

## Polynomial Spatial Constraint Databases

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# Polynomial Spatial Constraint Databases

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## SYNONYMS

Constraint Database Systems; Constraint Query Languages; Infinite Relational Databases; Linear Constraint Databases; Moving Object Constraint Databases; Spatiotemporal Constraint Databases

## DEFINITION

The framework of constraint databases provides a general model for spatial databases [4]. In the constraint model, a *polynomial spatial constraint database* contains a finite number of relations, that, although conceptually viewed as possibly infinite sets of points in some real space  $\mathbf{R}^n$ , are represented as a finite union of systems of polynomial equations and inequalities.

## MAIN TEXT

More specifically, in a *polynomial spatial constraint database*, a relation is defined as a boolean combination (union, intersection, complement) of subsets of some real space  $\mathbf{R}^n$  (in applications, typically  $n = 2$  or  $3$ ) that are definable by polynomial constraints of the form  $p(x_1, \dots, x_n) \geq 0$ , where  $p$  is a polynomial in the real variables  $x_1, \dots, x_n$  with integer coefficients. For example, the spatial relation consisting of the set of points on the upper half of the unit disk in  $\mathbf{R}^2$  can be represented by the formula  $x^2 + y^2 \leq 1 \wedge y \geq 0$ . In practice, spatial relations will occur extended with thematic alpha-numeric information, like a name. In mathematical terminology, these spatial relations are known as *semi-algebraic* sets and their properties have been studied extensively [1].

The polynomial constraint database model was introduced by Kanellakis, Kuper, and Revesz [2] in 1990. The application of this model to spatial databases was described by Paredaens, Van den Bussche, Van Gucht [4]. This model was studied extensively in the 1990s and a state of the art book “Constraint databases,” edited by G. Kuper, L. Libkin, J. Paredaens appeared in 2000 [3]. and the textbook “Introduction to Constraint Databases” by P. Revesz was published in 2002 [5].

## RECOMMENDED READING

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