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GNSS-levelling for practical height determination via Radial Base Functions

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In previous studies on the practical use of GNSS-levelling, the analysis of the optimal combination of heterogeneous data consisting of ellipsoidal, orthometric and geoid heights of a vertical control network was mainly based on polynomial models and similarity-based transformation models and its more simplified forms. In this study, Radial Base Functions (RBF) are used in addition. They provide an orthonormal basis which determines a parametric surface with uncorrelated parameters. At the same time, the corresponding performance of the surface is not dependent on the degrees of the base function. The optimization of the shape parameter inherent in the interpolation kernel will be realized by means of the Genetic Algorithms (GA) in order to minimize the interpolation error. This methodology has the advantage that it is differentiable. Thus, the data distribution can be taken into account and any possible oscillations in the parametric surface will be avoided. Among others, the performance of this inverse multiquadric function will be assessed by a special cross-validation procedure which has a higher performance than the classic ones. The resulting RMS will be compared with the RMS of the classical polynomial and similarity-based transformation models.

The described approaches will be evaluated using the most current geoid model, GPS and levelling data in Canada.