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Case-Based Reasoning System for Assessing Water Pollution

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Abstract

Water is a crucial resource that humans demand to live; some countries are affected by the water crisis due to three important resources: the scarcity of usable water, drought, and water pollution. Egypt faces water crisis mainly water pollution that is one of the major problems facing the global circumstance. The water quality assessment is a great challenge today. In Egypt, They need to monitor the parameters related to the quality of environmental characteristics; especially the water quality has been recognized for a long time.

Water pollution by organic materials or metals is one of the problems that threaten humanity, both nowadays and over the next decades. Morphological changes in Nile Tilapia"Oreochromis niloticus" fish liver and gills can also represent the adaptation strategies to maintain some physiological functions or to assess acute and chronic exposure to chemicals found in water and sediments.

Our aim is to use the existing knowledge in order to identify the water quality and accordingly the degree of water pollution. To achieve this goal the case-based reasoning (CBR) approach is being used. The method is based on the idea that the similar problems have the similar solutions and can edit and use the old strategies that have been used for a previously solved problem for solving a new one. This thesis presents an automatic system for assessing water quality; in Sharkia Governorate - Egypt, based on microscopic images of fish gills and liver. The proposed system used fish gills and liver as hybrid- biomarker in order to detect water pollution. It

utilized case-based reasoning (CBR) for indicating the degree of water quality based on the different histopathological changes in fish gills and liver microscopic images. The system will support and provide quick and easy way to assessing water pollution or not. Various performance evaluation metrics; namely, retrieval accuracy, Receiver Operating Characteristic (ROC) curves, F-measure, and G-mean, have been used in order to objectively indicate the true performance of the system considering the unbalanced data. Experimental results showed that the proposed hybrid-biomarker CBR based system achieved water quality prediction accuracy of 97.9%. Also, it outperformed both SVMs and LDA classifiers for the tested microscopic images dataset.