Automatic XQuery Generation and Generalized Visualization for an XML Interface to a Relational Database

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XBrain is an application that facilitates data exchange by dynamically publishing relational data over the web in XML format. In the current work we further enhanced its functionality through automatic query generation to aid the human users. We also extended its visualization tools by developing them into generalized XML visualization web services.

XBrain is a JSP web application that facilitates data exchange by automatically generating XML from a relational database containing language map data\textsuperscript{1}. XBrain takes XQuery as input, and interacts with a relational database through SilkRoute, an application that dynamically converts XQuery to SQL (Figure 2). XML results are then returned to the user as HTML, CSV, or a dynamically generated image. Although the users (neuroscientists) found the results of XBrain to be useful, they found XQuery too difficult to formulate. Furthermore, the previously implemented XML visualization tools were too specific to the XBrain application to be reusable.

From interviews, we found that users wanted a more intuitive query interface that automatically generates XQuery. To this end, we developed a graphical query interface front end to XBrain (Figure 1).

![Figure 1. Graphical User Query Interface](image-url)

With this interface, which is written in JSP, users can visually select and filter on a set of common variables. The application automatically generates an XQuery, based on the user specified criteria and a pre-defined XQuery template. The template structure was determined by assessing what are the most common types of query asked by the users. The users found this query interface much easier to use. The new query interface also aided the users in analyzing the underlying data more rapidly.

![Figure 2. XBrain Architecture](image-url)

In order to make the XML visualization tools more general, we transformed them into individual XML visualization web services. Each HTML, CSV, and dynamic image web service takes an XML file as input and returns visualization as output (Figure 2). The HTML and CSV web services can be used by any application to visualize any XML. The dynamic image web service can only be used to visualize structural brain data, but there are many applications that generate such data.

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References