Hierarchical Piecewise Linear Representation of Time Series Data

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Abstract : This paper presents a Hierarchical Piecewise Linear Approximation (HPLA) for the representation of time series data in which the time series is treated as a curve in the time-amplitude image space. The curve is partitioned into segments by choosing perceptually important points as break points. Each segment between adjacent break points is recursively partitioned into two segments at the best point or midpoint until the error between the approximating line and the original curve becomes less than a pre-specified threshold. The HPLA representation achieves dimensionality reduction while preserving prominent local features and general shape of time series. The representation permits course-fine processing at different levels of details, allows flexible definition of similarity based on mathematical measures or general time series shape, and supports time series data mining operations including query by content, clustering and classification based on whole or subsequence similarity.

Keywords : data mining, dimensionality reduction, piecewise linear representation, time series representation

Conference Title : ICKDDM 2014 : International Conference on Knowledge Discovery and Data Mining

Conference Location : Madrid, Spain

Conference Dates : March 27-28, 2014