

BRINGING URBAN ONTOLOGIES INTO PRACTICE

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SUMMARY: *The main objective of the European COST C21 Action was to increase the knowledge and promote the use of ontologies in the domain of urban development, in the view of facilitating the communications between information systems, stakeholders and urban experts at a European level. This special issue of IT-CON consists in a selection of the best papers presented during the final conference of this COST Action. It provides an overview of the main themes addressed during this research and introduces different approaches for developing and maintaining urban ontologies.*

KEYWORDS: *Ontologies, Urban development, Urban knowledge bases.*

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1. INTRODUCTION

The main objective of the COST C21 Action was to increase the knowledge and promote the use of ontologies in urban development projects, in the view of facilitating the communications between information systems, stakeholders and urban experts at a European level (Teller, 2004).

An ontology was basically understood in the course of the Action as a set of concepts with their associated definitions and an elicitation of the nature of relations holding between them. Such a broad definition deliberately encompasses formal ontologies as well as explicit and implicit conceptualisations framing communications and exchanges between urban stakeholders. Adopting a common and stable ontology is all but neutral in a domain like urban development whose boundaries are, by nature, subject to controversies (Nolmark, 2007). Furthermore the rapid pace of change of cities over the last decade and the challenges raised by urban transformations triggered the questioning of existing conceptual models and stimulated the elaboration of new ones centred around emerging issues such as sustainability, new forms of governance or urban containment. Transforming such conceptual systems into valid ontologies requires that the definition of concepts and the identification of relations holding between them is somehow stabilized and, most importantly, shared by a community of users.

The research work of this Action was hence guided by the assumption that urban practice is inherently based on shared conceptualisations even though these may be implicit. These conceptualizations can be regarded as ontologies even though they stay at a pre-formalisation stage. The work of the research network was then to reveal such underlying ontologies, understand how they are constructed by actors and propose adequate means to formalize and use them. The Action hence progressively rephrased its initial objectives around three basic questions :

- how can ontologies support urban interoperability at all levels (both between systems and people)?
- which sources can be used in order to initiate, populate and maintain urban ontologies?
- what are the potential applications of ontologies in the urban domain?

The papers selected for this special issue are addressing these three questions.

Interoperability between databases is an obvious application of ontologies in the urban domain. Urban databases are indeed characterised by different levels of information availability, reliability and precision. This is especially the case since a series of information services were decentralized from central states to local authorities. Furthermore private actors are playing an increasing role in the provision and delivery of urban data. Basic urban information is hence increasingly spread over different services and ontologies can be used as a way to select and combine information from various data sources.

Florczyk propose a comprehensive overview of conceptual, technical and administrative difficulties in combining different geoinformation services related to street networks (street gazetteers, cadastral services and address geocoding services). This information is used for a number of applications based on localisation: maintenance of urban networks, population, safety and emergency services etc. Ontologies provide a means to access these services and to address ill-defined spatial queries in a reliable and efficient manner. Métral further discusses the present limitations of CityGML for supporting high-level interoperability between different urban applications. The analysis is based on case studies in urban transportation and archaeology. The authors suggest that 3D representations may play a central role in communications between decision-makers and the population provided that such representations are complemented with higher level urban ontologies.

Ontologies can also be viewed as a way to support communication between experts and between lay people via the elaboration of a shared understanding of given concepts. This is quite a challenging task in the urban domain where a series of concepts is loosely defined and remain open to interpretation. Ban and Alqvist take the exurbanisation notion as a working example for developing a web interface allowing people to interact with a concept definition through its parameters and scope. Quite interestingly the authors argue that such a cooperative deliberation about a concept meaning may be a result in itself as it contributes to fostering links between people at the local level. Furthermore the elicitation of divergences between different groups may also be considered as a valuable objective as it may facilitate a common understanding of each other's positions. Such an opportunity was already discussed by Laurini (2007) who advocated for maintaining diverging definitions of concepts within an ontology when a consensus could not be reached between experts.

Besides such deliberative practices, the automatic extraction and indexation of concepts from reference sources appears as an efficient way to rapidly develop and populate urban ontologies. Such approaches can be based on the use of neural networks as proposed by Guyot or of natural language techniques as proposed by Mounce in this special issue. In both cases, it requires to have access to a significant corpus of background documents that can be used to populate the ontology. This is increasingly the case in the urban domain since the development of urban knowledge sources, as for instance the European Urban Knowledge Network (EUKN). The increased accessibility of urban policy documents, translated into various languages, can be considered as a valuable starting point for developing multi-lingual ontologies, an issue that was already approached in the building sector in the context of ISO-12006-3 standardisation efforts.

Finally two papers give an insight about the application range of ontologies in the urban domain. Finat discusses the use of ontologies for the automatic reconstruction of 3D scenes from clouds of points gathered from Lidar devices while Kaza suggests ontologies could be used as a way to improve coherency and congruency of urban plans evolving in the time as well as between different urban plans (transportation plans, environmental protection documents etc.). Quite interestingly in this later case, reasoning about the applicability of ontologies in the urban domain raises challenging questions about the mere nature of urban planning practice and the basic set of objects that are usually manipulated and coordinated by land use plans.

The COST C21 Action and its final conference helped to reveal a number of efforts in the development of urban ontologies designed for a diverse set of purposes. Still it should be admitted that it is very difficult to involve end users in the reflection about present and potential uses of ontologies. This may be due to the fact that urban practitioners are not aware of using ontologies in their daily work. Assuming that urban practices are inherently based on implicit conceptualizations or pre-ontologies was a way to face this difficulty in the course of the research. Complementarily demystifying, formalizing and evaluating ontologies can be considered as a required step for transforming existing urban practices.

2. ACKNOWLEDGEMENTS

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<http://www.towntology.net/>

3. REFERENCES

- Laurini (2007) "Pre-consensus Ontologies and Urban Databases" in Teller J., Lee J.R., Roussey C. (Eds.):
Ontologies for Urban Development. *Studies in Computational Intelligence* Vol. 61 Springer 2007, pp. 27-36.
- Nolmark H. (2007) "COST Action C20 Urban Knowledge Arena: Cross-boundary Knowledge and Know-how on Complex Urban Problems", in Teller J., Lee J.R., Roussey C. (Eds.): Ontologies for Urban Development. *Studies in Computational Intelligence* Vol. 61 Springer 2007, pp. 15-25.
- Teller J. (2004), *Urban Ontologies for an Improved Communication in Urban Civil Engineering Projects: Towntology Project*, Memorandum of Understanding of the COST C21 Action, available on the website of the Action <http://www.towntology.net/>, 13 p.