Searching over mobile user activity data

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Abstract. The widespread adoption of mobile computing and activity trackers that complement mobile devices has given rise to a different type of mobile data that includes diverse information on user activities. The utilization of this data can lead to a set of new applications, but also assist in different areas, such as recommendations, big data analysis, context-aware applications and the Internet of Things. In this challenge paper, we introduce this open research area presenting the motivation behind it and the relevant open issues with regard to searching over this data.

Keywords: mobile applications, activity tracking, health data, mobile user

1 Introduction and open area for research

Pervasive computing has altered the way in which information is collected, stored, disseminated and used. With a huge number of users on the move employing different applications with different levels of network connectivity (e.g., GPRS, 4G, WiFi) and using devices of different sizes (smartwatches, smartphones, tablets) and operating systems (Android, iOS), a popular industry has emerged offering various capabilities to mobile users.

A new group of activity trackers (e.g., from MisFit, FitBit, Garmin etc.) has made the type of information created more relevant to fitness and health monitoring [4], recording the movements of users throughout the day and contributing to the notion of the Internet of Things (IoT), where all the objects on and around us are connected to the Internet and communicate with each other with minimum human intervention [2]. These activity monitors can be worn around the wrist of a user, on belts and collars, and even as jewellery.

The vast amount of data created through this procedure can be utilized in smart ways. In this challenge paper, we introduce the need for exploiting the (structured) data gathered related to user activity, contributing to novel ways for searching over this form of structured data.

2   Open issues with respect to searching across activity data

The value in data collected from mobile devices can be found primarily in the collection and utilization of sensor data whose sources are mainly the sensors embedded in smartphones [3]. Many research works have used different means for exploiting this data and combining them to draw useful conclusions. This can be found, for instance, in the case of user activitiy recognition using data from different sensors on users' devices (e.g., accelerometer data, GPS) [1].

When it comes to activity trackers, although their main function is related to monitoring the physical activity of a user, they can also be useful sources of information in relation to a person's larger health issues, where their combination can assist in making health predictions and even preliminary diagnosis. In such a framework, a number of research challenges arise for further study referring to:

1. How can search methods over structured data be tailored to the needs of activity tracking data?
2. In which ways can activity tracking data be combined to assist with reasoning actions and user recommendations?
3. How is it possible to perform scalable search in this new environment that consists of heterogeneous devices with data represented in different formats coming from different sources?

3   Conclusions and action path

Many questions derived from the aforementioned research challenges on the use of and searching across activity tracking data remain unanswered. These questions call for research into the following aspects in order to promote this open research area, such as: uniform data representation, data transformations, semantic aspects of data, intelligent searching mechanisms, recommendation algorithms for activity tracking data, health predictions. In order to be able to profit from this information, careful actions are needed to address the above independently but at the same time in a unified way. Moreover, as in all pervasive computing problems, the issue of privacy protection remains vital.

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