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THE ERROR ASSOCIATED WITH DENSITY NUMBER (DN) RESAMPLING OF LANDSAT FOREST IMAGERY FOR MULTIDATE REGISTRATION

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Selection of the proper resampling technique for registration of multidate Landsat imagery can be important to digital classification accuracy in mountainous forest areas. The degradation of Landsat imagery by resampling for registration (or rectification) purposes was found to vary considerably depending on whether the cubic convolution, bilinear or nearest neighbor technique was used. In a 220 square kilometer study area located within California's Klamath National Forest, the cubic convolution technique was found to introduce the least amount of error in twice resampled imagery, with 14% of Band 5 pixels and 22% of Band 7 pixels altered by 3 density numbers (DN) or more. This compared to 35% and 44%, respectively, for the same imagery resampled with the bilinear algorithm. Both of these techniques produced satisfactory spatial relocation of pixels. Nearest neighbor resampling best preserved the original histogram of DN values, but proved unfit for multidate registration due to poor spatial relocation of pixels. Displacements of 1 pixel were common using the nearest neighbor algorithm. In a comparison test of classification performance, a classification derived from bilinear resampled data produced an accuracy 6.3% better than a similar classification based on cubic resampled data. Subtracting the two classifications revealed a 27% disparity attributable to differences in resampling techniques.

For multidate registration in mountainous forest areas, either cubic convolution or bilinear resampling can be used. For classification purposes, use of the bilinear technique is likely to produce a better result. In situations where the spatial relocation of pixels is not of prime concern, then nearest neighbor offers the best preservation of original DN values at considerably less computer expense.