

INTEGRATED REPRESENTATION OF (POTENTIALLY UNBOUNDED) 2D AND 3D SPATIAL OBJECTS FOR RIGOROUSLY CORRECT QUERY AND MANIPULATION

Rodney James Thompson^{1,2}, Peter van Oosterom²

¹ Department of Environment and Resource Management, Australia

² University of Technology, OTB, GIS technology, The Netherlands
rod.thompson@qld.gov.au, P.J.M.vanOosterom@tudelft.nl

Commission IV, WG IV/8

ABSTRACT:

In the search for a rigorous closed algebra for the query and manipulation of the representations of spatial objects, most research, apart from a few exceptions, has focused on defining and refining the mathematical model, whereby the representation is assumed to be defined by real-numbered coordinates in 2D or 3D space. The realization of this theory in the finite precision of a computer implementation is problematic, and frequently leads to unexpected and unwanted results. This paper explores a restricted, but useful representation, which supports a rigorous unsorted logic within the finite precision arithmetic of computer hardware: the regular polytope. This logic allows the derivation of a rich set of computable predicates and spatial functions. It is shown that this approach is readily implementable and is applicable to Cadastral data (with the growing need for integrated 2D and 3D representations and potentially un-bounded representations of ownership volume parcels into outer space), and has the potential to support more general spatial data.

This contribution was selected in a double blind review process to be published within the *Lecture Notes in Geoinformation and Cartography* series (Springer-Verlag, Heidelberg).

Advances in 3D Geo-Information Sciences

Kolbe, Thomas H.; König, Gerhard; Nagel, Claus (Eds.) 2011, X

ISBN 978-3-642-12669-7, Hardcover

Date of Publication: January 5, 2011

Series Editors: Cartwright, W., Gartner, G., Meng, L., Peterson, M.P.

ISSN: 1863-2246