

A DIMENSION INDEPENDENT GEOMETRIC MODEL FOR CITY MODELING

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ABSTRACT:

3D city modeling is not merely for the visualization of 3D city objects. A 3D city model should support analysis especially the geometric operations. Geometry is important for manipulating the spatial objects e.g. performing Boolean operations like intersection union and symmetric difference etc. Another characteristic of 3D city models is the ability of incorporate data from different sources e.g. nD city model is a 3D city model that incorporates diverse aspects of city involving temporal (time), social, environmental and economic dimensions. Especially important and challenging is the inclusion of temporal dimension. Recently we have proposed a geometric data model for spatial data modeling called alternate hierarchical decomposition, AHD. AHD recursively decomposes a nonconvex polytope (with or without holes) into its components which are convex hulls represented hierarchically in a tree structure called convex hull tree, CHT. In this paper we explore the application of AHD for modeling city objects especially buildings. The buildings are modeled inside out, so that the convex hull of the air gives the building while further detail gives chimney and other extruding structures. The characteristics of the AHD that make AHD attractive for city modeling are; 1. CHT provides support for geometric level of detail. 2. CHT supports n-Dimensional objects. AHD, thus, can be used for dimension independent geometric modeling. 3. AHD's hierarchical structure facilitates the computation of Boolean operations efficiently. Especially the union operation which is not closed i.e. the union of two convex polygons is not convex. 4. Ease of understanding and implementation

TOPIC: Geometric modeling

ALTERNATIVE TOPIC: Not Specified