INTERPOLATING HYDROLOGIC DATA USING LAPLACE FORMULATION

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Date and Time : 16th April 2021 (Friday) 3:30 pm

Zoom meeting: https://purdue-edu.zoom.us/j/7427404301

Meeting ID: 742 740 4301

ABSTRACT

Spatial interpolation techniques play an important role in hydrology as many point observations need to be interpolated to create continuous surfaces. Despite the availability of several tools and methods for interpolating data, not all of them work consistently for hydrologic applications. One of the techniques, Laplace Equation, which is used in hydrology for creating flownet, has rarely been used for interpolating hydrology data. The objective of this study is to examine the efficiency of Laplace formulation (LF) in interpolating hydrologic data and compare it with other widely used methods such as the inverse distance weighting (IDW), natural neighbor, and kriging. Comparison is performed quantitatively for using root mean square error (RMSE), visually for creating reasonable surfaces and computationally for ease of operation and speed. Data related to surface elevation, river bathymetry, precipitation, temperature, and soil moisture data are used for different areas in the United States. RMSE results show that LF performs better than IDW and is comparable to other methods for accuracy. LF is easy to use as it requires fewer input parameters compared to IDW and Kriging. Computationally, LF is comparable to other methods in terms of speed when the datasets are not large. Overall, LF offers a robust alternative to existing methods for interpolating various hydrology data. Further work is required to improve its computational efficiency and overcome its limitations in creating smoother surfaces.