Abstract

Many clustering and segmentation algorithms suffer from the limitation that the number of clusters/segments is specified by a human user. It is often impractical to expect a human with sufficient domain knowledge to be available to select the number of clusters/segments to return. Thus, the estimation of optimal cluster number during the clustering process is our prime concern. In this paper, we introduce a new validity index method based on multi-degree entropy algorithm. This multi-degree entropy algorithm combines a multi-degree immersion and entropy algorithm to partition an image into levels of intensity using multi-degree immersion processes. The output of the multi-degree immersion process is several regions which the interior does not
contain any sharp grey value transitions, i.e. each level of intensity may contain one or more regions, connected points, or oversegmentation. These regions are passed to the entropy procedure to perform a suitable merging which produces the final number of clustering based on validity function criteria. Validity functions typically suggest finding a trade-off between intra-cluster and inter-cluster variability, which is of course a reasonable principle. The latter process uses a region-based similarity representation of the image regions to decide whether regions can be merged.

The proposed method is evaluated on a discrete image example to prove its efficiency. The existing validation indices like PC, XB, and CE and the proposed index are evaluated and compared on two simulation and one real life data. A direct benefit of this method is being able to determine the number of clusters for given application medical images.

References


Index Terms

Computer Science
Pattern Recognition

Keywords

Clustering  Multi-Degree Immersion  Entropy  Validity Index