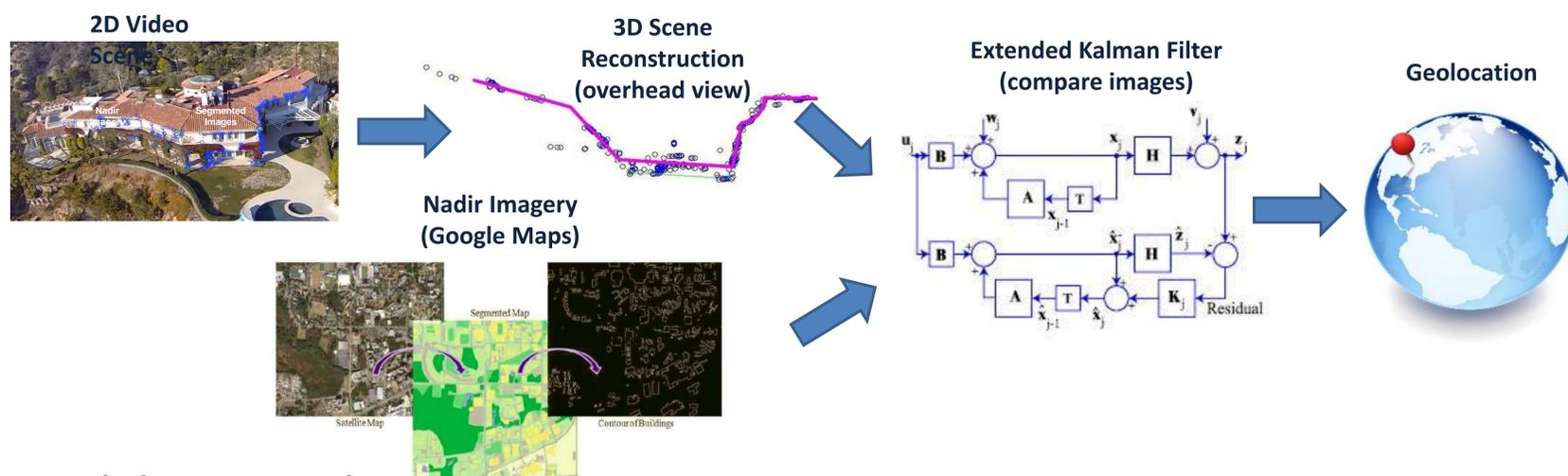
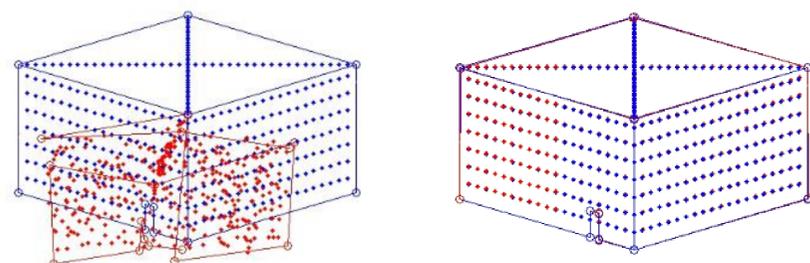


Principal Investigator - Warren Dixon, Ph.D.

Professor Dixon's research interests involve adaptive control methods for uncertain nonlinear systems. He has published 119 journal and 220 conference papers, along with numerous patents on image based estimation and control. His contribution have been recognized by a wide variety of best paper and early career awards. He is an IEEE Fellow, IEEE Control Systems Society (CSS) Distinguished Lecturer, member of the Air Force Science Advisory Board, and former Director of Operations for the IEEE CSS.

Most Relevant Past Projects and Demonstrations

- **IC Postdoc (Hakjae Kim)** – End-to-end geolocation solution from arbitrary video taken from a hand-held camera. Comparison of perspective invariance of reconstructed scene with nadir imagery enables geolocation of the camera.
- **NGA NURI** – Improved scene reconstruction solution, including real-time operation and stability guarantees with temporary loss-of-sight.
 - Simulation and experimental results showing full 3D scene reconstruction
 - Scene reconstruction in real time.
 - Highlighted contributions and further open problems to which our switched systems approach can be applied. Robust to intermittent loss of sight.



Capabilities sought

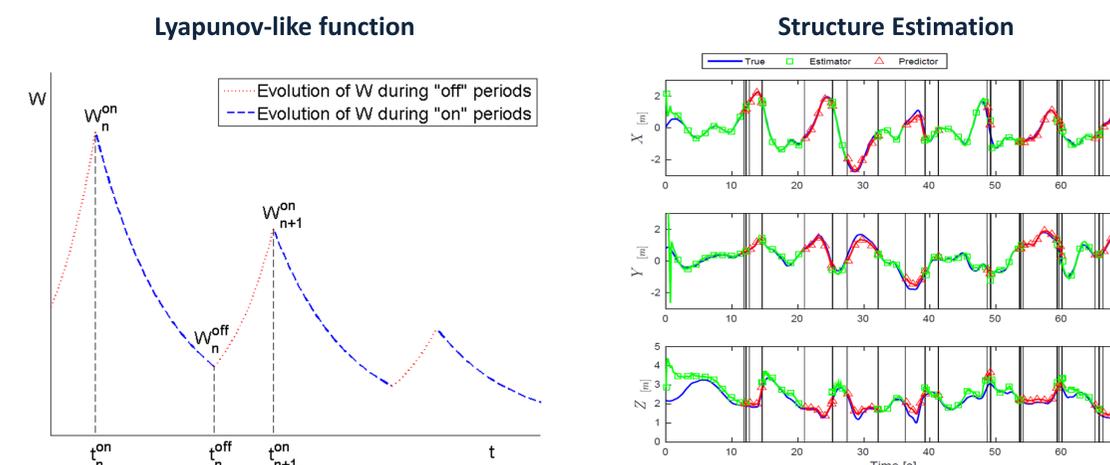
- Automatic target recognition and classification
- Ability to segregate man-made from natural environment in video

Supported Research

- 3D scene reconstruction from 2D camera images
- Concurrent Learning to identify scale in image estimation
- Switched systems analysis to develop bounds on observable and unobservable dwell times

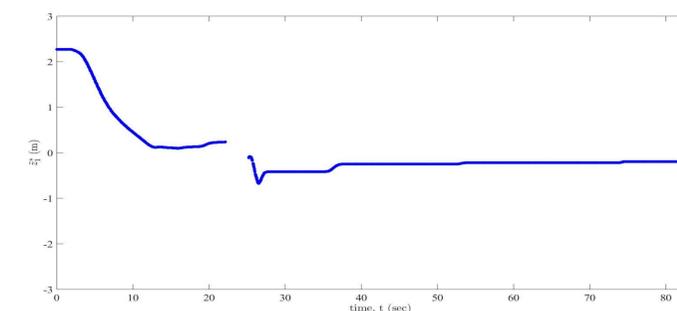
Switched Systems Analysis and Design

- Ability to guarantee estimation error convergence of 3D reconstruction methods even in the presence of intermittent measurements
- Intermittent measurements could be caused by occlusions in the environment, data loss, sampling, etc.
- Development of dwell time conditions for minimum time observed and maximum time unobserved yield guaranteed performance despite intermittent feedback.



Concurrent Learning

- Online method for learning unknown system parameters.



- Potential to employ this method to estimate camera parameters and camera velocity simultaneously, both of which are required for structure estimation.
- Using estimated camera parameters and camera velocity, nonlinear observers can be used to estimate 3D point cloud of video scene

Warren Dixon

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