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Rainfall Network Design using 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 required 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 entropy with probability distribution function 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. In addition to the discrete distribution obtained from the rainfall records, the probability distribution function will be also introduced to fit the statistical characteristics of data of the raingauges and compared with the discrete function. 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 study area. The preliminary result shows that only 3 and 4 raingauges can represent almost 90% and 95% of variance of rainfall distribution respectively in an existed network comprising 10 raingagues.