Chapter XVI
Building Applications to Establish Location Awareness: New Approaches to Design, Implementation, and Evaluation of Mobile and Ubiquitous Interfaces

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ABSTRACT

An emerging challenge in the design of interfaces for mobile devices is the appropriate use of information about the location of the user. This chapter considers tradeoffs in privacy, computing power, memory capacity, and wireless signal availability that accompany the obtaining and use of location information and other contextual information in the design of interfaces. The increasing ability to integrate location knowledge in our mobile, ubiquitous applications and their accompanying tradeoffs requires that we consider their impact on the development of user interfaces, leading to an agile usability approach to design borne from agile software development and usability engineering. The chapter concludes with three development efforts that make use of location knowledge in mobile interfaces.

INTRODUCTION

A key challenge in the emerging field of ubiquitous computing is in understanding the unique user problems that new mobile, wearable, and embedded technology can address. This chapter focuses on problems related to location determination—different ways to determine location at
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development of user interfaces. This chapter describes the merging of agile software development methods from software engineering with the scenario-based design (SBD) methodology from usability engineering to create a rapid iteration design approach that is heavy in client feedback and significant in its level of reusability. Also presented are three interfaces developed using our Agile Usability methodology, focusing on the benefits found in using the Agile Usability approach and the tradeoffs made in establishing location awareness.

BACKGROUND

From the early days, navigation has been central to progress. Explorers who set sail to explore the oceans relied on measurements with respect to the positions of celestial bodies. Mathematical and astronomical techniques were used to locate oneself with respect to relatively stationery objects. The use of radio signals proved to be fairly robust and more accurate, leading to the development of one of the first modern methods of navigation during World War II, called long range navigation (LORAN). LORAN laid the foundation of what we know as the Global Positioning System or GPS (Pace et al., 1995). Primarily commissioned by the United States Department of Defense for military purposes, GPS relies on 24 satellites that revolve around the Earth to provide precision location information in three dimensions. By relying on signals simultaneously received by four satellites, GPS provides much higher precision than previous techniques. GPS navigation is used in a wide range of applications from in-car navigation, to geographic information system (GIS)-mapping, to GPS-guided bombs.

GPS has become the standard for outdoor location-awareness as it provides feedback in a familiar measurement metric. Information systems like in-car navigators have adopted GPS as the standard for obtaining location, since it
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