Department of Computer Science and Engineering

Presents

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The Computational Complexity of Topological Logics

One of the many achievements of coordinate geometry has been to provide a conceptually elegant and unifying account of the nature of geometrical entities. According to this account, the one primitive spatial entity is the point, and the one primitive geometrical property of points is coordinate position. Over the years, however, various authors have expressed disquiet with this conceptual scheme. The primary source of this disquiet is the conviction that our theory of space should use only those resources absolutely necessary to systematize the data of spatial experience. The question therefore arises as to whether alternative mathematical models of space are possible, in which the primitive spatial entities are not points, but regions (of some kind), and the primitive spatial properties and relations are qualitative rather than quantitative.

In answering this question, researchers have developed a variety of "spatial logics"---formal languages whose variables range over some domain of geometric objects (broadly understood), and whose non-logical primitives denote relations and operations defined over these objects. Of particular interest is the special case where the non-logical primitives in question have purely topological interpretations. This talk presents a survey of recent advances in the complexity-theoretic analysis of such "topological logics". Of particular interest are topological logics interpreted over low-dimensional Euclidean spaces. I shall summarize what is known in this case, and conclude with some challenging open problems.

BIO: Ian Pratt-Hartmann is Senior Lecturer in the School of Computer Science at the University of Manchester. He read Mathematics and Philosophy at Brasenose College Oxford, and Philosophy at Princeton University, receiving his PhD. there in 1987. Ian Pratt-Hartmann has published widely in logic, cognitive science and artificial intelligence. In 2007, together with Marco Aiello and Johan van Benthem, he edited the "Handbook of Spatial Logic". His current research interests include (in addition to spatial logic) the complexity of decidable fragments of logic and the relationship between natural language and logic.

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