

Towards an e-Infrastructure for Australian Urban Research

Martin Tomko¹, Gerson C. Galang¹, Robert J. Stimson¹ and Richard O. Sinnott¹

¹ Australian Urban Research Infrastructure Network, The University of Melbourne, 3052 VIC
tomkom|ggalang|rstimson|rsinnott@unimelb.edu.au

INTRODUCTION

Australian urban and built environment research covers a multitude of research disciplines investigating social, economical and physical phenomena at a multitude of spatial and temporal scales and across diverse aggregation levels, from individual-level through to cohorts and populations, and across a range of scenarios, e.g. public health, voting patterns. The development of a common software platform (e-Infrastructure) meeting the needs of such research communities must tackle many challenges associated with data intensive areas of research. This includes dealing with data sets from a multitude of federal, state, municipal, academic and private institutions, which hold vast arrays of heterogeneous data. For many researchers these data sets are difficult to discover, access, interrogate and use more generally. It is also unrealistic to expect researchers to always have the technical capability and capacity to handle such large amounts of data, or to develop data processing tools making use of such data sets, or be able to run computationally intensive simulations and models based on these data sets. Islands of expertise and islands (silos) of data currently exist that has fragmented urban research and thwarted a holistic approach to the study of the Australian urban and built environment system.

AIMS

The Australian Urban Research Infrastructure Network (AURIN - www.aurin.org.au) is a \$20m SuperScience initiative established across Australia that seeks to address this directly by creating an e-Infrastructure aiming at bridging these gaps, by allowing researchers to conduct collaborative research in a security-enabled, browser-based environment providing seamless and transparent access to the distributed data and computational resources across Australia. These include metadata services, federated datasets, data integration and interrogation services, together with advanced visualization, collaboration and data storage capabilities. The goal is to provide access to rich datasets, state-of-the-art data processing tools, as well as a knowledge base where good research practices can be followed and used to assist researchers when navigating through vast data holdings to couple appropriate data and analytical tools for a range of urban research endeavours. In this presentation, we address the fundamental questions behind the establishment of this infrastructure. How to design a versatile and flexible software platform (e-Infrastructure) for urban research?

APPROACH

The approach chosen is based on past experiences from a variety of eResearch initiatives, such as the UK e-Science National e-Infrastructure for Social Simulation (NeISS - www.neiss.org.au) project [3]; the Data Management through e-Social Science (DAMES - www.dames.org.au) project [4]; the Spatial Information Software Stack (SISS) eResearch Facility [1], and the workflow-based image annotation using geographic information retrieval of TRIPOD [2]. It is centered on establishment of a range of demonstrator projects addressing specific urban and built environment themes and the challenges they give rise to through a common e-Infrastructure. We believe that such an approach will allow delivery of early functionality in supporting a range of urban research scenarios, and at the same time support novel links between tools traditionally not applied beyond individual research fields. Through a common (core) e-Infrastructure, we expect to develop urban research capability that will offer a step change in how urban research is currently conducted, to support multi- and inter-disciplinary research scenarios whilst preserving full functionality in individual urban research strands. We describe the initial design stages of the AURIN e-Infrastructure from a technical perspective. We illustrate the utility of the approach taken based on an initial set of demonstration projects exploring demographic and economic investigations of the Australian urban system.

DISCUSSION

The approach chosen delivers fully functional capabilities across a set of demonstration projects. It relies on a synergic effect to deliver an eResearch capability that supports researchers when exploring and analyzing data in scenarios that were not part of the demonstrator projects. The observation that many urban research questions are answered using a small set of common tools used in diverse sequences supports the basic assumption behind this approach. It does, however, pose obvious risks on the project – a weakly defined technical environment, complicated analysis of remotely accessed data and nuances in data analysis, to name a few.

REFERENCES

1. Liao, E, Shyy, T and Stimson, R.J. (2009) Developing a Web-Based e-Research Facility for Socio-Spatial Analysis to Investigate Relationships between Voting Patterns and Local Population Characteristics. *Journal of Spatial Science*, 2 54: 63-88.
2. Purves, R. S., Edwardes, A., Fan, X., Hall, M., & Tomko, M. (2010). Automatically generating keywords for georeferenced images. In *Proceedings of the GIS Research UK Conference*.
3. Birkin, M., Allan, R., Beckhofer, S., Buchan, I., Finch, J., Goble, C., Hudson-Smith, A., Lambert, P., Procter, R., de Roure, D., Sinnott, R.O. (2010) The Elements of a Computational Infrastructure for Social Simulation, *Journal of the Philosophical Transactions of the Royal Society A*, July 2010, (DOI:10.1098/rsta.2010.0150).
4. McCafferty, S., Doherty, T., Sinnott, R.O., Watt, J. (2010) Supporting Research into Depression, Self-Harm and Suicide across Scotland, *Journal of the Philosophical Transactions of the Royal Society A*, July 2010, (DOI:10.1098/rsta.2010.0150).

ABOUT THE AUTHORS

Dr. Martin Tomko is the Senior Project Manager in charge of the Information Infrastructure Design of AURIN, and Lecturer at the Faculty of Architecture at the University of Melbourne. He has a background in spatial information science, with experience in geospatial infrastructures and data handling. Most recently, he completed a post-doctoral research in Zurich, Switzerland, within the large EU FP6 project TRIPOD.

Gerson C. Galang

Prof. Robert J Stimson is the Director of AURIN and Professor Emeritus in the School of Geography, Planning and Environmental Management, The University of Queensland, fellow of the Academy of Social Science in Australia and the Regional Social Science Association International, and former Convenor of the ARC Research Network in Spatially Integrated Social Sciences. He is author of 48 books and monographs and more than 300 scientific papers and book chapters.

Prof. Richard O. Sinnott is the eResearch Director for the University of Melbourne. Prior to coming to Melbourne, Richard was the Technical Director of the UK National e-Science Centre; Director of e-Science at the University of Glasgow; Deputy Director (Technical) for the Bioinformatics Research Centre also at the University of Glasgow, and the Technical Director of the National Centre for e-Social Science. He is the Technical Architect of the AURIN project.