The SIGSPATIAL Special

Newsletter of the Association for Computing Machinery Special Interest Group on Spatial Information

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The SIGSPATIAL Special is the newsletter of the Association for Computing Machinery (ACM) Special Interest Group on Spatial Information (SIGSPATIAL).

ACM SIGSPATIAL addresses issues related to the acquisition, management, and processing of spatially-related information with a focus on algorithmic, geometric, and visual considerations. The scope includes, but is not limited to, geographic information systems.

For more details and membership information for ACM SIGSPATIAL as well as for accessing the newsletters please visit http://www.sigspatial.org.

The SIGSPATIAL Special serves the community by publishing short contributions such as SIGSPATIAL conferences' highlights, calls and announcements for conferences and journals that are of interest to the community, as well as short technical notes on current topics. The newsletter has three issues every year, i.e., March, July, and November. For more detailed information regarding the newsletter or suggestions please contact the editor via email at egemen@csse.unimelb.edu.au.

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Editorial

Dear Colleagues,

Welcome to the first issue of ACM SIGSPATIAL's newsletter *The SIGSPATIAL Special*. With this newsletter, we aim to serve the community by publishing short contributions. These include, but are not limited to, conference reports and calls for participation, journal special issue announcements as well as short technical notes on current topics; basically all that is of interest to our community that we can present using a SIG newsletter format. We will also bring you SIGSPATIAL housekeeping information such as membership updates. The contributions will be organized into three issues every year, i.e., March, July, and November.

The first issue is dedicated to the ACM GIS 2008 Conference, and in particular to the PhD Showcases presented at the conference. We have eight PhD Showcases from around the world that are at the forefront of research on spatial information.

The issue opens with a welcome letter by the Chair of ACM SIGSPATIAL, Prof. Hanan Samet. Next, we include two reports from the ACM GIS 2008 Conference. One is a letter from the Program Chair for the 2008 conference, Prof. Walid G. Aref, which presents various highlights from the gathering at Irvine, California. This year, ACM GIS also hosted a workshop, Security and Privacy in GIS and LBS (SPRINGL). The highlights of this event are also reported in this issue. The eight PhD Showcases from the conference follow these letters. Finally, the issue concludes with an announcement regarding SIGSPATIAL membership information.

We hope that you enjoy this first issue of The SIGSPATIAL Special. Please do not hesitate to contact us via email at `egemen@csse.unimelb.edu.au` for suggestions regarding the newsletter.

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Welcome to SIGSPATIAL

To the SIGSPATIAL Membership,

On behalf of the SIGSPATIAL Executive Committee, we would like to welcome you to the first issue of our newsletter, The SIGSPATIAL Special. This newsletter is presently scheduled to appear three times a year and is under the stewardship of Egemen Tanin, our newsletter editor.

By virtue of the existence of this Newsletter, and the fact that you are reading it, you can see that our efforts for the establishment of the ACM special interest group on spatial information known as SIGSPATIAL have come to fruition. Some basic information about the SIG can be found at the SIGSPATIAL web site at http://www.sigspatial.org/. In the following, I provide some historical background information about the organization of our SIG and how it came to exist.

The formation of the SIG was the result of a process of negotiation with ACM in which we were helped immensely by Jamie Callan of CMU, who is a member of the ACM SIG Governing Board Executive Committee (SGB EC). SIGSPATIAL is the first new SIG in quite a few years. Our application materials were prepared by the SIGSPATIAL Organizing Committee consisting of Walid Aref, Chang-Tien Lu, Hanan Samet, and Markus Schneider. We were complimented by the SGB EC on our thoroughness and on our sense of knowing where we were headed. One of the items in our favor was that there were three other SIGs who were interested in our subject domain and were offering to host us in order to save us the trouble and bureaucracy associated with being a SIG, which we are learning slowly is a nontrivial matter. However, this bureaucracy comes with the freedom to control our destiny. Otherwise, we would need to go through an additional level of bureaucracy to organize events, transactions, awards, etc.

As part of the approval process, we were provided a number of questions to answer which we did in a long document as well as instructed to investigate whether we could indeed be a part of another SIG by talking to the chairs of these SIGs. We did this but at the end, the SIGSPATIAL organizing committee felt that we would prefer to be on our own and we reported this to the SGB EC who at their March 2008 meeting gave us an informal go ahead provided we satisfied a few bureaucratic requirements that included filing a Mission Statement, Explanation of Benefits, Bylaws, Budget, and proposed activities for the first two years. The Budget issue was particularly tricky as we have already made plans for the ACM GIS 2008 Conference and thus had to assure ACM that no losses would arise or at least mitigated. As part of the formation of SIGSPATIAL, we received an initial allocation of $10,000 from ACM to help us get started so that we can carry out some of the activities of a SIG such as participating in meetings of the ACM SIG Governing Board where the chairs of the various SIGs meet.

The organizing committee spent quite a bit of time drafting the Bylaws which are available on the SIGSPATIAL web site. This process was accompanied by constant consultation with Jamie Callan of the SGB EC. After many iterations and discussions we realized that the Bylaws must be flexible and we turned to examining those of existing SIGs. Of course, different SIGs have different Bylaws. However, what we learned was that the most recently amended or formulated Bylaws were the most appropriate for us as they had passed muster with ACM. The main issues were the length of terms for the officers and ensuring participation by the membership. In this case, we opted for Bylaws identical to SIGIR which also meant that we would have no trouble getting them approved. We limited the terms of the officers to 3 years and made them non-renewable so as to ensure the injection of new blood into the system in coming years.

One of the biggest concerns of the ACM SGB was to make sure that we had a viable initial organization which ACM ensures, in part, by appointing the initial set of officers, the most crucial being the Chair and Treasurer with the remaining offices being stipulated by the Bylaws that we proposed. We opted for a classic list of functions for the officers which meant a Chair, Vice-Chair, Treasurer, and Secretary, whose duties are set forth in the Bylaws. The natural set of initial officers as far as the SGB EC is concerned usually consists of the ones conducting the negotiations with the SGB EC as this mitigates any difficulties with overcoming the learning curve. The organizing committee proposed the following set of officers, which the SGB EC approved along with all of the remaining application materials in their April 2008 meeting.

Hanan Samet, Chair
Walid Aref, Vice-Chair
Markus Schneider, Treasurer
C.T. Lu, Secretary

These officers, can of course be changed once the SIG has been established and the first set of elections are held. Only SIG members can vote in these elections and thus it takes a couple of years to get the SIG going. Please note that SIGSPATIAL members need not be ACM members although the officers must be both members of SIGSPATIAL and of ACM. We deliberately set the dues at a low amount ($15 for regular membership and $6 for student membership) to encourage participation, which is an important criterion in ACM's periodic evaluation of a SIGs viability. Of course, it is understood that initially the membership numbers will be low. Nevertheless, we should bear this in mind and this is indeed one of the reasons for keeping the dues so low.

As most ACM members join a SIG at the time of their general membership renewal, which varies, we expect to have a better idea of our membership rolls after one year that membership in the SIG becomes an option in the ACM marketing materials (which itself takes a bit of time). Of course, we don't want people to wait to join SIGSPATIAL until their membership expires and thus they should join as soon as possible. It is important to note that once the time comes to renew the ACM membership, ACM includes an invoice for the SIGSPATIAL membership which is prorated to reflect the part that has already

been paid when the member joined. In this way, the SIGSPATIAL membership expires and is renewed at the same time as the general ACM membership.

We have just concluded the 16th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (ACM GIS 2008) held on November 5-7, 2008 in Irvine, California, which is reported in this issue of the newsletter. We are currently busy planning the 17th ACM SIGSPATIAL International Conferences on Advances in Geographic Information Systems (ACM GIS 2009) to be held on November 4-6, 2009 in Seattle, Washington as well as looking for a site for 2010. Of course, we are always looking for volunteers to help out in the organization of future conferences, and to solicit sponsors so that we can continue to maintain the low registration fees for our events. In addition, we continue to be on the lookout for renowned invited speakers. Our aim is to have speakers that will be attractive to as large of a number of attendees and whose achievements can also attract people to attend who have not attended our event in the past. This was the case in 2007 (Michael Jones and Franz Leberl) and 2008 (Vint Cerf and Jack Dangermond) and we want to build on this success this year as well as in the future.

Other future activities depend to a large extent on the interests and initiatives of you, our members. We are looking into the possibility of holding additional workshops in conjunction with the SIGSPATIAL flagship conference, ACM GIS, as well as sponsoring additional related workshops. This could be done in cooperation with other SIGs both as sponsors or merely in cooperation mode where the latter means that there is no financial risk to our SIG. Other activities that have been discussed include setting up local SIGSPATIAL chapters.

Please also note that our plan is to eventually transition the conference name to be the SIGSPATIAL Conference. However, we must first establish the SIGSPATIAL brand, which will take some time. Thus we are still using the acronym ACM GIS to describe the conference as it has been in existence for 16 years and people are accustomed to its use as a differentiator from the myriad of GIS conferences that are held on a weekly and even daily basis.

As you can see, SIGSPATIAL has made tremendous progress in the past year, which has not been an easy process. However, it was all possible due to the incredible outpouring of support from our organizing committee and you, our members. So, we want to again thank all of you for your support in making SIGSPATIAL a reality. Now, we need your help in making it a success, which means at the least encouraging others to join the SIG, which is pretty easy as all you need to do is go to the SIGSPATIAL web page at http://www.sigspatial.org/. If you encounter some difficulties, like not having an ACM e-mail account, then please call ACM member services at (800) 342-6626 which is a toll-free number and they will sign you up.

Hanan Samet on behalf of the SIGSPATIAL Executive Committee: Walid G. Aref, Chang-Tien Lu, Hanan Samet, and Markus Schneider.

Highlights from ACM GIS 2008
The 16th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems
(Irvine, California - November 5 – 8, 2008)

Walid G. Aref
Purdue University
(PC Chair)

ACM GIS 2008 was the sixteenth event of an annual series of symposia and workshops with the mission of bringing together researchers, developers, users, and practitioners carrying out research and development of novel systems based on geo-spatial data and knowledge. The conference fosters interdisciplinary discussions and research in all aspects of Geographic Information Systems and Science (GIS) and provides a forum for original research contributions covering all conceptual, design, and implementation aspects of GIS ranging from applications, user interface considerations, and visualization to storage management, indexing, and algorithmic issues.

The ACM GIS 2008 conference was a great success! This was the first time that the conference was held under the auspices of the new ACM Special Interest Group on Spatial Information (SIGSPATIAL). The conference program attracted a record high of over 190 attendees. The conference ran as a single-track (i.e., with no parallel sessions) and lasted for two and half days.

This year's program featured two outstanding invited speakers: (1) Vinton Cerf, VP of Google, and 2004 ACM Turing Award Winner, and (2) Jack Dangermond, Founder and President of ESRI, as well as a pre-conference workshop (SPRINGL 2008) on the topic of "Security and Privacy in GIS and LBS".

In addition to the regular research paper track, this year's conference had two new tracks; a demonstration track and a Ph.D. showcase track. A program committee of 93 members reviewed the submissions.

The call for papers resulted in 232 submissions over all three tracks. The research paper track attracted 193 submissions, of which 38 were accepted as full papers and another 37 papers were accepted as poster papers. The Ph.D. Showcase track attracted 19 Ph.D. submissions, of which 8 were accepted, while the demonstration track attracted 20 submissions, of which 13 were accepted. These numbers indicate the continued health, interest, and growth of the research field of geographic information systems, and the need to bring its researchers, students, and industrial practitioners together. The accepted Ph.D. Showcase papers appear in this first issue in 2009 of The SIGSPATIAL Special (the new newsletter for SIGSPATIAL).

The conference was also the site of the first open business meeting for ACM SIGSPATIAL which was held in the evening of the first day of the conference just before the poster session. The meeting was open to all SIGSPATIAL members as well as to all conference attendees. In addition to discussing budgetary issues, plans for next year's conference, and soliciting members' feedback, the business meeting featured a presentation by Dr. Maria Zemankova of the National Science Foundation (NSF) about potential funding opportunities at the NSF that are available to members of the ACM SIGSPATIAL community.

This year's conference was generously co-sponsored by ESRI, Google, Microsoft Research, and Oak Ridge National Laboratory (ORNL) whose participation and generosity demonstrated what can be accomplished by a successful partnership between academia and industry. We are also grateful to Erik Hoel and ESRI who were responsible for all of the local arrangements and managed the conference logistics in their entirety including manning onsite registration. The sponsors also contributed to the conference program by participating in the Sponsor Demo session on the second evening immediately preceding the conference banquet.

ACM GIS 2008's Best Papers

Three papers were selected as the best papers for the ACM GIS 2008 conference. These papers are:

- David Eppstein, Michael Goodrich: Studying (Non-Planar) Road Networks Through an Algorithmic Lens.
- Benjamin Teitler, Michael Lieberman, Daniele Panozzo, Jagan Sankaranarayanan, Hanan Samet, Jon Sperling: NewsStand: A New View on News.
- Kenneth Weiss, Leila De Floriani: Sparse Terrain Pyramids.

Eppstein and Goodrich's paper starts from an experimental analysis that shows that real-world road networks have many edge crossings; hence, they are non-planar graphs. Then, it provides an alternative characterization of the road network as a first class algorithmic data type, which can be characterized by the way that the edges (road segments) and vertices (road intersections) are distributed. In particular, the authors show that road networks can be characterized in terms of the ways that circles centered at each vertex overlap.

Teitler, Lieberman, Panozzo, Sankaranarayanan, Samet, and Sperling's paper introduces NewsStand (denoting "Spatio-Textual Aggregation of News and Display") , a spatially-cognizant news reader (http://newsstand.umiacs.umd.edu/news) that monitors RSS feeds from thousands of online news sources, extracts geographic content from them using a custom-built geotagger, and groups the articles into story clusters using a fast online clustering algorithm. The clustering process embodies NewsStand's goal of understanding the so-called "Five Ws and H" attributes, namely Who, What, When, Why, Where, and How, of a news article, and making use of subsets of them such as What and When to determine other subsets such as Where, Who, How, and Why. NewsStand transforms the traditional linear news reading experience that accesses articles by their sequential position in the newspaper to one that accesses them on the basis of both topical significance

and geographic significance using a map interface (i.e., associating articles with their spatial context) that deploys panning and zooming to see substantially different stories depending on position and zoom level. This work represents an example application in a developing subarea of computer science called "Computational Journalism" which aims at exploring the consequences of the application of emerging computing technologies on the news collection and dissemination processes.

In the third paper, Weiss and De Floriani propose the Sparse Terrain Pyramid (SPS), a compact multiresolution representation for terrain datasets sampled at a subset of the vertices of a regular grid. Multiresolution models for regularly sampled terrains are usually represented as a nested hierarchy of diamonds (i.e., pairs of right triangles sharing their longest edge with vertices at the grid points). Such a hierarchy can efficiently represent models built on a complete grid, but this is not suitable when the field values are uniform in large areas or simply non-existent. An SPS provides an implicit encoding of the dependency relationship between diamonds and is based on a new diamond clustering construct, called a supercube, which greatly reduces the geometric and topological overhead.

Suggestions for the PC Committee of 2009 ACM GIS

The following recommendations are being made based on the experience of the PC-chairs of the 2008 ACM GIS conference and feedback solicited from the conference attendees during the ACM SIGSPATIAL business meeting:

1. **Conference Duration:** The majority preferred that the conference continues to consist of a single track. However, a number of people suggested to extend the conference duration to three full days (instead of two and half days) to allow for better time spacing between the sessions and to avoid excessively lengthy conference days.
2. **Industrial Sessions:** The newly introduced demonstration and Ph.D. showcase sessions were well received and the consensus was that they should be continued. In addition, it was suggested to introduce an industrial session to foster more interaction and exchange of ideas among participants from academia and industry. Given the constraints of the single track and the duration of the conference, implementation of this suggestion may be in the form of classifying some of the selected papers as suitable for an industrial session.
3. **Paper Submission and the Review Process:** As part of the paper submission process, authors will be requested to categorize their papers into one of the following four review tracks:
    a. **Foundations and Modeling:** This track addresses the science behind spatial information including 3D spatial, topological, cartographic, and semantic models, ontologies, etc.
    b. **Algorithms and Data Structures:** This track addresses algorithms and data structures for handling spatial and multidimensional data, algorithms for image processing, object recognition, sensors, spatial data mining, map overlay, generalization, conflation, etc.
    c. **Systems and Services:** This track addresses systems and services that deal with spatial information, e.g., location-based services, and service archi-

tectures and discovery, spatial and spatiotemporal data systems, geographic information system, computer-aided design systems, intelligent transportation systems, etc.

d. Applications and Standards: This track addresses standards and applications of spatial information systems.

No paper quotas will be pre-assigned to any of the tracks. However, the purpose of the tracks will be to facilitate the selection of the right set of reviewers relevant to a given paper.

These suggestions are yet to be finalized and approved by the executive committee of the ACM SIGSPATIAL in collaboration with the organizers of ACM GIS 2009.

ACM GIS 2008 Keynote, November 5, 2008 by Jack Dangermond, President, ESRI

ACM GIS 2008 Keynote, November 6, 2008 by Vint Cerf, VP, Google and 2004 ACM Turing Award Winner

SPRINGL 2008 Workshop Report
ACM SIGSPATIAL Workshop on Security and Privacy in GIS and LBS

Elisa Bertino
Purdue University
(PC Co-chair)

Maria Luisa Damiani
University of Milan
(PC Co-chair)

Patrick Capolsini
Univesity of
French Polynesia

Paul El Khoury
SAP Research,
France

Herve Martin
University of
Grenoble

The first Workshop on Security and Privacy in GIS and LBS (SPRINGL 2008) was held on November 4th at Irvine (CA) in conjunction with the ACM GIS Conference. The goal of the SPRINGL workshop series is to provide a forum for researchers working in the area of geospatial data security and privacy. Both security and privacy are critical for geospatial applications because of the dramatic increase and dissemination of geospatial data in several application contexts including homeland security, environmental crises, and natural and industrial disasters. Furthermore, geospatial infrastructures are being leveraged by companies to provide a large variety of location-based services (LBS) able to tailor services to users. However, despite the increase of publicly accessible geospatial information only little attention is being paid to how to secure geospatial information systems (GIS) and LBS. Privacy is also of increasing concern given the sensitivity of personally-identifiable location information. This is despite major advancements that have been made in secure computing infrastructures and the secure and privacy-preserving management of traditional (relational) data in particular. The workshop spanned across security and privacy aspects, as they relate to the management of geospatial data and to the development of emerging LBS. Eight papers were selected for presentation and inclusion in the workshop proceedings. In addition, the program included one invited talk by Gabriel Ghinita and an inaugural paper for SPRINGL by Elisa Bertino, Michael Gertz, Bhavani Thuraisingham, and Maria L. Damiani.

Invited Talk and Inaugural Paper

The invited talk by G. Ghinita focused on the trade-off between privacy and efficiency in privacy-preserving techniques in LBS. A taxonomy of privacy solutions was presented defined on the basis of the location transformation being used and the system architecture being adopted. The classification identifies three categories of techniques: (a) two-tier spatial transformations, (b) three-tier spatial transformations and (c) cryptographic transformations. Cryptographic transformations based on Private Information Retrieval offer the strongest privacy guarantees but may incur very significant processing overhead likely exceeding that of spatial transformation methods. The paper by Ghinita also identified several open research issues.

The SPRINGL inaugural paper was presented by E. Bertino. The paper offers a comprehensive overview of the security challenges in geospatial data management and

outlines a framework to deal with those issues. That framework encompasses a broad range of functions supporting: the specification of the policies and reasoning techniques for fine-grained access control to geospatial objects at varying resolution; interoperability of security policies for geospatial data; trust management, authentication, and secure third-party publication of geospatial data.

Papers

The 8 contributed papers were grouped in 3 sessions: Access Control Model for GIS and Pervasive Environments; Location Privacy; Policies.

Access Control Model for GIS and Pervasive Environments: *P. Capolsini* presented an extension of the Digital Right Expression Language ODRL to accommodate licensing for geographic data created by OpenGIS Web Map Services. The context-aware QACBAC access control model was presented by *J. Bringel Filho*. Such a model grants and applies permissions to users according to both context information and context quality indicators. *M.L. Damiani* discussed open issues related to the development of architectures and models for location-based access control models, proposing a shift from location-aware towards movement-aware access control.

Location Privacy: *N. Poolsappasit* presented a model for the specification of location privacy policies in LBS. Such a model targets the specification of context-aware privacy policies, in particular policies which typically depend on space, time and user category. *Y. Saygin* addressed the problem of how to make a trajectory database k-anonymous. A novel generalization-based approach was proposed that applies to trajectories and sequences in general. A different perspective was offered by *D. Lin* who presents a technique for the protection of location privacy in location-based queries such as "find my closest friends" based on the use of multiple agents for location transformation.

Policies: *P. El Khoury* proposed the use of description logics to define inter-organizational mappings for roles within a RBAC framework. Although those policies and methods are not specifically targeted to the geospatial domain, they can likely be extended for use in a mobile context.

Comments and Research Directions

The workshop was characterized by a lively and intense discussion on research issues and important challenges; we report some of these below:

1. **Security and Privacy Models:** There was agreement among the workshop participants that we are witnessing to a radical change of data infrastructures with the emergence of pervasive and ambient computing. Information is accessed from various places using mobile devices and personal data that can be acquired by sensor networks. In such a new world, we have to address the problem of the specification of adapted and contextual security policies. The associated languages and models should be able to integrate various knowledge representations by using formal descriptions like description logics.
2. **Security of Positioning Models:** Because many techniques for security and privacy of geospatial data depend on underlying assumptions about user position, security assurance about such positions is a key requirement. Also confidence

about the trustworthiness of contextual information has been identified as critical by the workshop participants.

3. **Security of IT Applications in the Domains of Homeland Security, Environmental Crises, and Natural and Industrial Disasters:** All workshop participants agreed that these data-intensive applications need to be more reliable than in conventional IT applications. Typically these applications are a highly sought target by attackers (e.g. hackers, terrorists...) and are prone to unpredictable situations. Many challenging issues need to be addressed in order to secure those applications, including: How to setup security solutions for minimizing risks and for adapting to detectable but unpredictable situations? How to configure the security settings to adapt to these situations when people are on site?

   Solutions building on workflow management systems seem reasonable in order to exploit the business logic layer as an attempt to be able to deal with unpredictable situations. Within this business layer geo-information can be captured and analyzed for adapting security solutions at runtime. Moreover, security patterns could be an interesting area to explore for providing security as services deployable at runtime based on some pre- and post- conditions.
4. **User Privacy in Mobile Applications:** Different approaches try to enforce the right for privacy, but noticeably very few are trying to work towards increasing the level of trust between the peers in mobile applications. Additional work for increasing trust level is indeed a different angle in order to enrich the solution for this privacy problem.
5. **Benchmarks and Scenarios:** An important issue that was pointed out by various workshop participants is the lack of public datasets (such for example, datasets of trajectories) that can be used by the research community to carry out experimental research. Scenarios were also identified as relevant to assess real requirements concerning security and privacy of geo-spatial data.

Conclusions

The workshop was concluded by a short discussion about the future editions of the workshop. All participants were very positive about the outcome of the first edition of SPRINGL and very much in favor of organizing it again in 2009.

join today!

SIGSPATIAL & ACM

www.sigspatial.org **www.acm.org**

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