Transformation Between Reference Ellipsoids, Using Non-Euclidean Relationships

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SUMMARY

Transformation between different geodetic datums is a general task, e.g. if a Global Navigation Satellite System's receiver is used for the measurements.

This paper does not deal with the transformation between datums, but the transformation between reference ellipsoids (as a part of the geodetic datum) is studied.

Reference ellipsoids (or spheres) are the basis of any projection system. A projection system describes the connection between the ellipsoidal, geographic coordinates (latitude and longitude) and the planar coordinates of the projection.

If the relationship between the two reference surfaces is determined, transformation between two projection systems can be easily carried out based on this relationship (because the projections are known).

The developed new method for determining the above mentioned relationship between two reference surfaces is based on projective geometry. Reference surfaces in geodesy (e.g. ellipsoids, spheres etc.) are quadrics.

Handling of quadrics and their relationships in projective geometry provides a flexible solution for determining the relationship between two reference surfaces.

Usage of collineations and correlations (as basic transformations in projective geometry) showed excellent and reliable results for transformation between two projection

systems.

Theoretical background of the method, results of testing on different Hungarian geodetic datums, and further development plans are presented and studied in the paper.