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INVESTIGATION OF SEVERAL ASPECTS OF LANDSAT 4/5 DATA QUALITY

Robert C. Wrigley, Principal Investigator
Quarterly Progress Report
September 20, 1984

Due to a paucity of Landsat-5 TM Data Products, little analysis was performed on the Band-to-Band Registration, Scene-to-Scene Registration and Periodic Components Tasks during the reporting period.

Geodetic Registration

An improved approach for the Geodetic Registration Task has been under development. The rationale for improvement derives from the fact that the National Map Accuracy Standard for easily identifiable points is that 90% of such points shall be within 0.5mm of their true position. For the best maps commonly available, the 7.5 minute quadrangle at a scale of 1:24,000, the error radius translates into 12,000mm, or 12m, along the ground. Since the Geodetic Registration Specification for TM is 0.5 pixels 90% of the time, or 14-15m, it is clear that the errors are nearly equal. In addition, older maps often do not meet this accuracy. To test TM better, a more accurate geolocation would be preferred for the ground point.

In making the 7.5'quads, the Geological Survey locates a number of photogrammetric targets within each quad to within 5 feet or 1.5 meters, roughly ten times better than the final map accuracies and the TM specification. Of course these targets are not detectable by TM even were they in place during a TM acquistion; the problem is to be able to use the targets in some transfer mode and not lose all the accuracy gained. The techinque under development with assistance from the Geological Survey uses a zoom transfer scope to register the photograph of the target with digitally enlarged photographic hardcopy of the TM data using a visual fit to the area surrounding the target. The first attempt using the Sacramento Scene (44/33) of February 1, 1983 indicated that relief displacement in the aerial photography would cause large errors. A second attempt is in progress using the aero-triangulated scene centers which have no relief displacement, by definition. Being calculated points, the scene centers have somewhat larger absolute errors in geolocation, approximately 3 meters instead of 1.5 meters.

Modulation Transfer Function

Preliminary analyses of the Modulation Transfer Function (MTF) of TM using 7 meter resolution aerial scanner data was reported previously and found to very noisy. In the current reporting period, Professor Schowengerdt made substantial improvements in noise reduction and symmetry of the MTF.

A different study area provided more high frequency content; better registration and additional data smoothing in six angular increments also contributed to the improvement. The average TM EIFOV calculated from the MTFs is 52.7 meters. This is smaller than the 55 and 65 meter EIFOVs reported earlier using the noisy MTFs but larger than the EIFOVs from the San Mateo Bridge analysis which ranged between 44.5 meters to 50.9 meters and averaged 47.6 meters for the same TM scene. Professor Schowengerdt's Progress Report is attached to, and made part of, this report.