Web experts ask scientists to use the Web to improve understanding, sharing of their data in science

February 12 2011

Peter Fox and James Hendler of Rensselaer Polytechnic Institute are calling for scientists to take a few tips from the users of the World Wide Web when presenting their data to the public and other scientists in the Feb. 11 issue of *Science* magazine. Fox and Hendler, both professors within the Tetherless World Research Constellation at Rensselaer, outline a new vision for the visualization of scientific data in a perspective piece titled "Changing the Equation on Scientific Data Visualization."

As the researchers explain, visualizations provide a means to enable the understanding of complex data. The problem with the current use of visualization in the scientific community, according to Fox and Hendler, is that when visualizations are actually included by scientists, they are often an end product of research used to simply illustrate the results and are inconsistently incorporated into the entire scientific process. Their visualizations are also static and cannot be easily updated or modified when new information arises.

And as scientists create more and more data with more powerful computing systems, their ability to develop useful visualizations of that data will become more time consuming and expensive with the traditional approaches.

Fox and Hendler ask the scientific community to take some important

lessons from the Web.

"…visualizations on the Web are becoming increasingly more sophisticated and interactive," they write. At the same time, those Web-based visualization are also inexpensive and easy to use, according to Hendler and Fox.

Simple Web-based visualization tool kits allow users to easily create maps, charts, graphs, word clouds, and other custom visualizations at little to no cost and with a few clicks of a mouse. In addition, Web links and RSS feeds allow visualizations on the Web to be updated with little to no involvement from the original developer of the visualization, greatly reducing the time and cost of the effort, but also keeping it dynamic.

"Visualizations are absolutely critical to our ability to process complex data and to build better intuitions as to what is happening around us," the researchers write. They use the example of an online weather report. With such visualizations, Web users can click on their area for a forecast or watch videos specific to their region. Without these visualizations, no one but a trained meteorologist would be able to make sense of the mess of raw data behind those pretty maps and graphical snow clouds.

In addition to the ease of using and developing visualization on the Web, visualizations on the Web can also be easily modified, updated, customized, and recreated by other users thanks to the use of Uniform Resource Identifiers. This "linking" of data is a key feature of the new vision that Fox and Hendler outline. It is of particular importance when dealing with what they refer to as "big science" on topics such as climate change that involves data that ranges from distinct fields like biology to geology.

"The challenge is that many of the major scientific problems facing our

world are becoming critically linked to the interdependence and interrelatedness of data from multiple instruments, fields, and sources," they write.

Fox and Hendler urge scientists involved in such vital scientific projects to take some tips from large Web companies like Google and Facebook, and even massive online communities such as World of Warcraft. These large companies use new data integration approach such as NoSQL, "big data," and scalable linked data to rapidly expand and maintain their capabilities. These new capabilities provide easy-to-use, low-end tools to generate visualizations and scalable tools for curating very large visualization projects that scientists can model their own visualization after, according to Fox and Hendler.

Provided by Rensselaer Polytechnic Institute