

**DG.02003: Birds of a Feather Theme**  
**by G. P. Patil\***  
**Geoinformatic Surveillance: Hotspot Detection and Prioritization Across**  
**Geographic Regions and Networks for Digital Government In The 21<sup>st</sup> Century**

Ten birds of my feather joined me and flocked with me for the entire BoF session yesterday. Ten different backgrounds, interests, and home ranges. Issues identified and projects planned are as follows. You are all invited to be a bird of these feathers:

Geoinformatic surveillance for spatial and temporal hotspot detection and prioritization is a critical need for the 21<sup>st</sup> century Digital Government. A hotspot can mean an unusual phenomenon, anomaly, aberration, outbreak, elevated cluster, or critical area. The declared need may be for monitoring, etiology, management, or early warning. The responsible factors may be natural, accidental or intentional, with relevance to both infrastructure and homeland security.

This BoF session described a multi-disciplinary research program based on novel methods and tools for hotspot detection and prioritization, driven by a wide variety of case studies of direct interest to several government agencies. These case studies deal with critical societal issues, such as carbon budgets, water resources, ecosystem health, public health, drinking water distribution system, persistent poverty, environmental justice, crop pathogens, invasive species, biosecurity, biosurveillance, remote sensor networks, early warning and homeland security. The geosurveillance provides an excellent opportunity, challenge, and vehicle for synergistic collaboration of computational, technical, and social scientists.

Our methodology involves an innovation of the popular circle-based spatial scan statistic methodology. In particular, it employs the notion of an upper level set and is accordingly called the *upper level set scan statistic*, pointing to the next generation of a sophisticated analytical and computational system, effective for the detection of arbitrarily shaped hotspots along spatio-temporal dimensions. We also propose a novel prioritization scheme based on multiple indicator and stakeholder criteria without having to integrate indicators into an index, using Hasse diagrams and partially ordered sets.

Responding to the Government's role and need, we propose a cross-disciplinary collaboration among federal agencies and academic researchers to design and build the prototype system for surveillance infrastructure of hotspot detection and prioritization. The methodological toolbox and the software toolkit developed will support and leverage core missions of federal agencies as well as their interactive counterparts in the society. The research advances in the allied sciences and technologies necessary to make such a system work are the thrust of this BoF initiative.

The initiative will have a dual disciplinary and cross-disciplinary thrust. Dialogues and discussions will be particularly welcome, leading potentially to well considered synergistic case studies. The collaborative case studies are expected to be conceptual, structural, methodological, computational, applicational, developmental, refinemental, validational, and/or visualizational in their individual thrust.

You are invited.

*Keywords:* hotspot detection and prioritization, surveillance system, digital government, GIS, information technology, upper level set scan statistic, Hasse diagrams, partially ordered sets, hotspot rating, carbon budgets, water resources, ecosystem health, public health, drinking water distribution system, persistent poverty, environmental justice, crop pathogens, invasive species, biosurveillance, remote mobile sensor network, early warning system, cyber security, homeland security.

For additional information, see the webpages:

- (1) <http://www.stat.psu.edu/~gpp/PDFfiles/Prospectus%2016.pdf>
- (2) <http://www.stat.psu.edu/~gpp/PDFfiles/Prospectus%2016%20overview.pdf>
- (3) <http://www.stat.psu.edu/~gpp/PDFfiles/Prospectus-15-Case%20Studies.pdf>

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