

Chapter 3.8

Increasing Spatial Awareness by Integrating Internet Geographic Information Services (GIServices) with Real Time Wireless Mobile GIS Applications

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ABSTRACT

Spatial awareness is one of the fundamental decision making capabilities for human beings. Two key information technologies, Internet Geographic Information Services (GIServices) and wireless mobile Geographic Information Systems (GIS) can enhance the spatial awareness of decision makers and facilitate more efficient and comprehensive decision making processes. Internet GIServices provide a collaborative communication environment for sharing data, information and knowledge among multiple decision makers and stakeholders. Wireless mobile GIS combines both geospatial information and Global Positional Systems (GPS) coordinates from remotely located field-based personnel to spatial decision support systems (SDSS). By adopting broadband wireless telecommunication technology for connecting Internet GIServices and mobile GIS devices, decision makers can gather near real time information from field personnel and equally quickly distribute updated information back to the field. Communicated via wireless devices and web applications, interactive and dynamic geographic information services will enhance spatial awareness of decision makers, field personnel (such as fire fighters and police officers), and the general public.

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1. INTRODUCTION

Spatial awareness is one of the fundamental decision making capabilities for human beings. People can answer the following questions, showing their spatial awareness, “Where are you?”, “Which direction should I go to the bookstore?”, “How many people are around this building now?” Some educational theories and schools have developed various methods to enhance students’ spatial awareness. Spatial awareness is a very important topic for K-12 education tasks. It is also a critical component for adult’s daily activities and strategic decision makings. This paper will first provide an operational definition of “spatial awareness”, and then introduce the two key information technologies, Internet GIServices and wireless mobile GIS, which can be used to enhance the spatial awareness for both decision makers and field personnel.

Similar to the military term, “situational awareness”, spatial awareness can be used to explain individual’s actions and responses during an event or in a specific environment. They are all closely related to cognitive science and human behavior research. However, situational awareness mainly involves with short-term, immediately responsive behaviors, such as driving a car, piloting an airplane, or manipulating a complicated system. Spatial awareness includes a broader scope of spatial decision making behaviors, including both long-term strategic actions and short-term individual responses. This paper defines the term, “spatial awareness”, as *the knowledge acquisition of geospatial information to facilitate decision making procedures for operational, tactical, and strategic plans*. For example, a firefighter can get a map (from a wireless mobile device) showing the wildfire perimeters near himself/herself and decide to create a backfire plan to control the spread of wildfires (immediately operational plan). A police chief can analyze the locations of evacuation shelters after a major earthquake and dispatch sufficient police officers for each evacuation shelter (short-term tactical plan). A

resident can review a nature disaster zoning map and then decide to sell their houses because of potential natural hazards. Internet GIServices and mobile wireless GIS can provide the critical geospatial information to enhance spatial awareness of firefighters, police officers, and citizens.

Both wireless mobile GIS and Internet GIS technologies have been developed for almost fifteen years (Peng & Tsou, 2003). Recent progress in broadband wireless technology, such as Wi-Fi, WiMAX and 4G cellular networks, has opened a new direction for integrating Internet GIServices and wireless mobile GIS with collaborative geospatial applications. By adopting wireless telecommunication technology and advanced Internet GIS tools, decision makers can benefit from real time information obtained from in-field personnel. In turn, in-field personnel benefit from more timely updated information from decision makers. The two-way communication mechanism between in-field personnel (*in situ* agents) and decision makers can facilitate better spatial awareness and more timely decision making process. Such a client/server framework, which combines a client-side wireless mobile GIS application and a server-side Web-based decision support system, will help optimize field-based management tasks, whether they are time urgent such as emergency dispatch, or a more general utility service call.

2. UTILIZING INTERNET GISERVICES FOR COLLABORATIVE DECISION MAKINGS

Internet GIServices are network-based geographic information services which utilize both wired and wireless Internet functionality to access geospatial information, spatial analytical tools, and GIS web services (Tsou, 2009). The GIS community started to research on-line, web-based, and distributed GIServices in the mid-1990s (Gardels, 1996; Plewe, 1997; Tang, 1997, Peng & Tsou, 2003). The development of Internet GIServices

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