one location of interest to another location of interest in the mobile environment. Walking pattern is the proposed method where it examines from the source data in order to find out the two-step, three-step and four-step walking patterns that are performed by mobile users significantly and strongly through location movement database using measure of support and confidence. Performance evaluation shows the tendency for the increased number of candidate walking patterns with the increase in location of interest and steps. Walking pattern has proven itself to be a suitable method in finding knowledge from mobile users.
Introduction

With the advances of information technology, data processing and memory capacity are becoming more advanced and more accessible. The same processing power and memory capacity would not be affordable or accessible 10 years ago. Information technologies have been adopted by the economy in many aspects. As information technologies have the capability to record a massive amount of data and also to process these data in a remarkable speed, one of such application is to record the activities carried out by a subject matter in order for further analysis (Tjioe & Taniar, 2005; Roddick & Lees, 2001; Roddick & Spiliopoulou, 2002).

Subject matter can be anything from mobile users, customers, weather balloon, motor vehicles, and so forth. With information technologies, these subjects can be identified quickly and efficient, and their dealings or activities could be tracked and recorded in a storage capacity which is available in vast amount of size at an affordable cost. Mobile users are one of such subjects that are used for recording of activities and then further analysis. The process of recording vast amount of data and later for analysis is also known as knowledge extraction or data mining (Han & Plank, 1996; Han, Dong, & Yin, 1999; Han, Pei, & Yin, 2000; Jayaputera & Taniar, 2005).

Mobile users are a promising candidate for knowledge extraction because mobile devices, especially mobile phones are increasingly capable in terms of processing capacity, network bandwidth, and also storage capacity. Mobile devices are not limited to mobile phones, but also devices such as personal digital assistant (PDA), laptop computer, and other potentially newly developed mobile devices as long as it serves the mobile users on the move and have the ability to communicate to a server and be able to be queried by server.

New generation of mobile phones (Varshey, Vetter, & Kalakota, 2000; Reed Electronics, 2002) have capability of downloading movies on the move, and playing back the movie to mobile users (Tse, Lam, Ng, & Chan, 2005). Such operation would take a great deal of processing power, memory and also bandwidth. As mobile devices are carried by mobile users at most of the times, and with the advent of technologies such as global positioning system (GPS) (Song, Kang, & Park, 2005; Zarchan, 1996) or other location identification technologies (Hofmann-Wellenhof, Lichtenegger, & Collins, 1994; Häkkinlå & Mäntyjärvi, 2005) incorporated into mobile devices, mobile devices now can be queried (Lee, Zhu, & Hu, 2005) and detail of mobile users such as their name, age, address, date/time, and current location on earth can be gathered.

As the goal of knowledge extraction (Chen & Loi, 2005) is to find useful knowledge out from the subject (Koperski & Han, 1995; Forlizzi, Guting, Nardelli, & Schneider, 2000; Cho, Pei, Wang, & Wang, 2005), such as how the mobile users behaves by looking at who the mobile users interacts with (person), when the mobile users interacts (timing), how the mobile users interacts (method), what the mobile users interacts with (objects), where the mobile users interacts with (location). This is done by analyzing the source dataset in order to detect patterns or trends or any other useful information in which it could make sense.

A piece of information that makes good deal of sense describing how mobile users behave is a piece of knowledge and thus knowledge extraction (Chakrabarti, Sarawagi, & Dom, 1998; Chen & Loi, 2005). Depending on the application domain and data collected such as temporal data (Chakrabarti et al., 1998; Wang, Yang, & Yu, 2002), and different data
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