

## IGU Commission Task Report 2012-2013

# COMMISSION ON MODELING GEOGRAPHICAL SYSTEMS

### Background of the Commission

This Commission on Modeling Geographical Systems has acted as a focus for those members of the international community who share an interest in using mathematical and statistical models in geographical systems analysis, geographical systems theory, geographical systems dynamics, geographical decision (or decision support) systems, GIS and remote sensing. This synthesis will aid and enhance research on mathematical modeling, statistical methods and other technological advances. In addition, the specific systems orientation of the Commission will enable a new emphasis to be placed on more applied outputs that have relevance to geographers engaged in evaluating a variety of policy arenas. To date, geographical systems analyses have contributed significantly to the understanding of, for example, the space economy, transportation and urban planning, global environmental change, spatial epidemiology and health care delivery. The Commission, therefore, will emphasize the following general areas of concern:

- geographical systems analysis;
- geographical systems theory;
- geographical decision support systems and decision theory;
- geographical systems dynamics;
- the interface between GIS, remote sensing and spatial modeling;
- applications of systems models to policy making and evaluation;
- geographical knowledge discovery and data mining

The promotion and publication of these ideas will be facilitated by our strong links with the editorial boards of the international journals such as: *Annals of Association of American Geographers*, *Environment and Planning A-C*, *Journal of Geographical Systems*, *International Journal of GIS*, *Papers in Regional Science*, *Geographical and Environmental Modeling*, *Canadian Geographer*, and *Sistemi Urbani*, *Geographical Analysis*, and *Geoinformatica*.

## **A Summary of our 2012-2013 Activities**

The Commission continued to be active in organizing and co-organizing conferences during 2012-2013. In addition to our existing collaborating organizations/associations, we have further established new linkages with major associations, such as the International Spatial Accuracy Research Association (ISARA), and the International Environmetrics Society, by co-organizing conferences with them. We have also slightly expanded our membership. We also held a steering committee at the Kyoto conference to make future plans for the advancement of the mission of the Commission. It was in general a fruitful year for the Commission.

## **A. Membership of the Steering Committee**

### **Chair:**

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### Number of Commission Members on Email by country 2013

Australia	7	France	4	Japan	7	Spain	1
Austria	5	Germany	7	New Zealand	4	Sweden	7
Belgium	4	Greece	1	Nigeria	1	Switzerland	3
Canada	34	Hong Kong	7	Norway	1	Tunisia	1
China	2			Poland	1	The Netherlands	13
Denmark	1	Ireland	3	Russia	3	United States	72
England(UK)	51	Israel	3	Scotland	2	total	257
Finland	1	Italy	8	South Africa	3	countries	29

## **B. Conferences Organized/Co-organized in 2012-13**

### ***Accuracy 2012, July 10-13, 2012 Florianópolis, SC – Brazil***

IGU-CMGS co-organized “ACCURACY 2012” - The Tenth International Symposium on Spatial Accuracy Assessment in Natural Resources and Environmental Sciences with the International Spatial Accuracy Research Association (ISARA) in Florianópolis-SC, Brazil during July 10-13, 2012. This Accuracy Symposium brought together experts from environmental sciences, natural resources, spatial statistics, and geographic information science to develop theory and methods for assessing and understanding spatial uncertainty. The symposium has met every two years since 1994 in a variety of international locations (USA, Canada, The Netherlands, Australia, Portugal, China, and United Kingdom) and has attracted between 80 and 300 participants. The 2012 Symposia attracted over 200 participants and the programs included combinations of keynote speakers, invited paper sessions, contributed paper sessions, posters, and workshops. Symposia topics covered aggregation and generalization in spatial uncertainty assessment, design- and model-based approaches to spatial accuracy assessment, error sensitive GIS, incorporating uncertainty in spatial decision making, uncertainty in remotely sensed data and images model validation with imperfect ground truth data. Accepted papers will be published in a special issue of The Brazilian Journal of Probability and Statistics. This was the first time IGU-CMGS co-organized conference with ISARA, and will set the path for closer collaboration in the future.

### ***32nd International Geographical Congress, August 26-30, 2012 Cologne, Germany***

The 32nd International Geographical Congress was held in Cologne, August 26-30, 2012. IGU-CMGS organized four sessions on spatial statistics and applications, geocomputations and applications, modeling human and physical processes, and spatial data mining in this congress. A multitude of novel applications and theoretical approaches were presented in these sessions. “Spatial statistics and applications” session focused on the recent advances in the theory and applications of spatial statistics. The purpose was to stimulate discussions on the development and use of spatial statistics in solving geographical problems. “Geocomputations and applications” session placed emphasis on recent developments in geocomputation methods other than statistics. It contained four presentations with the view to encourage discussion on the formulation of novel geocomputation methods for solving geographical problems in general and GIS/remote sensing problems in particular. “Modeling human and physical processes” dealt with the modeling of human activities and physical processes in space and time. The purpose was to show how models can be built to analyze spatial and temporal processes in human and physical systems, with the purpose to solve practical problems in a systematic manner. “Spatial data mining and knowledge discovery” session had four presentations centering on the theme of discovering patterns and

processes from spatial and temporal data. Algorithmic developments and practical applications were discussed. The fundamental issues in this area of research were explored in the exchange of ideas.

***23rd Annual Conference of The International Environmetrics Society, TIES 2013, June 10-14, 2013, Anchorage, Alaska, US IGU-CMGS is a co-sponsor of the session on Multiple Testing Problems in Environmental Research***

Multiplicity of statistical hypothesis tests is a common issue in many fields within the environmental sciences, including, for example, spatiotemporal climate trend detection, feature selection in hyperspectral remote sensing, and the analysis of experimental data with multiple outcomes and confounder variables. In order to address the issue of increased false-positive error rates in multiple hypothesis testing, numerous statistical concepts and approaches have been proposed in different contexts, most notably methods for controlling the false discovery rate and the familywise error rate, or for achieving field significance in climate science.

This session brought together researchers from geography and different fields within the environmental sciences and statistics to discuss methods, applications and current challenges in the statistical treatment of multiple testing problems. Of particular interest were novel methods that address this problem in the context of the analysis of spatial data, time series data, and space-time data, which may exhibit spatial or temporal autocorrelation.

***IGU Regional Conference "Traditional Wisdom and Modern Knowledge for the Earth's Future," August 4-9, 2013 in Kyoto, Japan.***

Over the past decades, globalization and other global changes have re-structured relations between countries and regions in the world, and have greatly altered the world geography. Such changes have put forward various problems of local, national or global scales, such as economic imbalance, social fragmentation, political conflicts, and environmental crises. All of these problems threaten the future of the earth. While acknowledging the world's diversity, geography as a discipline must endeavor to resolve these problems by devising plans for cooperation and symbiotic existence of the different peoples of the world. In this conference, CMGS organized five sessions with the topics on modeling geographical systems, advances and applications in geographical analysis and modeling, spatial cognition and analysis, as well as concepts and analysis of volunteer GIS. Theoretical and empirical results on the modeling of various geographical processes were presented in these sessions. In particular, analysis of spatial processes with voluntary geographical information was a topic that attracted attention of the participants.

**C. Planned Conferences for 2013-2014**

***Joint International Conference on Geospatial Theory, Processing, Modelling and Applications, October 6-8, Toronto 2014.***

*This conference will be co-organized with the IGU-GIS Commission and the International Society for Photogrammetry and Remote Sensing (ISPRS).*

***Regional Conference of IGU, Kraków, Poland, August 18-22, 2014.***

*The Commission plan to organize sessions at this IGU regional conference.*

## **D. Networking**

The Commission has further expanded its network of cooperation by co-organizing conferences with the International Spatial Accuracy Research Association (ISARA) and organizing session in the conference of *the International Environmetrics Society* on various themes in the modeling of geographical systems

## **E. Publications**

The Commission is strongly committed to the encouragement of scholarly publication derived from the work of its members and their contributions to symposia. Theoretical and empirical research will be published as special issues in journals and edited volumes in books. Some books published by members are listed as follows:

Yeh, A.G.O.; Shi, W.; Leung, Y.; Zhou, C. (Eds.). [Advances in Spatial Data Handling and GIS](#). Springer, 2012.

## **F. Archival Contributions**

All publications, newsletters and reports have been archived in the website of the Commission.

