Introduction to this Special Issue: Geosensor Networks

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The last two decades have seen unprecedented advances in the development of small-scale sensors, as well as inexpensive, small computing platforms and a plethora of wireless communication media. These technological developments have lead to the research area of geosensor networks (GSN), which are wireless sensor networks deployed in geographic space. From a practical perspective, we see GSN often as 'networked geosensors' that live-stream information to the Internet today. Sensors can range from stationary environmental sensors to drones, ocean drifters, autonomous unmanned vehicles collecting environmental data or even humans acting as sensors. A GSN enables us to observe, reason about and react to events in geographic space in near real-time.

This special issue consists of five contributions that are differently related to GSN. The first two contributions explore hands-on experiences with true GSN field deployments: *Gopal Mulukutla, Brian T. Godbois and Serita Frey* from the University of New Hampshire describe their development of a distributed GSN to monitor soil moisture, soil CO_2 efflux and other parameters to increase scientific understanding of the complex interactions of ecological, biogeochemical and meteorological processes. The second article comes from a GSN research perspective and looks into taking decentralized algorithms from the lab to the field. *Matt Duckham, Xu Zhong and Kevin Toohey* discuss their experience designing and deploying a 70-node wireless GSN for monitoring environmental conditions relevant to wildfire hazard in Victoria, Australia. The authors review decentralized algorithms for understanding observations under the constraints of a realistic setting with today's off-the-shelf hardware. Similarly, *my own contribution* focuses on a consequence of GSN deployments, which are massive amounts of real-time sensor data streams. These sensor data streams contribute to the problem of 'big spatial data' and also raise the interesting question of efficient and effective *near real-time* data analysis. The article discusses specific data management requirements due to massive real-time sensor data streams and provides some guidance for identifying effective data management technology, ranging from Hadoop-GIS, NoSQL tools, spatio-temporal database systems and data stream engines.

The fourth contribution by *Bernd Resch and Thomas Blaschke* focuses on the ever more important aspect of humans as 'sensors' providing relevant data without the need for expensive infrastructure, as for example in traffic monitoring with traffic jam alerts or citizen science efforts. However, information gathered by humans poses challenges such as interpreting and fusing heterogenous, unstructured and semantically rich information. In the fifth article *Jake Beal and Mirko Viroli* explore the much necessary aspect of formal foundations for geosensor network programming based on the field calculus.

I hope that the readers will enjoy reading this issue and appreciate the multiplicity of views it offers.