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MULTIPLE REPRESENTATIONS

A BIBLIOGRAPHY

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PREFACE AND ACKNOWLEDGEMENTS

In the context of GIS and geographical analysis, this is an important problem because the nature of geographic data renders changes in its appearance and underlying structure depending on the resolution at which it is digitally encoded. Topographic information and statistical phenomena with a spatial component both tend to exhibit characteristics of scale-dependence, and it renders more difficult the process of automating the mapping sciences as well as the analysis of geographical pattern. The expense and tedium of generating unique database information for every desired scale of representation continues to challenge data production, to inhibit research efforts, and to limit the reliability of many GIS applications involving spatial decision support.

We intend this document as a tool for the general community, to provide an overview of research in a topical area that has to date not been identified in its own right. It is clear to us as we complete this literature search that the volume of research that has been reported is being catalogued under categories that are quite diverse, and little if any centralization to the topic we now refer to as "Multiple Representations" has penetrated keyword generation to date.

We anticipate that the publication of this bibliography will reduce redundancy of research efforts and alert individuals who do not commonly interact about the communality of efforts to understand the nature of things that change with scale, and encourage interchange between researchers in many disciplines. We hope to be kept informed of work that is not included in this version of the bibliography, to maintain currency in a field that is to date only crudely defined.

Information sources for this bibliography include the usual bibliographic tracing through published research reports and general reference. Online searches were performed through computerized bibliographic data bases and CD ROM archives of the Science Citation Index, INSPEC (Electrical and Electronic Engineering Abstracts) GEOBASE (GeoAbstracts) and GEOREF (Bibliography and Index of Geology). Several

government abstracts and archives have been searched, including Government Reports Announcements and Index (GRA &I), Scientific and Technical Aerospace Reports (STAR), Energy Research Abstracts (ERA) and Monthly Catalog of US Government Publications. Finally, online search has been completed using the American Statistics Index and the Statistical Reference Index, although these sources were not found to be extremely productive.

The contributions to this bibliography include the work of Melissa Schaeffer and Karen Crawford, both Master's students at SUNY-Buffalo School of Library Science, who performed initial online searches for the bibliography. Ernest Woodson, Reference and Map Librarian at the SUNY-Buffalo Science and Engineering Library, has been very helpful in refining our keyword choices, and in directing us to consider all possible bibliographic alternatives . Mark MacLennan has contributed a multitude of citations on scale-space filtering, indeed he introduced the topic and its relevance to us. We also thank all the researchers who have commented on drafts of this document, and helped with corrections and additions.

Categories of citations in the bibliography below were developed in part during discussions held at the Specialist Meeting for NCGIA Initiative 3, in Buffalo (February, 1989). Thirty-five individuals from universities in North America and Europe, from federal agencies, and from the private sector met for 4 days to discuss research impediments to the problem of Multiple Representations, and to prioritize a research agenda to address those impediments. The four major issues discussed at that meeting (digital representation, database issues, map generalization, and image processing) are represented in the organization of the bibliography that follows. For a detailed report on the Specialist Meeting, the following report is available from the National Center for Geographic Information and Analysis, UCSB, Santa Barbara, CA 93106.

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II. GENERALIZATION OF MAP FEATURES

II.1 Theoretical Issues

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IV. IMAGE PROCESSING ISSUES

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