QuakeSim Science Gateway Updates

Pierce, M[1], Fox, G[1], Gao, X[1], Ji, J[1], Ma, Y[1], Wang, J[1], Donnellan, A[2], Parker, J[2], Glasscoe, M[2], Granat, R[2], Al-Ghanmi, R[3] and McLeod, D[3]

(1) Pervasive Technology Institute, Indiana University, Bloomington, USA
email mpierce@cs.indiana.edu
(2) NASA Jet Propulsion Laboratory, California Institute of Technology, Pasadena, USA
(3) University of Southern California, Los Angeles, USA

The QuakeSim web portal provides access to services for running deformation modeling and time series analysis applications using fault model, GPS position, and GPS velocity data. We describe here major enhancements to the QuakeSim Science Gateway since the previous ACES workshop (2008). Our concentrations have been on adopting Web 2.0-style design approaches, improving interactivity in the user interfaces, integrating with the improved version of the QuakeTables fault database, integrating with external data sources, and improving support for InSAR use cases.

Architecturally, we are moving to a more lightly coupled portal design. QuakeSim has always been based on reusable components and Service Oriented Architecture principals. The current QuakeSim builds on these concepts in two ways. First, all user interface components (for setting up and running a deformation calculation, for example) are developed as Google gadgets that we make backward compatible with the older Java portlet standard. This allows gadgets to run in the original QuakeSim portlet container, in standalone mode, and as embedded gadgets in gadget containers (such as iGoogle). We use Google's single sign-on service in the latter two cases. Second, across the project, we are collectively developing Representational State Transfer (REST) style Web services that use KML as a standard message format. This allows the QuakeSim portal and other project components (QuakeTables, for example) to easily important and export data to each other and to/from third party services and tools such as Google Earth.

We have a continuing effort to capture usage requirements to improve the portal. Improvements to the time series analysis components are described in a separate abstract (X. Gao et al.). Improvements to deformation modeling components include the addition of interferogram plotting tools that can be compared to InSAR plots. We have added UNAVCO's GPS Web services as data sources for velocity inputs to Simplex, our deformation inversion tool. We are also completing development of an automated version of Disloc (our Okada model deformation tool) that ingests USGS earthquake RSS feeds and provides automated deformation and interferogram plots using KML.

Future developments will include better support for emergency responder and disaster planning tools. Architecturally, we will also investigate Cloud computing models. The "infrastructure as a service" model is appropriate for many of QuakeSim's services and will allow us to provide better delivery of capabilities to international partners. Cloud computing's "software as a service" model (Apache Hadoop is a well-known example) is also very interesting for managing data processing pipelines. We will investigate this in both our GPS time series and interferogram analysis tools.