COST C21

Urban Ontologies for an improved communication in urban civil engineering projects

TOWNTOLOGY Project
Torino workshop - 17 & 18 October 2007

Jacques Teller
LEMA Université de Liège
Objectives of the COST C21 Action

The main objective of the Action is to increase the knowledge and promote the use of ontologies in the domain of Urban Development projects, in the view of facilitating the communications between information systems, stakeholders and UCE specialists at a European level (Groupware).
Definition of ontologies

Ontologies determine what can be represented and what can be said about a given domain through the use of information techniques.

"an engineering artefact, constituted by a specific vocabulary used to describe a certain reality, plus a set of explicit assumptions regarding the intended meaning of the vocabulary words.." (Guarino, 1998)

"ontology designers have to make conscious and explicit choices of what they admit as referents in a particular system or language." (Kuhn)

The way to make these choices is an important subject of research given their practical implications over the long-term.
Ontologies in the urban domain

WG1 Improve the communication between Urban Information Systems
*Catherine Roussey, INSA Lyon*
How can we share information/knowledge between different UIS? Raises issues of communication between **domains** (cadaster, population, planning, environment etc.), **scales** (nation, city, district), **purposes** and **qualities** (2D/2.5D/3D, topologically correct/incorrect, precision).

WG2 Improve the communication between domain experts
*Gilles Falquet, Université de Genève*
How can ontologies help us to identify and describe elements of convergence/divergence between **European urban planning systems**? Neologisms and "planning revisions" have been flourishing throughout Europe to cope with the evolution of urban systems. Example of sprawl or planning gains.

WG3 Improve the communication between experts and decision-makers
*Chris Tweed, University of Cardiff*
How can ontologies help us to build a **common culture** between experts, stakeholders and decision-makers? Argumentation, negotiation and conflict resolution require a common vocabulary, shared by the different partners.
Ontologies in the urban domain

There are no commonly accepted urban ontologies

Terminology is by nature unstable & contested, especially in this domain

Definitions and relations between concepts are often conveyed through graphics/maps.

Evolution of urban concepts over time (ex. boulevard)

Translation of terms is not such an issue as identifying concept mismatches and their rationale

Bottom-up approaches may include end-users - folksonomies
1) Assume the existence of ontologies, even though they may be implicit
2) Integrate "Practices" in the conceptual framework
Relevant experiences (not ontologies...)

<table>
<thead>
<tr>
<th>Formalisation</th>
<th>Construction sector classification</th>
<th>AEC Modelling</th>
<th>GIS Ontologies</th>
<th>Urban knowledge bases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Purpose</td>
<td>Standardisation Entire life cycle</td>
<td>Software Interoperability</td>
<td>Domain Interoperability</td>
<td>Exchange of experience Cataloguing</td>
</tr>
<tr>
<td>Leadership</td>
<td>Normalisation bodies</td>
<td>Internation Alliance for Interoperability: AEC &amp; software industry, Public bodies</td>
<td>Research organisations Private agencies</td>
<td>European Networks Public/Private bodies</td>
</tr>
<tr>
<td>Scale</td>
<td>Focused on building entities (buildings, bridges) and construction complexes (motorways)</td>
<td>Buildings and Sites</td>
<td>Street networks to satellite img processing</td>
<td>From public spaces to urban regions</td>
</tr>
<tr>
<td>Formalism</td>
<td>EXPRESS bcXML taxonomy</td>
<td>EXPRESS ifcXML</td>
<td>XML, GML, OWL</td>
<td>Taxonomy ISO 5964 (multilingual thesauri)</td>
</tr>
</tbody>
</table>

**Urban**
Identify existing and potential use cases of ontologies

Share best or innovative practices (case studies)

Design ontologies for practice (success stories)

Develop a repository of ontologies
Main achievements until now

First Towntology conference in Geneva
Centered on Information systems and techniques • Design of ontologies (bottom-up and top-down approaches) • Extract ontologies from existing spatial databases • How and why ontologies in the urban domain and likely effects on communication

Software tools developed by members of the Action
Towntology (INSA Lyon) - Design and browse urban ontologies
ThManager (Zaragosa) - From thesaurii to ontologies
Poprhry (INSA Lyon) - Support of Multi-lingual ontologies

Repository of urban ontologies
In construction under wikipedia (private). Common format to describe and document existing ontologies.
The series Studies in Computational Intelligence (SCI) publishes new developments and advances in the various areas of computational intelligence – quickly and with a high quality. The intent is to cover the theory, applications, and design methods of computational intelligence, as embedded in the fields of engineering, computer science, physics and life science, as well as the methodologies behind them. The series contains monographs, lecture notes and edited volumes in computational intelligence spanning the areas of neural networks, connectionist systems, genetic algorithms, evolutionary computation, artificial intelligence, cellular automata, self-organizing systems, soft computing, fuzzy systems, and hybrid intelligent systems. Critical to both contributors and readers are the short publication time and worldwide distribution – this permits a rapid and broad dissemination of research results.

Action C21 of the European programme for Cooperation in the field of Scientific and Technical Research is dedicated to investigating urban ontologies for an improved communication in urban civil engineering projects. The Action, known informally as „Townology”, brings together a large and heterogeneous grouping from across Europe, whose interests range from construction to urban tourism and from transport infrastructure to resource visualisation. On 6-7 November 2006, in Geneva, the Action convened a successful workshop to address emerging issues in the field. This volume presents the contributions to that workshop, in many cases revised afterwards to capture some of the outcomes of discussion.

Many of these contributions are from members of the Townology group, but there are also contributions from other European researchers, and from researchers in the US. The volume represents a valuable overview of major current issues in the field of urban ontologies and encapsulates many useful and different approaches. We hope that it will serve not only as a worthy outcome of Action C21, but also as a valuable resource for a wide range of researchers.
Main deliverables at the end of the Action

Repository of urban ontologies
Available at the end of the project • Documents and reviews existing ontologies • Provide them in a common format (OWL).

Book composed of three separate volumes produced by the different Working Groups
Volume 1 - Success stories in the use of ontologies to support software interoperability
Volume 2 - Ontologies : from existing urban sources to applications
Volume 3 - Ontology case studies

MT Assessment meeting - Multi-lingual ontology in one specific field
Example of sprawl for instance • May be based on Rabino and Joutsiniemi's collaboration • sprawl, periurbanisation, desurbanisation
Ontologies for urban development: conceptual models for practitioners

17&18 of October 2007
Castello del Valantino, Turin, Italy

Wednesday 17/10
9:00 Registration & Coffee
9:30 Welcome addresses
10:00 Presentation of the COST C21 Action
Jacques Teller, LEMA Université de Liège, Belgique

KEYNOTE SPEECHES

11:00 Social Ontology
Prof. M. Ferraris - Laboratory for Ontology

11:30 Multi-lingual ontologies in the HEREIN project
Phil Carlisle, English Heritage

SESSION 1 - ENVIRONMENTAL DATA INTERPRETATION AND COMMUNICATION

14:00 Urban ontology for semantic interpretation of multi-source images
Pulissant, A.; Durand, N.; Sheeren, D.; Weber, C.; Gańczański, P.
Image et Ville Laboratory, UMR 7011 CNRS

14:30 Ontologies for the Integration of Air Quality Models and 3D City Models
Moritz, Claude; Falquet, Gilles; Karatzas, Kostas
Université de Genève

15:00 Using a hybrid approach for the development of an ontology in the hydrographical domain
López-Pellicer, F.J.; Vilches-Blázquez, L.M.; Nogueras-Isso, J.; Corcho, O.; Bernabé, M.A.; Rodríguez, A.F.
Computer Science and Systems Engineering Department, University of Zaragoza

SESSION 2 - URBAN DATA CLASSIFICATION AND RETRIEVAL

16:00 Web-based Interactive Visualization of Uncertain Concepts in Urban Ontologies
Hyowon Ban and Ola Ahlgvist
Department of Geography, The Ohio State University

16:30 Studying the impact of urbanism in cross-domain areas through the analysis of lexical ontologies
Lacasta, Javier; Nogueras-Isso, J.; Zarazaga-Soria, F.J.; Muro-Medrano, P.R.
Computer Science and Systems Engineering Department, University of Zaragoza

17:00 An Ontology-Based Intelligent Information System for Urbanism and Civil Engineering Data
Trausan-Matu, Stefan; Neacsu, Anca
Research Institute for Artificial Intelligence of the Romanian Academy

SESSION 3 - LANDSCAPE CHARACTERISATION AND MANAGEMENT

9:00 Geo Semantic Web Communities for Rational Use of Landscape Resources
Marchegiani, Ernesto;ucci, Michele; Tummarello, Giovanni; Morbidoni, Christian
Technical University of Marche, Dipartimento di Scienze Applicate ai Sistemi Complessi

9:30 Exploring Ontologies of Historic Landscape Characterisation: Towards an approach for recognising the impact of incremental change to historic legibility in urban areas
Dobson, Stephen
University of Sheffield, Department of Landscape

10:00 Using an Ontology-based Model for Knowledge Representation in Rural Landscape
Cataldo, Antonio; Rinaldi, Antonio M.
Università di Napoli Federico II, Dipartimento di Informatica e Sistemistica

SESSION 4 - TOWNSCAPE ANALYSIS AND URBAN REGENERATION

11:00 Colour plan for urban design
Cecconello, Mauro; Bisson, Mario; Boer, Cristiana; Vignati, Giorgio
Politecnico di Milano, Dipartimento INDACO

11:30 Ontologies for urban regeneration: opportunities and weaknesses for their development in cohesion policies for cities
Rotondo, Francesco
University of Bari Polytechnic, Department of Architecture and Town Planning

12:00 Generating Urban Forms from Ontologies
Caneva, L.; Collo, M.; Di Giannantonio, D.; Lombardo, V.; Montuori, A.; Pensà, S.
Politecnico di Torino

SESSION 5 – INTERPRETATION OF DESIGN PROCESSES

14:00 Updating Plans: A historiography of decisions over time
Kaza, Nikhil; Finn, Donovan; Hopkins Lewis D.
University of Illinois at Urbana Champaign, Department of Urban & Regional Planning

14:30 Elaboration and application of ontology in a process of architectural project
Pellegrino, Emmanuelle
CRAAL - Centre de Recherche en Architecture et Architetturologie

15:00 Expressing Urban Development Concerns within a Domain Ontology
Athanasopoulos, Nikolaos
Harrow School of Computer Science

16:00 Summary

16:00 Round table discussion