VirGIS: Mediation for Geographical Information Systems

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Geographic data have been collected for centuries and are available in a wide variety of formats and supports. Most of the geographic data providers such as the French Institut National de la Statistique et des Etudes Economiques (INSEE), Michelin or the French Research Institute for Exploitation of the Sea (IFREMER) deliver their data in ASCII files (see for example EDIGEO, the road network delivered by Michelin). There is no accepted standard for spatial or geographic data representation. Each GIS provides its own proprietary format as well as its specific query language. In addition, geographic resources are designed for a variety of different purposes. Orthogonal directions in the design of geographic resources may affect the semantics of the data they contain and impair their integration. These discrepancies make the integration of different geographic resources significantly complex.

VirGIS [1] provides an integrated view of the data, and a geographical query language to access and manipulate integrated geographical data. Typical mediation approaches are data-driven and do not address the problem of integration of query capabilities. But the exploitation of available query capabilities is critical to a geographical mediation system. Geographic languages provided by GIS usually express spatial selections, metric or topological queries, allocations, etc., in addition to standard data manipulation such as performed by SQL [2], and are usually implemented as ad-hoc functions with respect to a specific data representation and indices. These query capabilities may be available partially or totally at some of the integrated data sources. Similar operators may not be semantically equivalent at two different sources. In contrast, the VirGIS mediation system aims to integrate geographical query capabilities with GQuery, a XML geographical query language, and recent specifications published by the Open GIS Consortium (OGC) [3] and adopted by major GIS vendors [4, 5]. Among those specifications are the Geography Markup Language (GML) [6], and Web Feature Servers (WFS) [7]. VirGIS uses GML as an internal format to represent, manipulate, and exchange geographic information, and WFS interfaces to perform communications with clients and integrated data sources. A GQuery query is divided into sub-queries, each being shipped to its corresponding WFS data server, allowing the retrieval of features, geographical query capabilities and data. WFS play the role of wrappers in the mediation. Each WFS server returns data in XML, with a structured content in GML. Major GIS vendors, such as ESRI or Intergraph are now offering WFS connectors to their products. Other companies (e.g., IONIC) are deploying WFS-based solutions in the context of geo-spatial applications such as the European Spatial Agency.

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