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Georeferencing of Jordanian Cadastral Block Sheets in Palestine Using non-linear Conditional Least-Squares Approach

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Abstract

This study links the coordinates of historical Jordanian cadastral settlement-basin plans in Palestine to modern high-precision terrestrial survey data through a simultaneous least-squares adjustment. Discrepancies have arisen because the original maps—drawn more than 70 years ago at small scales and with deficient control—are now referenced to evolved Palestinian coordinate systems and 1 cm-accuracy instruments, producing positional errors that distort area computations, boundary re-establishment, and land-administration transactions while fueling ownership disputes. The workflow begins by collecting paper and digital copies of the basin plans, selecting a study area according to data quality, and analyzing every legacy plan to identify persistent, visually discernible features. A detailed field-reconnaissance campaign measures these features—stone walls, iron corner monuments, survey crosses, and the like—after which each basin is individually transformed with several adjustment techniques whose accuracy is rigorously assessed. In parallel, a network-wide adjustment incorporates shared boundary vertices, enforcing common control points and inter-station distance constraints in a single non-linear least squares solution. The resulting coordinates are benchmarked against the archival data to maximize congruence and precision, delivering a reconciliation framework that is expected to surpass existing methods, eliminate overlaps between adjacent parcels and basins, and ultimately guarantee citizens' property rights while enhancing transparency in the cadastral registry.