

# Efficient GML-native Processors

## for Web-based GIS: Techniques and Tools

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### ABSTRACT

Geography Markup Language (GML) is an XML-based language for the markup, storage, and exchange of geospatial data. It provides a rich geospatial vocabulary and allows flexible document structure. However, GML documents are usually large and complicated in structure. Existing techniques for XML document processing, either streaming-based or memory-based, may not deal with such GML documents efficiently. There is an urgent need to adapt existing XML techniques to support the processing of large XML/GML documents, as well as to express GML-native geospatial operations.

In this paper, we propose and implement an efficient GML query processor, *GPXQuery*, and a GML-aware streaming parser, *GPSAX*, by extending an XQuery processor and a SAX parser, respectively, to support GML-native geospatial functionalities. In addition to these tools, an XML prefiltering technique is applied to the processors to speed up geospatial operations over large GML documents. Our experiment results show that the XML prefiltering technique significantly improves the performance of both the *GPXQuery* and *GPSAX* processors by reducing either the query execution time or the memory space consumption. Depending on the nature of user queries, the enhanced query processors can achieve a ten-fold performance improvement. These efficient GML-native processors have been used to develop a GML-based Web GIS with a geospatial query interface and a Scalable Vector Graphics (SVG) map navigator.