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Comparison of different interpolation methods for Hungarian climatological data

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Interpolation is one of the most frequent operations used in computational techniques. In this study, three different interpolation methods are carried out, using the weather stations data in Hungary. This study focuses on the temperature and precipitation averages derived for the 1981-2010 normal period. Some yearly, seasonal and monthly averages are investigated in this work.

This paper compares two GIS interpolation methods such as Inverse Distance Weighting and Ordinary Kriging to the method MISH (Meteorological Interpolation based on Surface Homogenized Data Basis; Szentimrey and Bihari). The main difference between these methods is that in the case of geostatistical procedures the usable sample for modelling of the statistical parameters are only the predictors. While in meteorology we have spatiotemporal data, namely the long data series which form a sample in time and space as well.

For comparison of the different interpolation methods the cross validation was applied that is a widely used model validation technique for assessing how the results of a statistical analysis will generalize to an independent data set, which is created for subsets.

Subsetting is a built in process in GIS systems which divides the database randomly into two parts namely the training and the test datasets. Then we apply the model with using the training dataset and by using the validation tools it can evaluate how good the predictions are relative to the known values in the test dataset.

For each method, the prediction values and corresponding observed values were compared. By using Geostatistical Analyst in ArcGIS, 6 subsets were created in every single case and the results were averaged. The performance of the methods was assessed by identifying the Root Mean Square Error (RMSE) in the predictions. Higher values of RMSE obtained in case of Inverse Distance Weighting and Ordinary Kriging, nevertheless the slightest values of RMSE occurred with the MISH interpolation method.