Application of the non linear regression on the 3-D and 2-D coordinates transformation problem. Case of Algeria.

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Abstract:

The global transformation models (Bursa-Wolf, Molodensky-Badekas, Veis,. . .) are the most used to compute the transformation parameters between geodetic systems.

In the case of Nord-Sahara 1959 datum (Algeria), these models are not most appropriate to give good accuracies, because of lack of information about the geoid's undulation above astro-geodetic ellipsoid (Clarke 1880). The two dimension models such as geodetic lines and multiple regressions have given best results. In all cases, the computation method is the traditional least squares adjustment.

The paper's main objective is the transformation of geodetic control from the WGS-84 datum to the old Algerian system Nord-Sahara'59 using different methods of nonlinear least squares adjustment.

The test carried out concerned the application of these methods to compute the transformation parameters in the three-dimensional case (global transformation models) and in the two-dimensional case (local transformation models).

In this context, a set of 16 benchmark, have been integrated to compute the seven transformation parameters (3D).

Four optimization algorithms (Newton, Steepest Descent, and Levenberg-Marquard, Least squares adjustment) have been used to solve problem.

Conclusions and recommendations are given with respect to the suitability, accuracy

and efficiency of each method.