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Editorial

The present journal issue contains two papers on case-based reasoning.

The first paper proposes a new and interesting reflection of the problem of normalization under the aspect of incremental data gathering as it is the case particularly for case-based reasoning systems. It is generally recognized that normalization allows a better comparison of examples having features involving different scales – such as combining height and weight for instance – so that we can compare apples and oranges. Classical normalization methods involve determining an upper bound and a lower bound value for each attribute and using these to map each feature value into a [0, 1] interval. That allows to calculate the similarity between [0, 1] and gives the similarity a semantic meaning. The paper starts by defining the problem in incremental systems, such as case-based reasoning systems, where the absolute upper and lower bounds are not known in advance and therefore evolve over time, causing classification errors. Moreover, the semantic meaning of the similarity between cases becomes flawed due to the fluctuation occurring in these values over time. Later, the authors explain a method for predicting the upper and lower bound of features from the subset of cases already processed. Further, it analyzes the problem through a thorough experimental setting and draws the conclusion that the best manner of solving this problem is to design an algorithm capable of learning the upper and lower bounds over time as part of the case base maintenance tasks. Absent this algorithm or other methods to resolve this issue, the authors recommend resorting to the classical nearest-neighbor rule in order to base CBR on the case with nearest distance as long as no further evidence is available to judge the real upper and lower bounds.

The second paper presents a case-based reasoning (CBR) system for coastal image interpretation. The goal of the system is to extract coastal aquaculture areas from multi-spectral remote sensing images. The application domain is important due to the increase in fish farming and sea reclamation – a trend which is likely to augment as a consequence of marine fishery decline and growth of the demand for fish. The CBR system described succeeds at identifying coastal aquaculture regions with 84.5% accuracy, which is an improvement over more classical methods such as maximum likelihood classification (MLC). The paper details the system design and its case representation, using objects and relationships, the spatial pattern of a case, the attributes chosen to represent a case, feature selection with principal component analysis, the similarity function between cases, and finally experimental results from the Eastern Guangdong region of China. One interesting characteristic of the system is to use multi-scale image segmentation of a fused image of the area being represented in the multi-spectral image. This capability of the system to take into account multiple spectral images, with different scales, is a definite advance over previous methods, based on a single spectral image of an area. Another advance of the system is to reason from the semantic information extracted from the images, such as for example the spatial relationships. In addition, the performance of the system is shown as increasing as the case base becomes more populated with image examples as the system is used more broadly.

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