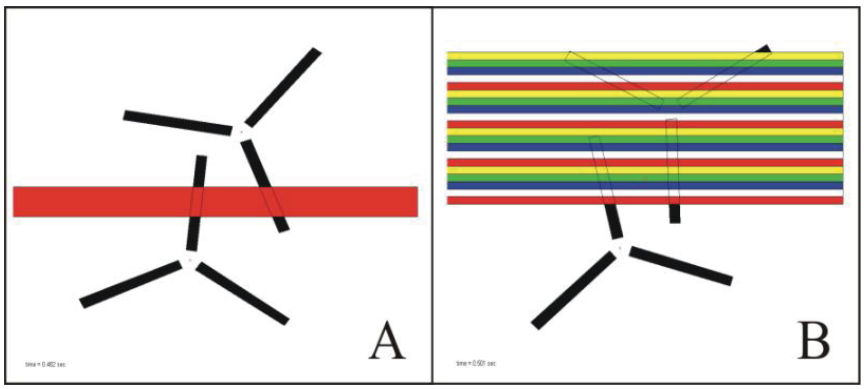
RSC
Remote Sensing Center
at the **Naval Postgraduate School**

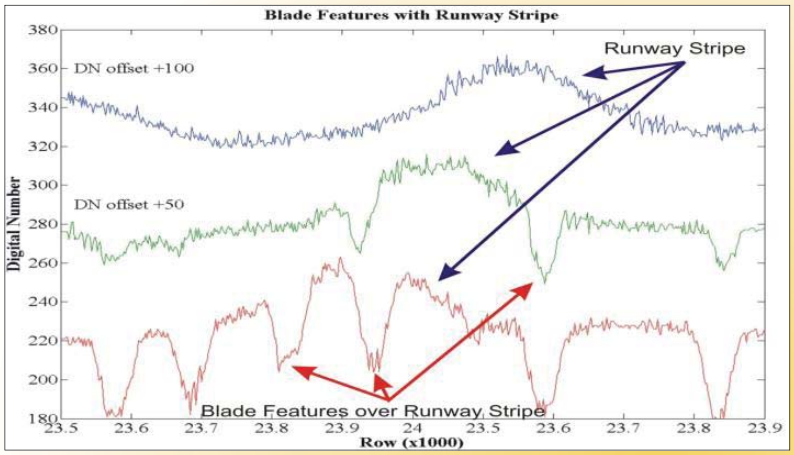
Satellite Imaging of Temporal Phenomena

Commercial imaging satellites implementing a non-traditional imaging mode are used to detect and characterize temporally varying phenomena. Precession of the satellite as it images allows an increase in the sample rate which increases the amount of imagery taken of a single location over a few second time frame, allowing short-term change detection.

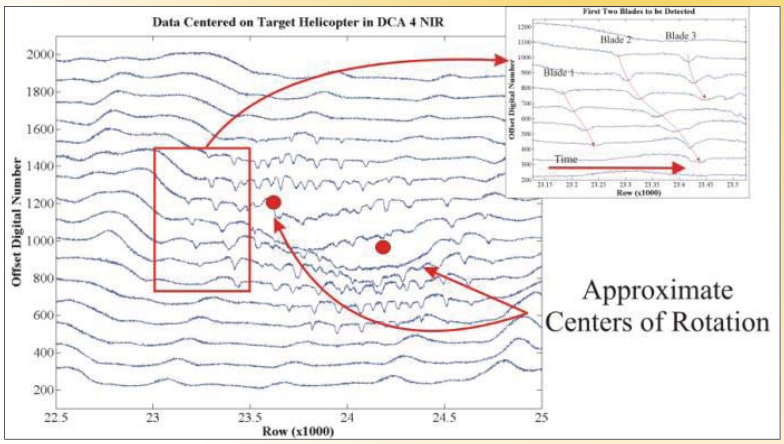


Data acquisition simulations: (A) MS Array (B) 20 stage TDI (Time Delay and Integration).

Imaging & Modeling of Rotational Targets



Detection of runway features and multiple helicopter blade features.



Determination of helicopter blade direction of rotation.

Quickbird II imagery has been used to image rotational targets, including hovering CH-47 helicopter blades at the Stockton, CA Municipal Airport and windmill blades at Ponnequin Wind Farms in northern Weld County, Colorado. Prior to the data collection, MATLAB simulations were carried out, providing good approximations to the data actually collected. Detailed analysis of the satellite attitude was necessary to interpret the data. Kinematics-based analysis and Fourier analysis were used to calculate the angular velocity, blade direction of rotation, and number of blades. Additional topics investigated include exploitation of the time lag between detector spectral bands in order to infer linear velocity of various targets, and detection and characterization of suspected sub-pixel rotational phenomena. Future investigations will include temporal imaging of water to study currents, tides, and other movement over water. Previously imaged targets rotate with frequencies on the order of 1 Hz. Increasing the oversample rate (number of lines of data collected per line of data collected in the normal imaging mode) will allow detection of changes on the order of kHz, allowing detection of shorter-lived or faster temporal phenomena.

For Further Information Contact:
Remote Sensing Center
Naval Postgraduate School
remotesensing@nps.edu

BECAUSE THE WORLD IS WATCHING

NPS PRAESTANTIA PER SCIENTIAM 1909