The Qualitative Treatment of Spatial Data

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This paper aims at an efficient treatment of spatial data using qualitative representation. We propose a new framework called PLCA, which provides a symbolic representation for the figure in a two-dimensional plane, focusing on the connections between regions. It is based on four simple objects: *points (P), lines (L), circuits (C) and areas (A).* The entire figure is represented as a combination of those objects. Pairs of areas, circuits or lines never cross. The simple, clear data structure based on objects makes the system feasible and easy to implement. A PLCA expression can be subject to topological reasoning such as judging the connection patterns of areas.

We define the operations of area integration and area division on a PLCA expression. These operations preserve the consistency of the expression, and correspond to real actions on the figures.

We can add attributes to each object, such as the properties that hold on an area or that an object represents, and make an attributed PLCA. The operations of area integration/division on an attributed PLCA correspond to the alteration of the classification level of objects, and semantic spatial reasoning can be performed on an attributed PLCA.

Keywords: Qualitative spatial reasoning; region connection calculus; spatial database.