Abstract

Excessive groundwater withdrawal has become a serious national problem in recent years. In this research, three data mining techniques of decision tree, clustering and association rules were used to solve problems associated to water resources management. The predictive models of data mining algorithms such as CART, CHIAD, CVM, M5P, REPTree and M5Rules algorithms predicted the amount of aquifer depth changes with respect to various influential factors. According to the results, CART tree algorithm has better performance than other algorithms in predicting changes in depth of the entire aquifer of Qazvin plain. The prediction results of the CART algorithm indicated the completely different behavior of aquifer in two parts of year. From November to April, increasing in rainfall and decreasing in air temperature play a major role in the aquifer depth uprising. From May to October, increasing consumption and reducing the natural supply of water resources play an important role in the aquifer depth drop. According to the clustering, the best aquifer status was determined for the agricultural area of Booinzahra and the worst condition was obtained for the agricultural area of Qazvin city. According to the results of the Apriori algorithm, the highest confidence level in August was equal to 66.67% and in cases where the volume of water entering to irrigation network was less than 0.2×10^6 m^3, the volume of agricultural water demand was less than 0.47×10^6 m^3, the the volume of precipitation was less than 0.0002×10^6 m^3, the air humidity was greater than 41%, potential evapotranspiration was more than 5 mm/day and air temperature was higher than 26.3^o C, and the depth of aquifer was 0.3-1.0 meters. Among the set of factors influencing the changes in the depth of aquifer, the set of humidity of air values was less than 55%, the volume of agricultural demand was between 0.06 and 0.14×10^6 m^3, the water volume taken from the agricultural wells was more than 0.1×10^6 m^3, and potential evapotranspiration was more than 2 mm/day with a uprising of 0.3 to 1 m which occurred simultaneously in March with a supporter of 3%. Also, the highest positive correlation was 4.45 in June, between the previous set of values (the volume of water entering to irrigation network was less than 0.27, the water volume taken from the agricultural wells between 0.26×10^6 m^3 and 0.97×10^6 m^3, the volume of agricultural water demand exceeds 1.25×10^6 m^3, the air temperature higher than 24.4^o C and potential evapotranspiration more than 5 mm/day) and the amount of tally (the drop between 0 and 0.3m).

Keywords: predictive algorithm, clustering, association rules, groundwater resources.

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Study of the effects of agricultural water use on Qazvin Plain Aquifer behavior using data mining algorithms

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