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Application of Transinformation Entropy And Genetic Algorithm for Raingauge Site Selection

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To assure the success of water projects, providing accurate rainfall data has great importance. Recognition of all the processes that create the surface water is the first step in water projects. Principle of this understanding is based on the information from climate and precipitation characteristics. So, the necessity of rainfall data in water projects and regional programming is undeniable. Collection of rainfall stations in a region or basin is called rainfall network. An efficient network is a network which provides us with accurate and trustable data due to proper raingauges density. So, an acceptable estimation of the needed climatic and hydrologic factors could be provided. Therefore, spatial distribution of these stations should give a comprehensive understanding of the spatial variability of rainfall in the region. The rainfall network design includes the number of raingauges and their locations. In this paper, an entropy-based method is applied to determine the location of new rainfall stations in Gav-khuni basin located in central region of Iran. For this purpose, the measurement of transinformation entropy that represents the transmitted information has been used. Because of spatial variations in annual rainfall in the area, it has been divided into three zones based on mean annual rainfall of its stations and the correlation coefficient between each pair of stations. Then, the transinformation-distance curve is developed for observed data of each zone to find the transinformation-distance relationship in each area. A set of potential points are created in center of cells of a 5km×5km grid. Then through the optimization by genetic algorithm the best locations for new monitoring stations in each zone have been achieved and a set of 20, 15 and 9 potential points are determined as additional raingauges to be added to zone one, two and three, respectively, which improve the mean transinformation entropy in that zone through the new developed rainfall network.

Keywords: Entropy, Information theory, Genetic algorithm, Network design, Rainfall station