The Knowledge Based
Representation and Manipulation
of Geometry

Dissertation

by

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Abstract

An approach to the integration of geometric information in knowledge based systems is described as an *architecture* for geometric reasoning. The general requirements for this integration arise from the need for rich geometry representations in engineering domains and the conflicting demands of current geometric modelling and knowledge based systems. Four concepts are used as a basis:

1. *Classes of spatial sets*, which act by inheritance as a means for incremental definition by specialization,

2. *Features*, which denote evaluated portions of a geometric model,

3. *Abstractions*, which provide partial representations of geometric objects, and

4. *Constraints* through which spatial relationships are expressed.

These four concepts combine in a synergistic manner to define the complete architecture. A prototype implementation of the architecture, built using object oriented programming techniques and a boundary based solid modeller, has been achieved and demonstrated through examples in the domains of robot task planning and automotive parts design.