TIP Project Brief – 090099/10H018

Civil Infrastructure
Development of a Multiscale Monitoring and Health Assessment Framework for Effective Management of Levees and Flood-Control Infrastructure Systems

Develop a new health assessment framework, ranging from a satellite-based radar system to local sensor arrays to monitor, assess the health, and ensure the safety of levees and other distributed systems of a flood-control infrastructure.

Sponsor: Rensselaer Polytechnic Institute
Troy, NY

- Project Performance Period: 2/1/2010 - 1/31/2014
- Total project (est.): $6,928 K
- Requested TIP funds: $3,462 K

This joint venture led by Rensselaer Polytechnic Institute partnering with Geocomp Corporation is developing a new health assessment framework with the potential to revolutionize our ability to monitor, manage, and ensure the safety of levees and other systems of a flood-control infrastructure. The integrity and reliability of levees, earthen dams, and flood-control infrastructure are essential components of homeland safety. The failure of such systems due to a natural or manmade hazard such as a hurricane storm surge, flood, earthquake, deterioration, or terrorist attack can have monumental repercussions, sometimes with dramatic and unanticipated consequences on human life, property, and the country's economy. Levees, earthen dams and similar structures are difficult structures to assess not only because of their sheer size but also because they are constructed of complex geological materials, somewhat random in composition, with intricate degradation mechanisms. The planned framework provides a comprehensive multiscale monitoring and analysis for real-time health assessment of this infrastructure. This framework relies on long-term continuous monitoring techniques that are minimally-intrusive and inexpensive, and include satellite-based interferometric synthetic aperture radar (InSAR) measurements and a new high resolution shape-acceleration-pore pressure (SAPP) array able to measure soil displacements and movements over local areas for tens of meters. Novel high resolution GPS sensors with millimeter level accuracy tie the local SAPP arrays to the InSAR measurement system. The planned system would provide for the first time a long term, continuous assessment of the health of levee systems on both local and global scales, allowing federal, state and local governments to prioritize repairs and rehabilitation efforts, and assess the effectiveness of those efforts before a serious failure. The new health assessment framework will be implemented and benchmarked through an ambitious field test in the New Orleans area. The benchmark plan will include a $5,000,000 full-scale test of a levee that will be loaded until failure (i.e., a levee breach). This test will be conducted by the U.S. Army Corps of Engineers and fully funded by the Department of Homeland Security. If successful, the project innovations will transform the field of geohazard mitigation to enable more global and holistic approaches, and thereby enable a better management and more reliable flood-control infrastructure.

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Active Project Members

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