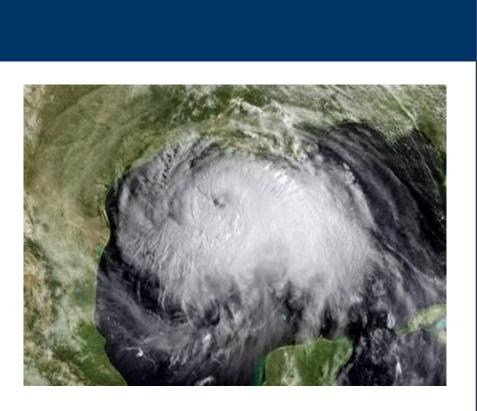
Object-oriented Representation and Analysis of Coastal Changes for Hurricane-induced Damage Assessment Qiusheng Wu, Ph.D.

BINGHAMTON UNIVERSITY STATE UNIVERSITY OF NEW YORK

Abstract

Hurricanes and tropical storms represent severe threats to coastal properties, settlements, and infrastructure. The research objects are to:

- Develop an object-oriented conceptual framework for representing hurricane-induced damages
 - Much more concise and explicit representation of damages than gridbased raster representation.
- Develop algorithms to numerically detect and quantify change objects
 - Extract quantitative spatial distributed information about damages for supporting hazard mitigation and recovery activities





Introduction

Conventional Methods for Coastal Change Analysis

Ground surveys

Accurate measurements

- Small spatial coverage
- Time-consuming

> Difficult in inaccessible and hostile environments

Digitizing and interpreting aerial photographs

- High spatial resolution
- Costly and time-consuming
- Labor-intensive



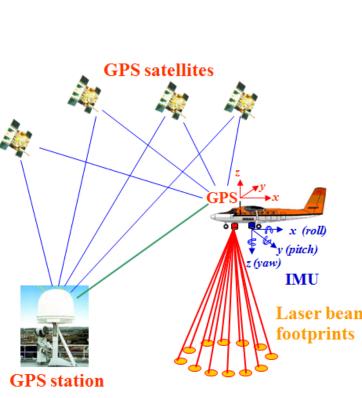


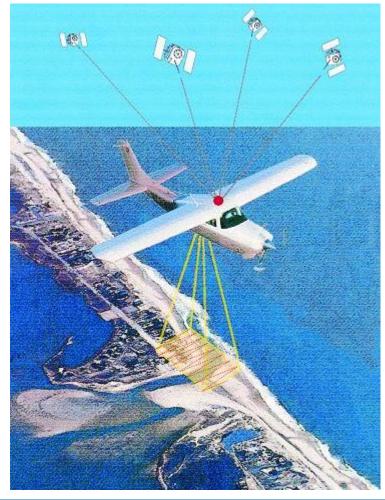


Airborne LiDAR Technology for Coastal Change Analysis

Airborne LiDAR (Light Detection And Ranging) System

- \geq 15 cm vertical accuracy
- > 1-2 m spatial resolution
- Cost-effective, rapid mapping

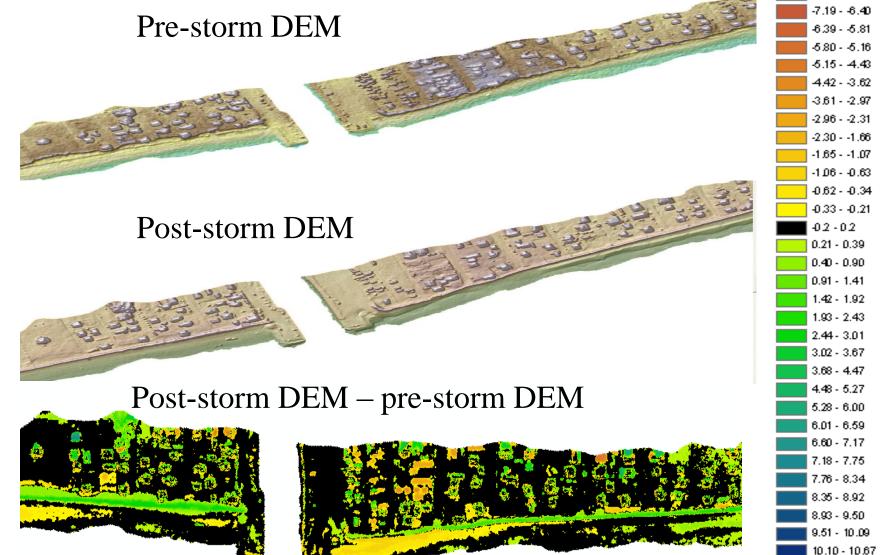




Cell-based Approach for Coastal Change Analysis

Problems:

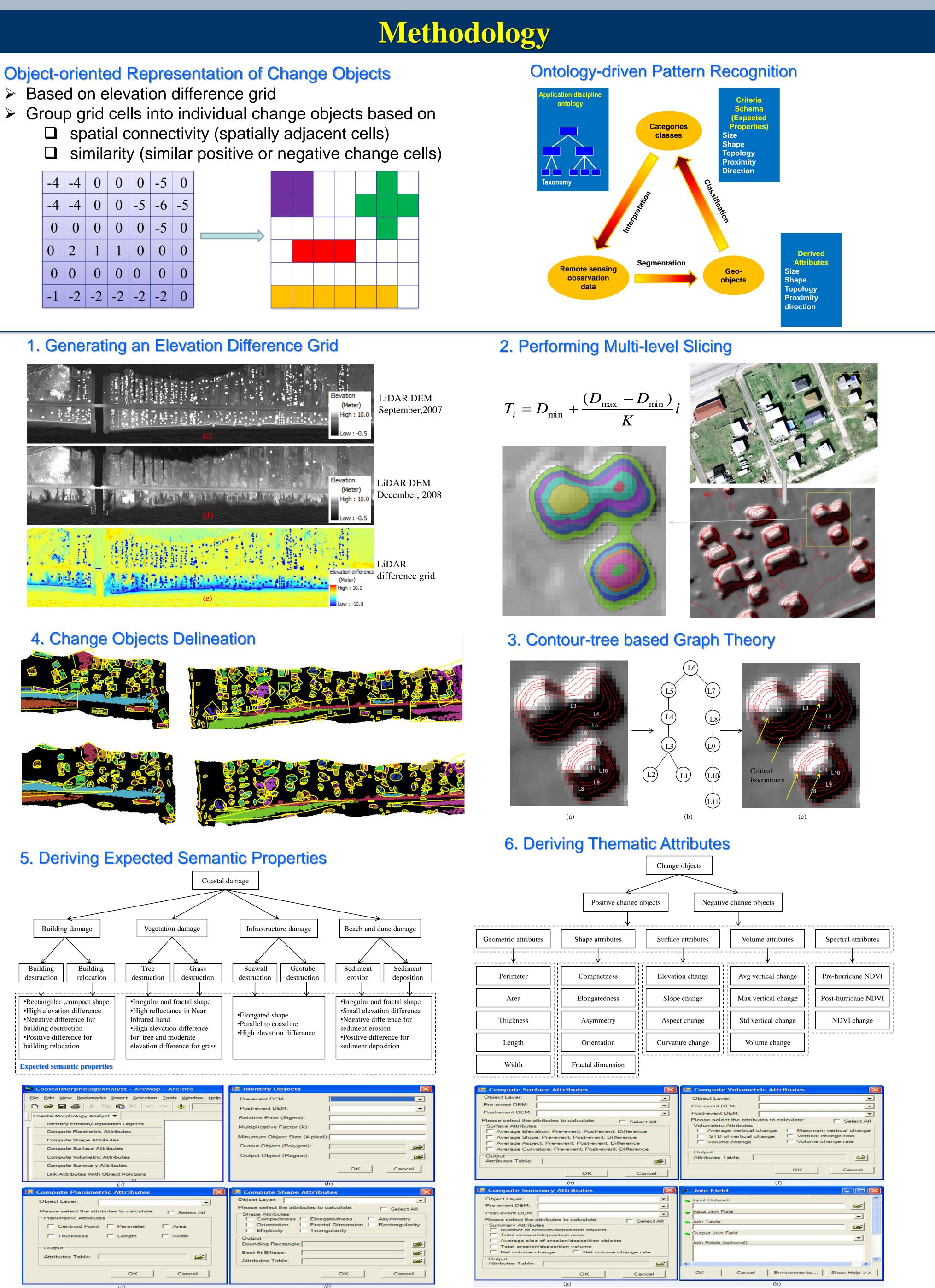
- Large volume of data associated with raster representation
- > No much explicit information about damages
- Difficult to be used for hazard mitigation and post-hurricane recover decision making



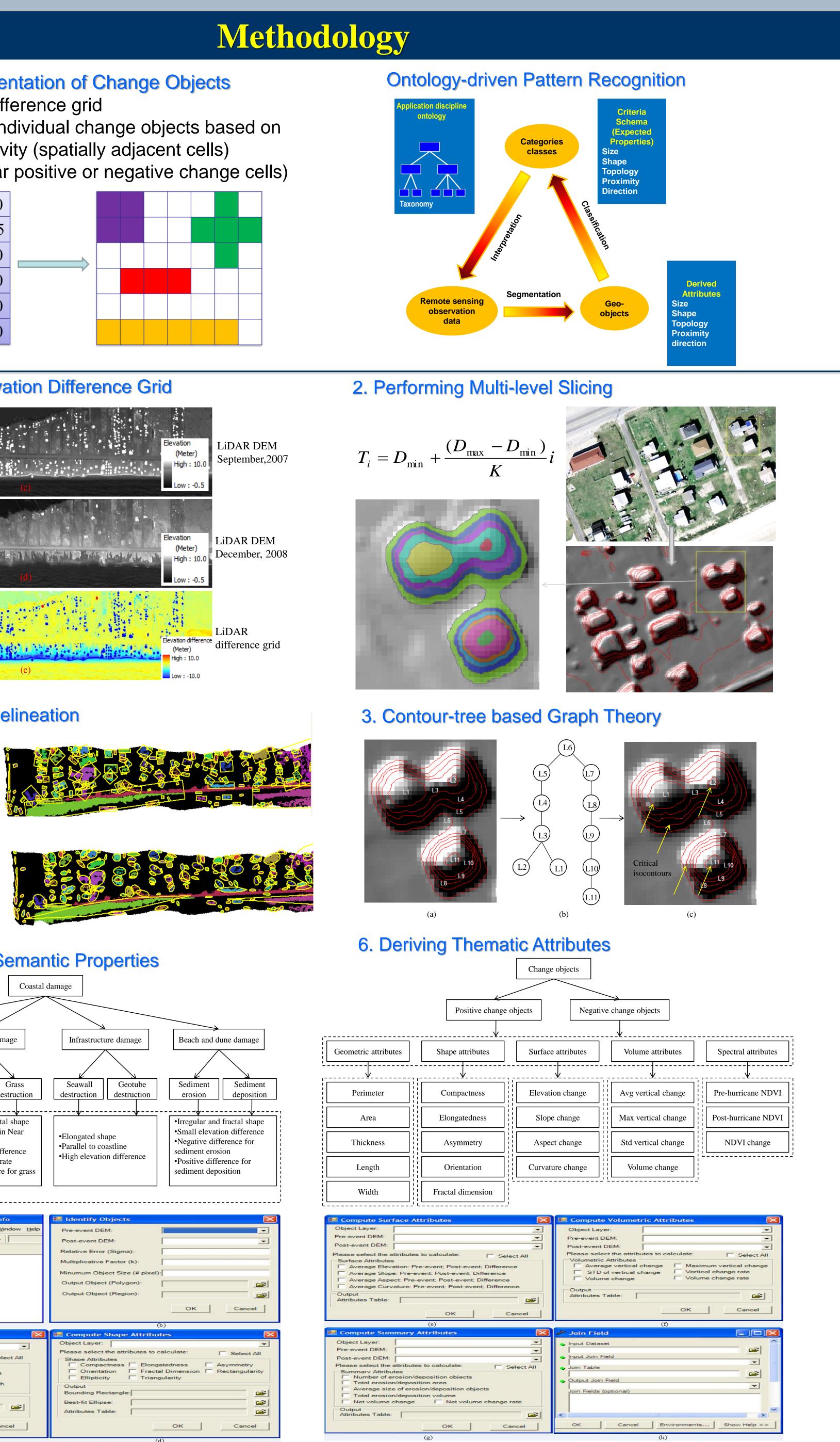
Department of Geography, Binghamton University, Binghamton, NY 13902



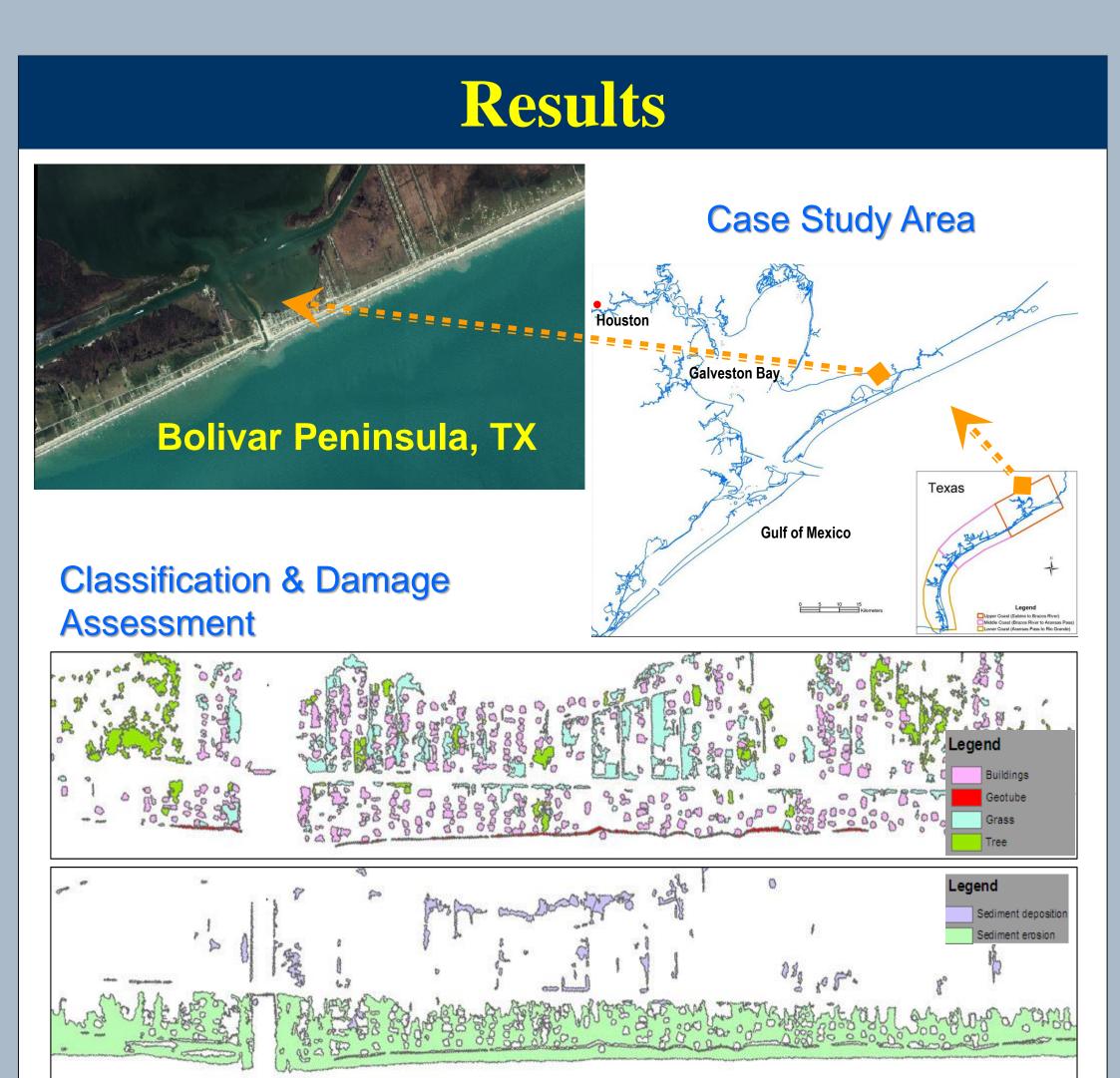
-7.93 - -7.20







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Buildings: 86947 m^2 Trees: 6082 m^2 Grass: 16400 m² Geotube: 1.818 *km* Shoreline: pushed landward by 15.2 m

Table 1 Classification error matrix

Sediment erosion: 271022 m^3 Sediment deposition: 22361 m^3

Overall accuracy: 05.0%

	sancan		Παιτιλ	Overall accuracy. 95.970					
	Buildings	Trees	Grass	Geotubes	Sediment erosion	Sediment deposition	Row totals		
Buildings	62	1	0	0	2	0	65		
Trees	1	69	3	0	0	0	73		
Grass	0	2	44	0	1	0	47		
Geotubes	0	0	0	10	0	0	10		
Sediment erosion	1	0	1	0	46	0	48		
Sediment deposition	0	0	0	0	0	52	52		
Column totals	64	72	48	10	49	52	295		

Conclusion

- > An object-oriented analytical framework for representing morphological changes for damage assessment
- Object-oriented representation provides explicit and quantitative damage information for supporting hazard mitigation and post-storm recovery effort
- An effective change object detection algorithm based on multi-level slicing and contour-tree graph theory
- > A software tool for automatically deriving quantitative attributes for change objects
- Taxonomy and rule-based approach for classifying change and damage types

References

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