GCP database development methodology for remote sensing and GIS, using GPS and SOI topographic maps

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Abstract: Ground Control Points (GCPs) are essentially required for the rectification of remote sensing images and georeferencing map database in GIS. Investigations have been done on the accuracy and methodology for GCP database development. GCPs were identified on the Survey of India (SOI) toposheets, after confirming their present position on the IRS LISS-III sensor images. Coordinates of these GCPs were read from 1:25,000 and 1:50,000 scale SOI topographic maps in Indian datum. The corresponding WGS-84 datum coordinates of above GCPs were also determined by carrying out the GPS Survey in autonomous and DGPS mode observations. The distance offsets between the two different datum and scale, coordinates of the same GCP were calculated, and used as a parameter for determining the accuracy of map derived coordinates by using point pairing technique. The accuracy aspects of GCP coordinates from DGPS and autonomous mode GPS observations, effects and issues related to the selection of appropriate map projection for the GCP database have been investigated. Because of higher degree of unreliability in the map derived GCPs, these were found to be inappropriate for the rectification of high-resolution images. Hand-held GPS observations in autonomous mode can provide positional accuracy in the range of 4 to 7 m by taking mean values of observation at good GDOP values. Based on these above mentioned investigations, a GCP database development methodology for remote sensing applications has been suggested.

Keywords: GCP, DGPS, GIS, image rectification, map projection, WGS-84 datum.