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Rasterization of Mountain Weather Temperature Data Using Spatial Statistical Methods

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Extended Abstract

Surface air temperature is a typical meteorological factor in the field of meteorology and climatology, and has recently been used as a measure to understand extreme weather phenomena such as droughts and heat waves due to global climate change. In particular, it is very important because it is used as data for monitoring forest disasters such as forest fires and landslides [1]. However, the limited spatial distribution of the weather temperature observation network has limitations in representing the spatial distribution of continuous temperature [2]. Therefore, this study aims to calculate continuous grid data by applying the numerical elevation model (DEM) to the temperature data of the automated mountain meteorology stations (AMOS) operated by the National Institute of Forest Service. AMOS is an automatic weather observation equipment that is being and operated in major mountainous areas across the country for the purpose of preventing to forest disasters such as forest fires, landslides, and forest pests that are due to climate change. The 2m-temperature (℃) observed in real time was obtained every hour from 2014 to 2021 through the Open API of the Mountain Meteorological Information System (http://mtweather.nifos.go.kr), and the initial experiment was conducted by selecting one month on behalf of each season (spring, summer, fall, and winter).

This paper rasterizes considering temperature changes in mountainous areas according to the altitude through optimized kriging with the laps rate. To derive the optimal theoretical variogram from the empirical variogram representing the dissimilarity of the observations according to the separation distance, Kriging weights were optimized by the weighted least square (WLS) method. Cubic spline time series interpolation and Six Sigma outlier detection were performed for AMOS data Quality Control (QC), and the grid data with a target resolution of 500m was calculated using DEM data provided by Shuttle Radar Topography Mission (SRTM). DEM data reflects the topographic effect in the calculating the information of the unobserved points. The observation data within the experimental period were conducted random sampling at 8: 2 and used for estimation and validation, respectively. For the validation, the ordinary kriging and the optimized kriging considering the laps rate were compared. As a result, MAE (℃) decreased by 0.127, 0.18, 0.07, and 0.105, respectively, in spring, summer, fall, and winter. Above all, the error distribution with the actual observed value on the histogram was concentrated at 0 in the case of the optimized kriging considering the laps rate. Using the rasterized temperature data, forest disasters such as forest fire risk prediction will be analyzed. In the future, if the optimized kriging of precipitation data is carried out in the same way, it can be applied to landslides.

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