Report on Geosensor Networks, EuroSDR & ISPRS Workshop
Hannover, Germany
February 20-22, 2008

The EuroSDR and ISPRS Workshop on Geosensor Networks was held in Hannover at the end of February 2008. Recent months have seen accelerating growth in interest by the spatial information community in exploring the problems and opportunities connected with new sensor technology. So it was perhaps no surprise that this timely and topical workshop managed to capture and fuel the enthusiasm of attendees from across the entire spectrum of the community.

The workshop attracted more than 70 participants from government, industry, and academia, and at every stage of career, from graduate students to senior researchers and professionals. Most of the participants had traveled within in Germany, but many had come from much farther away, including the USA and Australia. The core of the workshop was a technical program of 24 speakers, including three keynote speakers, spread over one full and two half days. Reflecting the broad mix of participants, the talks covered a wide range of topics and expertise, from measurement science and geodesy, computer science and ICT (Information Communication Technology), through to environmental applications and human user issues.

Paradoxically there was little agreement on what exactly “geosensor” is. About half of the speakers were working to definitions broadly in keeping with Nittel et al. (2004): a geosensor network as a *wireless sensor network* (an ad hoc wireless network of self-powered, sensor-enabled miniature computers) that monitors phenomena in geographic space. However, a significant proportion of speakers were working to a much more general definition, as “any network of sensors that sense geographically referenced information”. While there are clearly issues that cut across both interpretations of the term, the former definition presents some specific problems that are not usually relevant to work in the area of the latter definition (primarily problems associated with robust and scalable management and processing of massive volumes of low-quality data from ad-hoc wireless networks comprising hundreds or thousands of individual nodes that are subject to severe energy constraints).

Despite the underlying ambiguity in the use of the term, a range of clear themes did emerge from the workshop. In terms of the application of geosensors, numerous speakers used disaster and emergency management as their focus. New automated geosensor systems present important opportunities for automated monitoring of changes for disaster mitigation, early warning, and recovery, at a level of spatial and temporal granularity that is not possible with other technologies. Nevertheless, other key application areas, including transportation, precision farming, security, and environmental monitoring were also all represented in talks.

Another key theme represented in many of the talks concerned the efforts to integrate data from geosensor networks with other data sources, and more importantly make data accessible to scientists, decision makers, and the wider public. The goal of using

standards for interoperability to help incorporate data from geosensor networks in all areas of public life is certainly a worthy one. However, given the difficulties in achieving meaningful inter- and even intra-agency interoperability with today's relatively simple, static spatially referenced data, the vision of an "open information space" in geosensor networks still appears remote. As one delegate pointed out, interoperability faces not only technical problems, but social and institutional hurdles. These latter hurdles are set to increase, rather than decrease, as geosensor networks become more mature, as the data they generate becomes more valuable.

Precise positioning of geosensors was another key theme, understandably so given the strong representation of the measurement sciences among the participants. However, the technology of geosensor networks (specifically in the sense of a "special type of wireless sensor network") presents some particular issues that are new to measurement science. One issue is the ability to potentially tolerate relatively low absolute accuracy and precision in geosensor networks. Given the fine granularity of information generated by geosensor networks, reliable positioning of nodes *relative* to one another is adequate in many applications. Another issue is the need to conserve limited power and communication resources by processing data in the network itself. Using the ability of individual or small groups of nodes to collaborate to filter or partially process data generated by those nodes, can help to reduce the requirement to communicate data, leading to a range of benefits including improved network longevity.

Undaunted by a public transport strike, participants on the final day of the workshop heard co-organizer Christian Heipke summarize the most important messages from the workshop in his closing address. The technology is set to be "part of everyday life tomorrow": the innovations being developed now and reported at this workshop clearly have direct relevance to near-future applications across a broad range of critical human activities, from emergency management to environmental monitoring to transportation. However, while the technology is driving the area, it only provides a motivation for new and interesting theoretical and applied questions, but should not in itself be the focus for new research and innovation in the spatial information science community. Rather, to make progress the research must be able to separate the technology from the important concepts. But the most important aim to ensure good research progress is that we "talk to each other" across disciplinary boundaries. The challenges and benefits of such interdisciplinary collaboration were another recurring theme in the meeting. But, for the broad spectrum of spatial information scientists and professionals represented at this meeting at least, the workshop showed that the potential for collaboration is very healthy, and bodes well for rapid growth and progress in research in geosensor networks over the next few years.

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References

Nittel, S., Stefanidis, A., Cruz, I., Egenhofer, M., Goldin, D., Howard, A., Labrinidis, A., Madden, S., Voisard, A., and Worboys, M. (2004) Report from the First Workshop on GeoSensor Networks. *ACM SIGMOD Record,* 33.