Strain Determination Using Point Displacements and Unified Least Squares Adjustment Approach

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Abstract: Deformation analysis is crucial to applications of geodesy, structural engineering and geology. With modern techniques such as the Light Detection and Ranging (LiDAR) or close-range photogrammetry, one can easily obtain a large number of spatial data in an efficient way. Strain tensor quantifies the deformation of an object, and can be estimated by the spatial data obtained. In this work, we used point coordinates and their displacements across time to estimate strain parameters, and improved the estimation model by using unified least squares adjustment approach. A numerical experiment based on real data suggested that the proposed approach detected behaviors of a deformed body effectively. Consequently, strain parameters from any region of interest on an object can be easily obtained using the point observables provided by the modern remote sensing techniques.

Keywords: remote sensing; deformation analysis; light detection and ranging; strain field determination