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**An Agent-based Communication Mechanism
for Distributing Geographic Information Services on the Internet**

Ming-Hsiang Tsou and Barbara P. Buttenfield
Department of Geography, San Diego State University, CA 92182 USA
Department of Geography, University of Colorado, Boulder, CO 80309 USA
E-mail: tsou@colorado.edu, babs@colorado.edu Phone: +1-303-492-3684

ABSTRACT

The progress of information technology (IT) and the need for global distribution of geographic information is pushing the GIS community to deploy distributed Geographic Information Services (GIServices) on the Internet. Currently, on-line GIService research mainly focuses on technique-centered solutions without the consideration of the integration of heterogeneous GIService frameworks. This research proposes an agent-based communication mechanism to facilitate the dynamic integration of geospatial data, GIS programs, and modeling procedures in distributed network environments.

The goal of agents is to reduce user work and information overload. In a distributed GIService environment, users may need to interact with heterogeneous data models and different types of programs in different computer platforms. An agent-based communication mechanism will help users to access distributed data objects and GIS components on heterogeneous GIS platforms by interpreting, filtering, and converting information automatically.

An agent is an autonomous computer program, which has some specific functions and responds to specific events, based on pre-defined knowledge rules or user's instructions.

Three fundamental roles of agents are essential to distributed network environments: information finder/filter, information interpreter, and decision maker.

An information finder and filter helps users to find out the requested information and filter out unnecessary information according to a specified user task. The agent will provide a reasonable number of choices to users or suggest an alternative option if the requested information items are not available.

An information interpreter can access and convey information from one side to the other. In distributed network environments, heterogeneous data models and systems can not communicate directly. An agent can bridge heterogeneous information systems and translate different data types and models for different GIS tasks.

A decision maker can make decision autonomously based on its own knowledge and user-defined rules. An agent can collect and analyze information according to specific events, such as the migration and linkages of objects and components, and then make an optimal decision based on the rational rules defined by users or other agents.

This research proposes an agent-based GIServices architecture based on their mobility and functionality. The mobility of agents relates to the dynamic feature of network environments and the communication between different machines. Stationary agents and

mobile agents distinguish two types of agents based on their ability to move around or not. The functionality of agents relates to the interaction and responsibility for different tasks, such as the communications among machines, the integration of GIS components, and the searching for requested geodata objects. Geodata agents, component agents, and machine agents are three types of agents based on their functionality in distributed GIServices.

The detailed design of the agent-based GIServices architecture is illustrated by the Unified Modeling Language (UML) and emphasizes the design of a high-level communication mechanism of heterogeneous GIServices. An agent-based communication mechanism will help users deal with heterogeneous distributed databases and GIS components in dynamic network environments. The collaborations among agents will provide a flexible and scalable framework for distributing GIServices on the Internet.