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Chapter XIV

Location-Dependent Data Access and Queries

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Abstract

Location-dependent data access technology will create a new family of services in mobile telecommunication systems of the near future. This technology is based on positioning, communication over various protocols, and spatial databases. Location-dependent applications will be used in many fields such as emergency services, information services, and financial services. This chapter intends to present the infrastructure that makes it possible to create such services, and provides an insight on key application development issues. The focus is on location information access as the latest achievements of this research field are presented.

Introduction

In the past decade, mobile communication technology has gone through a major evolution. As a result of this, today we have cellular radio networks that cover a large

percent of the earth and serve millions of customers. These radio networks are capable of providing voice and data access to mobile devices moving between different locations. This infrastructure can be exploited to a further extent if location-based services, such as location-dependent data access, location-dependent queries, automatic reconfigurations, and location-based push services, are introduced.

Those of us who are interested in this technology or would like to develop services to exploit this opportunity must have a clear understanding of how location-based data access works. It is also important to see what tools are available and how they can be used to create advanced location-based applications. In the following text, the theoretical background and some of the most advanced tools are presented, as positioning techniques, various data access technologies, spatial database systems, and spatial queries are discussed. Some of the most interesting research achievements and development activities carried out in a European Fifth Framework project, Configurable Radio with Advanced Software Technology (CAST; Madani et al., 2000), are also outlined. The reader of the chapter will get insight on how location-based data access technology was used in this project and what role it will play in Fourth-Generation Wireless (4G) wireless networks. During the discussion, the focus is on location-based data access and queries.

In the first part of this chapter, an overview of positioning technologies and the description methods for location-based data are presented. In the second part, data access methods for retrieving location information are discussed, including location-based information retrieval using the Wireless Application Protocol (WAP), data access with the help of J2ME, and mobile execution environment Classmark 3 (MExE CM 3). In the third part, the discussion is about the extension of the SQL language to support the querying and displaying of location information. In this part, many useful examples are presented. In the fourth section, along with a set of example applications, the system developed in the frames of the CAST project is introduced as we present how it is possible to dynamically update the configuration of wireless terminals using location-based queries. In the final part, some open issues of the research associated with location-based data access and queries will be presented, and the effects of future improvements to the wireless infrastructure will be predicted.

Basics of Location-Based Data Access and Queries

In the field of mobile computing, location-based data access and location-based information retrieval are very hot topics. Information providers see new opportunities in providing information either by push technologies or by user-initiated queries based on the location of the user. New technologies are being developed for location-dependent data access to fulfill the needs. Among these technologies, some deal with positioning, some with retrieving location information from the terminal or the network, and others are focused on the location information storage and management. The reader must understand what kind of location information is available, how it is represented, and how it can get to the information provider.