

SGER: A New Tool for Economic and Environmental Planning – Expanding the Boundaries of LiDAR (NSF #0722106)

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LiDAR (Light Detection And Ranging) is an active sensor now approved by FEMA for construction of digital terrain models (DTMs) and digital elevation models (DEMs). DTMs and DEMs, together with appropriate GIS layers, are key sources for the construction of digital flood insurance rate maps (DFIRMs). LiDAR use has not yet supplanted the USGS-generated DEMs and DTMs that have been available for decades. However, the momentum is in that direction. We wish to turn the attention of agencies at the state and local level to other possibilities for obtaining value from the LiDAR data they are already collecting.

To do so, we intend to show that LiDAR - combined with multispectral data - can (1) detect watersheds in urban areas that are at the scale of a neighborhood thus can be used for storm drainage management, and (2) collect sufficient detail of the urban structural landscape to be of real use in predicting property damage for given catastrophic events such as floods or earthquakes.

We employ a set of tasks that include selecting urban sites for study. We have both the LiDAR and IKONOS multispectral imagery for New Orleans, Louisiana. By a combination of new analytical techniques, field observation, and comparison to standard datasets, we will increase the value of LiDAR data now owned by many jurisdictions. Key to our approach is the development of a set of information-fusion related algorithms that answer each of the questions: (1) Can present USGS DEMs and DTMs be improved by automatic detection of break lines and neighborhood-scale watersheds gleaned from LiDAR elevation data fused with multi-spectral imagery? (2) Can the heights, geometries, and footprints of buildings be determined with an accuracy sufficient for disaster assessment? (3) Can the fusion product provide a modeling tool to predict, given factors such as water rising level, the potential damage and provide valuable information for pre- and post-disaster planning?

An interdisciplinary team from the University of North Texas and Southern Methodist University is in place. It includes an environmental engineer and two computer scientists. Each is supported by capable technical staff and laboratory associates.

SGER: US/China Digital Government Collaboration: A New Tool for Economic and Environmental Planning - Expanding the Boundaries of LiDAR (NSF #0737861)

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This proposal extends a funded Digital Government project entitled “SGER: A New Tool for Economic and Environmental Planning - Expanding the Boundaries of LiDAR” (proposal ID: 0722106). LiDAR (Light Detection And Ranging) is an active sensor approved by FEMA for construction of digital terrain models (DTMs) and digital elevation models (DEMs). DTMs and DEMs, together with appropriate GIS layers, are key sources for the construction of digital flood insurance rate maps. FEMA-specified LiDAR products are primarily designed for terrestrial floodplain mapping applications. In our previous proposal, the key was to develop information fusion related image understanding algorithms that answer three questions: (1) Can present USGS DEMs and DTMs be improved by automatic detection of break lines and neighborhood-scale watersheds gleaned from LiDAR elevation data fused with multi-spectral imagery? (2) Can the heights, geometries, and footprints of buildings be determined with an accuracy sufficient for disaster assessment? (3) Can the fusion product provide a modeling tool to predict, given factors such as water level rise rate, the potential damage and provide valuable information for pre- and post-disaster planning?

In this project, this collaborative work focuses on multispectral data aggregation and 3D visualization. Our goal is to answer the following question: *Can 3D model be generated and strategic planning questions, e.g. given a flood stage visualize the flooded area, possible breaching locations, and elevations of water around building footprints, be answered?* The China/US team plan two tasks to achieve this goal. First, we will develop a method to render photogrammetric and processed images over the “surface” of the reconstructed 3-D model from LiDAR data. Second, develop an integrated visualization tool. The data needed is the building footprints, building heights, and structural form of the rooves. These are similar to specific data products from the previous project and, with some additional effort, they can be extracted from the disaster maps. The data support will be extended to include a km² region of Hefei, China.