Research Project Highlight

Development of a Database and a Toolbox for Regional Seismic Risk Assessment of California's Highway Bridges

Project # #1145-NCTRER

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Start-End Dates:
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Abstract
The first objective of this proposed project is to develop a database of California's bridges. This database will provide various data and metadata that can be used by experts from multiple domains, including bridge engineers, city planners, emergency responders, and insurance researchers. The database will be launched with content that is harvested by the project team from several sources, and it will be updateable by direct input from users—through a crowd-sourcing model like Wikipedia—and by automated continuous updating scripts developed by the project team. The second year objective of the project will be to synthesize a computational seismic "app"—*BridgeR*—that will interact with the database and produce continuous performance-based seismic assessments of California's highway transportation network. *BridgeR* will produce quantitative results in the form of site- and facility-specific seismic bridge fragilities, which will ultimately enable regional economic loss studies. *BridgeR* will incidentally form the blueprint for future apps that will be developed by experts from other domains (e.g., first responders). Through the present project, we aim to develop the backbone of *BridgeR*, verify it, and apply it to a set of testbed bridges in Los Angeles.

Deliverables
The project deliverables are:
- A database that will present data/metadata for all California bridges, which can be searched and visualized through GoogleEarth
- A BridgeR sub-app that converts bridge metadata into OpenSees (Tcl) input files.
- A BridgeR sub-app that visualizes the bridge geometry.
- A BridgeR sub-app that computes and compiles bridge component and system fragilities.

Research Impact
Once publicly launched, the database and its seismic app *BridgeR* will have the potential to grow and evolve with contributions from many users due to its open-access architecture and open-source building

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blocks. The resulting bridge-specific seismic safety/loss information can be used by decision makers who play integral roles in managing seismic risks. That is, government policymakers can better prioritize critical bridges for retrofits; and emergency first-responders can better prepare, plan, and react to a powerful earthquake if they know where the greatest structural damage is most likely to occur.

Project Image

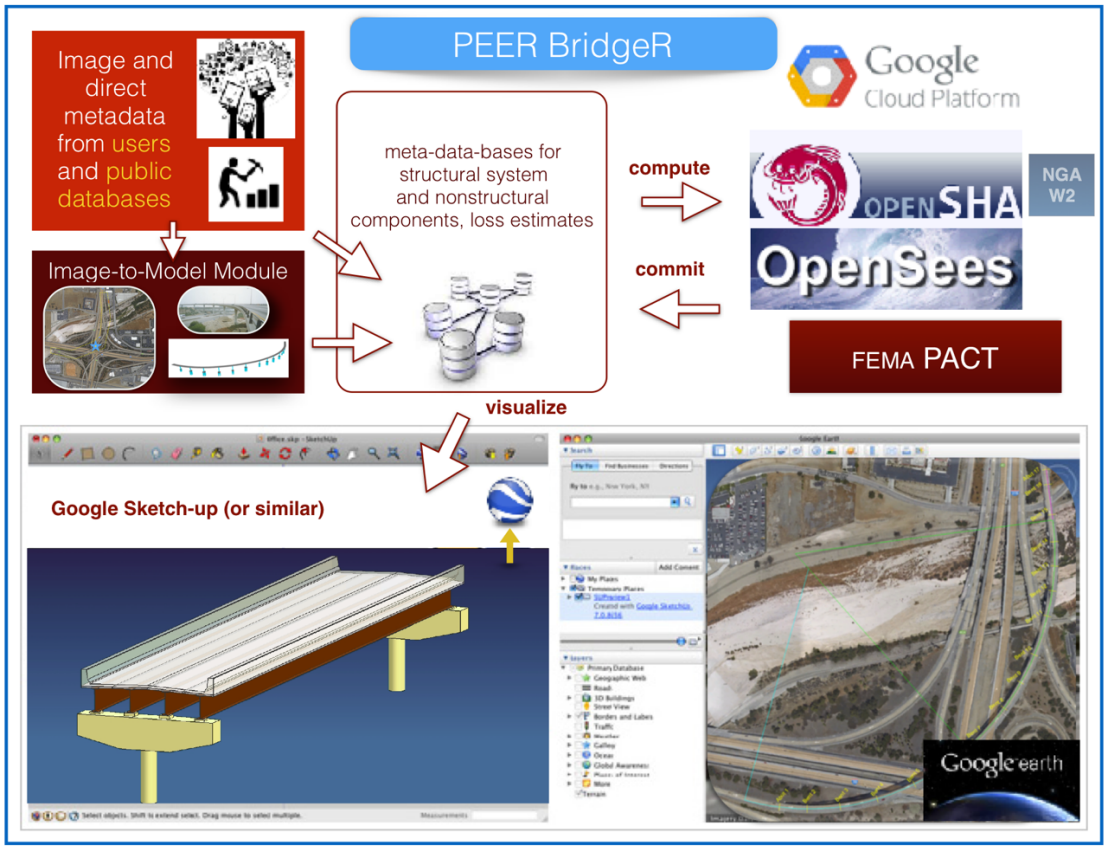

Figure 1 Graphical illustration of *BridgeR* components.

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