Research Elaborated
August 18, 2015

Dr. Tomi Kauppinen, Docent, PhD
Department of Computer Science
Aalto University School of Science, Finland

For a full list of publications please visit http://kauppinen.net/tomi. The bibliography file\(^1\) and source file\(^2\) of this document are also available online.

Publications briefly elaborated (almost all of them)

- **Linked Science—Interconnecting Scientific Assets\(^3\)**
  - See our original article called Linked Open Science [47] and its extension as a book chapter [46].
  - About applying Linked Science approach see our work on sharing remote sensing data [49]—especially Linked Brazilian Amazon Data [50], and our work on managing scientific findings [4].
  - For making sense of publication data see spatial@linkedscience\(^4\) [71] and for visually interacting with Linked Spatiotemporal Data with gestures see [6]. Another way to explore linked scientific data is to create analysis and animations on the fly with our ELBAR explorer [77] as a **hypothesis generation step for further spatial data mining**.
  - Our work related work on Linked Universities is reported in a paper about the Linked Open Data University of Muenster (LODUM), see [72] and in papers about Linked Open Aalto, especially using the idea for visual exploration of data [2], for instance to understand interorganizational collaboration [21] via **visual analytics**.
  - Further on, we have used **text mining techniques** to understand and plot spatial aboutness of publications [3]. The idea is to thus to facilitate directing of new research to regions yet unexplored. Linking of scientific assets together, and to space and time should create grounds for Linked Earth, where **all important information about the Earth is interconnected** and can be explored at different levels [45].

- We have studied **Volunteered Geographic Information (VGI)** to understand and advance the role of affordances [82], modeling of provenance [73] [74] [83], spatial data mining to assess classification of VGI features [1] and modeling of trust and reputation [9].

- Related to our VGI efforts we have employed **bayesian networks for crowdsensing and to support situation awareness** [17]. Crowdsensing is interesting also for understanding local phenomena. For this we have created a platform for **gathering and visualizing user**

\(^1\)http://kauppinen.net/tomi/publications-tomi-kauppinen.bib
\(^2\)http://kauppinen.net/tomi/publications-tomi-kauppinen-elaborated.tex
\(^3\)http://linkedscience.org
\(^4\)http://linkedscience.org/spatial
experiences about spaces (indoor such as office buildings) via mobile and web interfaces [60]

• The vision for Geographic Information Observatories was outlined in [37]. Related to this, we have studied the role of contextual information [38] as lenses to observe the data universe.

• Our work on making higher level conceptualizations from raw data is documented in papers about modeling geosensor observations [11] [12]. Similar task has been in our work on creating a usable information layer about the deforestation in the Brazilian Amazon see [48] [10], and particularly about using Linked Data technologies to share remote sensing observation data [49]. A related work is the methodology for crowdsourcing Linked Spatiotemporal Data after an earthquake and interacting with it with an user interface see [78] [43].

• Our studies have argued that Linked Data introduces a paradigm shift for Geographic Information Science [75] and that it thus is a core component of the Future Spatial Data Infrastructure [13]

• Digital Cultural Heritage has been one of the main themes, especially during my PhD dissertation [41]. This has led to new methods for using Fuzzy Sets to model imprecise temporal periods [62] according to how users cognitively rank the relevances. Another related research direction has been to reason about changes [63]. One practical result has been SMARTMUSEUM [68, 7, 80, 79] which matches user profiles with the available semantic annotations thus bridging the cognitive gap between humans and machines. In our studies we did data mining to analyze annotation co-occurrences [59] and spatial data mining for finding out interesting relations between places [66]

• The core result of my PhD [41] was The Finnish Spatiotemporal Ontology (SAPO):
  – First mention about SAPO was made in [55]
  – SAPO was built using different methods and components. These include
    * reasoning about changes (such as merges and splits) in administrational regions [58] [57] [56] , and
    * a vocabulary for collecting changes supported by a method for creating the temporal parts of regions [70].
  – The benefits of using SAPO is shown via application examples for
    * managing digital cultural heritage content [63],
    * for query expansion [87], and
    * for semantic autocompletion [84].
  – An evaluation in an information retrieval task shows [63] that by using SAPO the recall increases considerably without loss in precision.
  – A book chapter gives an overview of the research related to SAPO [31].

• We have also used ontologies to integrate health information with geoinformation [85] [16]
• Back in my PhD period I worked on The Finnish Geo-ontology (SUO) [20] [53] [54] and particularly on using geospatial ontologies in CultureSampo [63] [51] [25] [26] [25] [27] [28] [29] [30] and on developing spatiotemporal ontologies and services [53] [24] in the FinnONTO project [34] [81] [33] [32] [76] [86].

• I have also edited proceedings in the above fields, these include SAFE2015 [8], JOINT SSA-SMILE 2014 [14], VISUAL2014 [35], LISC 2011 [64], LISC 2012 [65], LISC 2013 [15], LISC 2014 [89], Geographic Information Observatories 2014 [36], GIScience in the Big Data Age 2012 [39], Developments in Artificial Intelligence [22], Web Intelligence [23] and XML Finland [18].

• Further on, as an application of my research I have published vocabulary specifications online. These vocabularies are CHANGE [42], TEACH [69], EXPERIENCE [61], LSC [5] and TISC [44].

• Finally, I have written papers also in Finnish, for instance about the Finnish Spatiotemporal Ontology SAPO [88], Geospatial Ontologies [19], Sensor Web [52], Semantic Web [67] and Pattern Recognition [40].

Last updated: August 18, 2015

References


[4] Alkyoni Baglatzi and Tomi Kauppinen. Managing and representing scientific findings about the environment. In Demos and Posters of the 18th International Conference on Knowledge Engineering and Knowledge Management (EKAW2012), National University of Ireland, Galway, Ireland, October 2012.


User Interfaces for Knowledge Engineering and Linked Data Analytics co-located with 19th International Conference on Knowledge Engineering and Knowledge Management (EKAW 2014), volume 1299, Linköping, Sweden, November 24 2014. CEUR Workshop Proceedings.


[59] Tomi Kauppinen, Heini Kuittinen, Jouni Tuominen, Katri Seppälä, and Eero Hyvönen. Extending an ontology by analyzing annotation co-occurrences in a semantic cultural heritage


[79] Tuukka Ruotsalo, Krister Haav, Antony Stoyanov, Sylvain Roche, Elena Fanid, Romina Delia, Eetu Mäkelä, Tomi Kauppinen, and Eero Hyvönen. SMARTMUSEUM: A Mobile Recom-


