Chapter VIII

Applications of Moving Objects Databases

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Abstract

Miniaturization of computing devices and advances in wireless communication and sensor technology are some of the forces propagating computing from the stationary desktop to the mobile outdoors. Some important classes of new applications that will be enabled by this revolutionary development include location-based services, tourist services, mobile electronic commerce and digital battlefield. Some existing application classes that will benefit from the development include transportation and air traffic control, weather forecasting, emergency response, mobile resource management and mobile workforce. Location management, that is, the management of transient location information, is an enabling technology for all these applications. Location management is also a fundamental component of other technologies, such as fly-through visualization, context awareness, augmented reality, cellular communication and dynamic resource discovery. Moving Objects Databases (MODs) store and manage the

location as well as other dynamic information about moving objects. In this chapter we will present the applications of MODs and their functionality. The target readership is researchers and engineers working in databases and mobile computing.

Background

In 1996, the Federal Communications Commission (FCC) mandated that all wireless carriers offer a 911 service with the ability to pinpoint the location of callers making emergency requests. This requirement is forcing wireless operators to roll out costly new infrastructure that provides location data about mobile devices. In part to facilitate the rollout of these services, in May 2000, the U.S. government stopped jamming the signals from global positioning system (GPS) satellites for use in civilian applications, dramatically improving the accuracy of GPS-based location data to 5-50 meters.

As prices of basic enabling equipment like smart cell phones, handheld devices, wireless modems and GPS devices continue to drop rapidly, the number of wireless subscribers worldwide will soar. Spurred by the combination of expensive new location-based infrastructure and an enormous market of mobile users, companies will roll out new wireless applications to recoup their technology investments and increase customer loyalty and switching costs. These applications are collectively called *location-based services.*

Emerging commercial location-based services include Mobile Resource Management (MRM) applications, such as systems for mobile workforce management, automatic vehicle location, fleet management, logistics, transportation management and support (including air traffic control). These systems use location data combined with route schedules to track and manage service personnel or transportation systems. Call centers and dispatch operators can use these applications to notify customers of accurate arrival times, optimize personnel utilization, handle emergency requests and adjust for external conditions like weather and traffic. Another example of location-based service is Location-aware Content Delivery, which uses location data to tailor the information delivered to the mobile user in order to increase relevance; for instance, delivering accurate driving directions, instant coupons to customers nearing a store or nearest resource information like local restaurants, hospitals, ATM machines or gas stations.

In addition to commercial systems, management of moving objects in location-based systems arises in the military in the context of the digital battlefield. In a

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