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# Rain Gauges Network Design using Discrete Entropy and Kriging Approach

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A well designed rainfall network can accurately provide and reflect the information of rainfall in a catchment. However, the adequate number and optimal location of rain gauge stations have yet to obtain a satisfactory result. At alpine area, in particular, due to the high variation of relief, a more accurate design of raingauge network is required. Hence, a proposed model composed of kriging and discrete entropy is introduced in this study to relocate the rainfall network and to obtain the optimal design with the minimum number of rain gauges. The ordinary kriging is used to generate rainfall data of potential locations where rain gauge stations may be installed. The information entropy based on probability is used to measure the uncertainty of rainfall distribution. By calculating the joint entropy and the transferable information, the relocated rain gauges are prioritized and the minimum number and location of the rain gauges in the catchment can be obtained to construct the optimal rainfall network to replace the existing rainfall network. The alpine area located at Experimental Forest of National Taiwan University in central Taiwan is selected as the target area. Comprising 50 existed rain gauges, 346 blocks covering $1 \times 1$ km^2 size are delineated from the target area as the candidate rain gauges to test the proposed algorithm using rainfall records between 1992 and 2009. The result shows that only 2 and 5 candidate rain gauges can represent 62.93% and 85.21% of variance of rainfall distribution respectively.