Automated urban debris zone extraction from post-hurricane very high-resolution satellite and aerial imagery
Shasha Jiang\textsuperscript{1} and Carol J. Friedland\textsuperscript{2}
\textsuperscript{1}Engineering Science program, Louisiana State University
\textsuperscript{2}Department of Construction Management, Louisiana State University

Automated remote sensing methods have not gained widespread usage for damage assessment after hurricane events, especially for low-rise buildings, such as individual houses and small businesses. Hurricane wind, storm surge with waves, and inland flooding have unique damage signatures, further complicating the development of robust automated assessment methodologies. As a step toward realizing automated damage assessment for multi-hazard hurricane events, this paper presents a mono-temporal image classification methodology that quickly and accurately differentiates urban debris from non-debris areas using post-event images. Three classification methods are presented: spectral, textural, and combined spectral-textural. The method is demonstrated for Gulfport, Mississippi, using IKONOS panchromatic and NOAA aerial imagery collected after 2005 Hurricane Katrina. The results show that multivariate texture information significantly improves debris class detection performance by decreasing the confusion between debris and other land cover types, and the extracted debris zone accurately captures debris distribution. Additionally, the automated extracted debris boundary is approximately equivalent regardless of imagery type, providing a flexible and robust methodology for debris mapping. While the test case presents results for hurricane hazards, the proposed methodology is generally developed and expected to be effective in delineating debris zones for other natural hazards including tsunamis, tornadoes, and earthquakes.