An aerial photograph of a city street, likely San Antonio, Texas, showing a person walking in the center. The image is slightly blurred and has a light blue tint. It is framed by a thin orange border on the left and top, and a thin orange line on the right and bottom.

LANDSAT IMAGE-BASED LULC CHANGES OF SAN ANTONIO, TEXAS USING ADVANCED ATMOSPHERIC CORRECTION AND OBJECT- ORIENTED IMAGE ANALYSIS APPROACHES.

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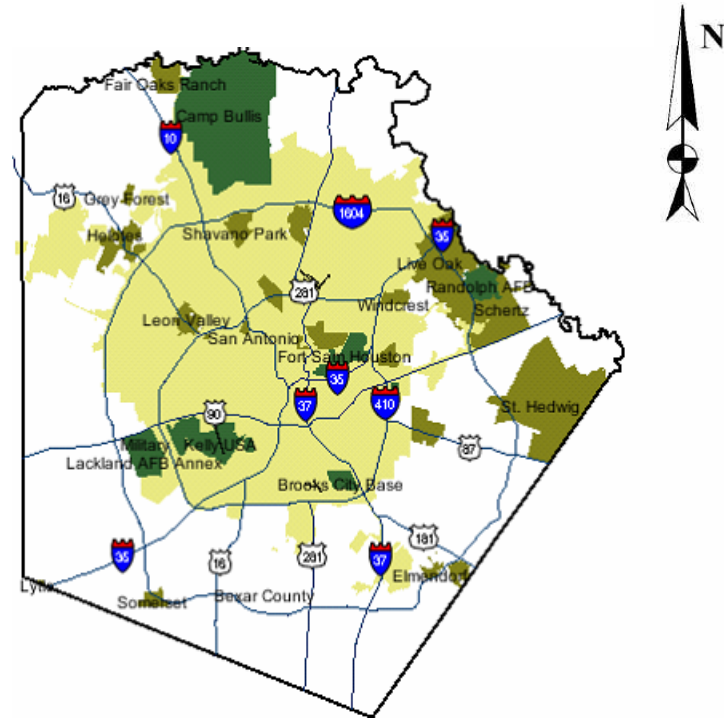
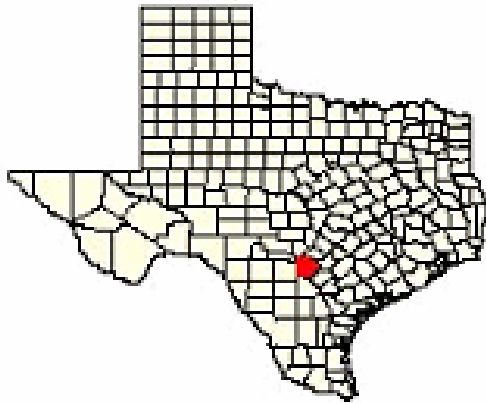
University of Texas at San Antonio

San Antonio, TX

Specific Objectives

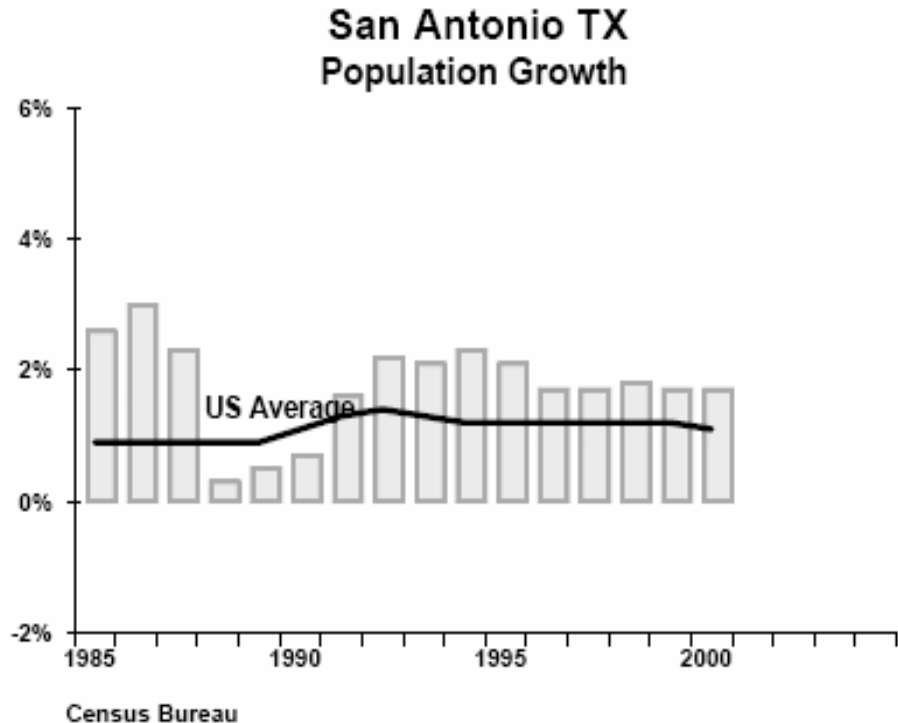
- to produce accurate and reliable results regarding LULC changes in the San Antonio area between 1985 and 2003 using Landsat TM images,
 - to examine the advances of radiative transfer model based atmospheric correction and object-oriented classification method.
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Study area & dataset



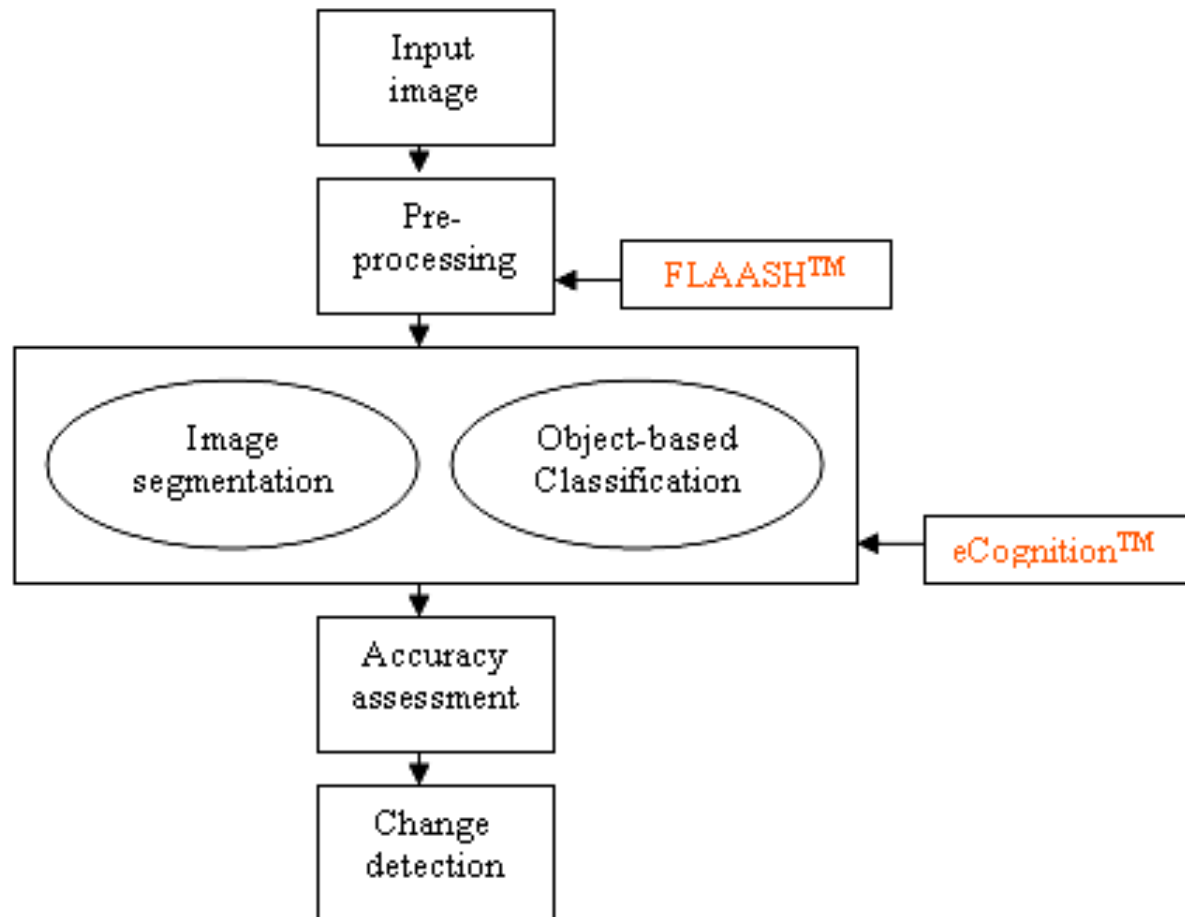
Bexar County

Study area & dataset



- **San Antonio**
 - **8th most populous city in the US**
 - **Population growth is 2% per year in the last decade.**
- **Landsat TM images**
 - **10-05-1985 & 10-23-2003**
 - **Path27/Row40**
 - **0% Cloud cover**
 - **Long 98.82,98.21W**
 - **Lat 29.68,29.17N.**

Methodology

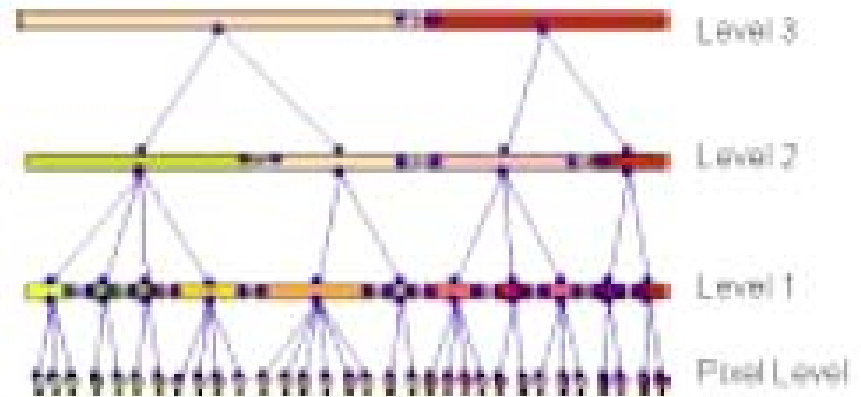


Atmospheric Correction - FLAASH

- FLAASH – Fast Line-of-sight Atmospheric Analysis of Spectral Hypercubes
 - Retrieves spectral reflectance
 - Incorporates the MODTRAN4 radiation transfer code
 - Can compensate for atmospheric effects more accurately
 - Module input includes: elevation, scene coordinates, sensor type, flight date & time, aerosol distribution, water vapor conditions, etc.
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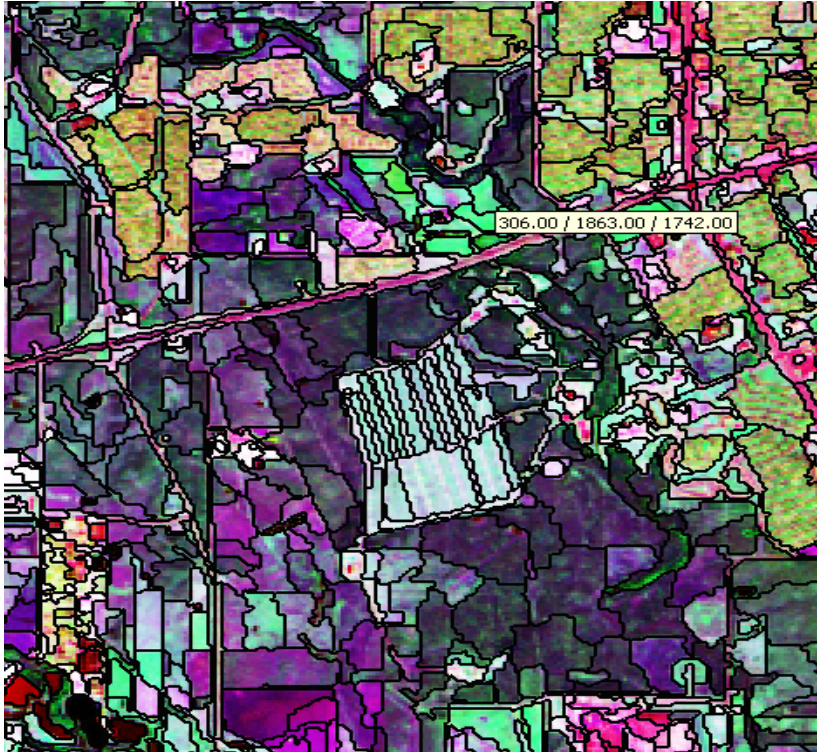
Image Classification (eCognition™)

- Multiresolution Segmentation
 - Subdivision of an image into separated regions
 - Based on adjustable criteria of homogeneity (shape, texture, etc.)
- Object-based Classification
 - Standard nearest neighbor approach
 - 7 classes: Fallow land, Cropland, Forest, Grass, Road/Pavement, Residential, and Water.



Hierarchical network of image objects

Multiresolution Segmentation



Multiresolution segmentation (Level 1)

Scale parameter = 25

Shape factor = 0.8

Compactness = 0.7

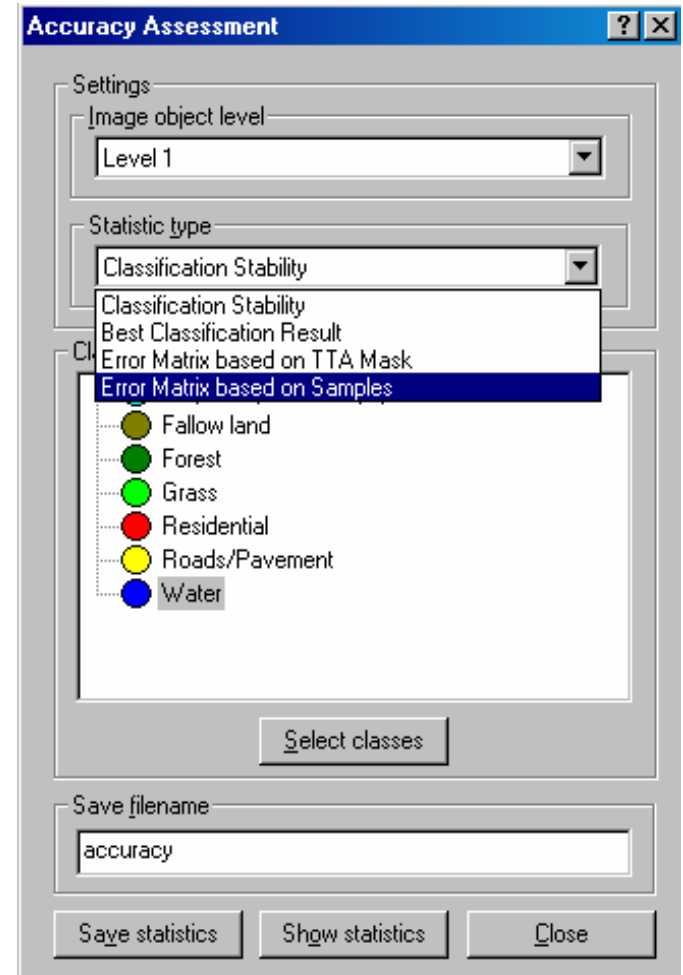
Smoothness = 0.3

Accuracy Assessment

- Error matrix based on samples

Year	1985	2003
Overall Accuracy	0.9382	0.9169
KIA	0.9237	0.8984

Results of accuracy assessment



Results

Initial State (1985)

	Fallow land	Forest	Grass	Roads/Pavement	Residential	Water	Cropland (Active crops)	Row Total
Unclassified	0.015	0.017	0.000	0.031	0.007	0.000	0.000	99.329
Fallow land	39.835	9.920	18.694	11.529	4.030	0.920	24.219	99.993
Forest	15.659	58.989	16.217	11.625	12.182	16.804	13.325	99.999
Grass	21.676	8.876	30.598	8.507	5.638	1.217	32.651	99.998
Roads/Pavement	9.484	9.338	9.643	40.737	11.911	3.635	7.111	99.931
Residential	4.169	9.032	13.575	24.192	64.235	2.426	7.755	99.987
Water	0.229	0.847	0.192	0.390	0.244	74.438	0.211	99.964
Cropland (Active crops)	8.934	2.981	11.080	2.990	1.753	0.559	14.728	99.999
Class Total	100.000	100.000	100.000	100.000	100.000	100.000	100.000	
Class Changes	60.165	41.011	69.402	59.263	35.765	25.562	85.272	
Image Difference	-18.556	-22.891	90.650	6.916	24.925	27.838	130.895	

Final State (2003)

Change detection statistics (area in percentage)

Results (contd.)

- Reduction in forest cover (-23%) with corresponding increases in residential land cover(25%), roads and pavements (7%) between 1985 and 2003).
 - Reduction in fallow land (-18%) and increased farming (131%) in the same period.
 - Surface water coverage increased (28%) probably due to a heavy rain episode.
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Results (contd.)



Mitchell Lake (2003)



Mitchell Lake (1985)

Conclusions

- Results demonstrated the potential for accurate LULC change assessment with advanced atmospheric correction and object-oriented image analysis using moderate resolution satellite data.
 - Pollution in Mitchell lake needs to be confirmed using current data.
 - Increasing impervious surface coupled with reduction in forest cover in the San Antonio area, portends significant economic and ecological implications in the near future such as:
 - Increased stormwater flow
 - Increased atmospheric moisture
 - Urban heat island effect
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Thank you!
