Affinity Propagation Approach for Catchment Classification Applied to Arid Catchments

Asep Hidayatulloh[1], Sameer Bamufleh[1], Anis Chaabani [1], amro elfeki[1], and A. Al-Wagdany[1]

[1]King Abdulaziz University

February 18, 2021

Abstract

One of the major issues in the arid region is the availability of hydrological data for hydrological studies of the basins for water resources projects. Since the Kingdom of Saudi Arabia (KSA) is a huge country and contains many arid basins it is awfully expensive and time-consuming to make hydrological networks for studying all these basins. Therefore, the Affinity Propagation (AP) clustering technique is proposed to cluster basins into groups that are similar in morphological, hydrological, and landcover characteristics and defining an exemplar (a representative basin) to each group. This basin is utilized for the installation of a detailed hydrological network. The hydrological response of that basin can be transferred and scaled appropriately to other basins in the cluster since they are hydrologically and morphologically similar. A pilot study is performed on 18 sub-basins in the southwestern part of KSA. GIS software is used to extract basin attributes and the clustering process is performed using the AP cluster packages in R software. The results show that four clusters are obtained based on the morphological attributes (twenty-eight attributes), five clusters based on hydrological attributes (twelve attributes), and three clusters based on land cover and CN (three kinds of landcover as attributes). The AP clustering technique was evaluated by the construction of a correlation matrix that shows a high correlation of 0.817 to 0.999. This study provides a robust technique that is effective and efficient to identify the similarity of catchments and can help hydrologists to develop a catchment management application in arid regions.

Hosted file

`AP For Catchment Similarity Classification in Arid Catchments.docx` available at https://authorea.com/users/396448/articles/509623-affinity-propagation-approach-for-catchment-classification-applied-to-arid-catchments