

When Granules Are not Enough in a Theory of Granularities

Ricardo Almeida Silva, João Moura Pires, Maribel Yasmina Santos

Abstract Several approaches have been proposed to model spatiotemporal phenomena at multiple LoDs, in particular, under the granular computing research area, where a granularities-based model was proposed. Such model stands out from the related literature, but has two major limitations. On one hand, it has difficulties for describing regions, intervals of time, among others complex descriptions, and on the other hand, the generalization process is the same whether it is generalizing spatial, temporal or other features of a phenomenon. These problems reduce its applicability. To overcome such limitations, this paper extends the granularities-based model by introducing the granular term concept. We apply this concept to represent time instants and intervals as well as cells and raster regions. For each granular term, generalization rules are defined so that a phenomenon can be expressed from one LoD to a coarser one in an automatic way. Changing a phenomenon's LoD can simplify granular terms, transforming for instance a time interval into a time instant or a raster region into a cell. Our contributions are shown based on a real dataset about tornadoes in the USA. The results obtained show an enhancement of application scenarios from the extended granularities-based model to its ability of providing different phenomenon's representations in each LoD, while keeping its original strengths.

Keywords Granule, Granularity, Granular computing

