SEMANCO

SEMANTIC TOOLS FOR CARBON REDUCTION IN URBAN PLANNING

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SEMANCO News

• SEMANCO researchers took part in the 2nd VoCamp in Brussels on 21-22 February 2013, alongside more than thirty other key experts from around Europe. The main discussion in the workshop was around open BIM modelling and its enrichment using open standards such as IFC from buildingSMART for the support of enhanced building performance analysis during the building life-cycle.

• On 11-12 April SEMANCO hosted our interactive workshop, "Analysing and Visualising Energy Related Data in our Buildings, Towns and Cities" in Barcelona in April. Thirty-eight participants and 16 projects took part in the two day event. For details of the workshop programme, presentations and outcomes visit the workshop blog.

• SEMANCO's NEA partners presented the project on 8-9 May 2013 during the Sustainable Cities session at Greenbuild Expo in Manchester. Their presentation focussed on the project's approach to tackling urban carbon emissions and presented the latest project developments at our display stand throughout the Greenbuild event. To find out more about Greenbuild Expo, visit their website.

• SEMANCO's CIMNE partners participated in the workshop "Tools for the evaluation of nZEB", organized by the Catalonia Institute for Energy Research (IREC) within the framework of the EU projects AIDA and MARIE which took place in Construmat . The presentation focused on the challenges of energy efficient urban planning from a multi-scale perspective and on the advances in the SEMANCO project in that regard.

Welcome to the third SEMANCO Newsletter. The SEMANCO project has entered a truly exciting phase in 2013. We have made major developments towards achieving the overall project objectives by development of the local and global ontologies that are the basis of the SEMANCO platform, and the development of the interface through which domain experts can interact with the SEMANCO semantic energy model. The ability of the SEMANCO platform to integrate data from any number and type of building-energy related database and to facilitate queries of this semantic data by end users holds exciting promise that the platform will have a significant role to play in the decarbonisation of urban place.

I hope you find the review of our progress as stimulating as we find this work: you can find more detail on our website.

Leandro Madrazo, SEMANCO Project Coordinator.

Update on SEMANCO technology development

Central to achieving the SEMANCO project aims is the creation of the Semantic Energy Information Framework (SEIF) and the basis for this is the development of a global ontology – the semantic energy model. In the last months, a fundamentally important stage of the project has been completed: the semantic modelling of all the

inputs and outputs for the Use Case Activities. This has involved the identification of the categories of the various data that are to be semantically modelled (see here) and further classification of these into two broad groups: Energy Data, which includes data relating directly to energy, climate, building technical data etc.; and Energy-related Data (contextual data), including energy-cost data, environmental and legislative information, socioeconomic and demographic data.

The guidelines that we have defined and followed in this sematic modelling process are laid out in our Report on Guidelines for Structuring Energy Data and Report on Guidelines for Structuring Contextual Data.

Establishing a shared vocabulary is an essential first step in developing the underlying semantic model. For the SEMANCO project, these definitions are based on international technical standards and by reference to several other EU projects working in this area. Each concept within the ontology has been defined as an object with attributes. For example, within the category of building technical data, the concept of a 'building' has a number of attributes, one of which is its age. This concept in turn can be expressed either as a year of construction or as an age class (with reference to a particular standard). Therefore, a 'building' has 'age' which is either 'year of construction' or 'age class'.

These relationships are set out in Standard Tables (see the reports on structuring Energy Data and Contextual Data) which are linked to input data from data sources and tools, as defined in the Use Cases. Importantly for the successful semantic modelling of energy-related data, it is necessary to relate each data category to a particular spatial scale (region, municipality, neighbourhood, building) through a Standard Table that links other tables to the spatial scale of interest. This semantic data modelling allows the direct importation of data into an Ontology Editor –a tool created within the project to facilitate the collaboration of ontology engineers and domain experts in the ontology design process–and, hence, ultimately into the global ontology – the semantic data model – at the heart of the SEIF.

The semantic energy model has been developed as a formal ontology in OWL 2 based upon a design methodology that allows both the integration of data sources and the processing of queries. This dual purpose design methodology has been devised specifically for the SEMANCO project as no approach previously existed to perform both functions.

A critical aspect of the ontology design process is vocabulary building which must take into account the perspective of users in order to achieve a high quality ontology in which concepts are appropriately labelled. In the SEMANCO project, this has been achieved through detailed specification of use cases and their inter-related activities. These specifications are also ideal for query design. The vocabulary has subsequently been built based on the information in international standards and the relationships set out in the Standard Tables. The implementation of the energy model has been undertaken using DL-LiteA formalism and is carried out using the SEMANCO ontology editor described in the Report on User Interfaces for Knowledge Representation. Finally, the properties of the semantic energy model have been evaluated in terms of its intelligibility, mapping compliance and computational efficiency. In tests of the ontology concepts' intelligibility both computer science students and domain experts scored well over 90% on average. The results of the other tests are still under evaluation.

The data mapping activities have been used to construct the ontology repository containing the building data and urban data provided by the Case Studies, transforming the relational databases into the project's semantic energy model in RDF (Resource Description Framework). This process takes place firstly by the automated creation of a local ontology for the individual data sources, followed by the integration of these local ontologies into the global ontology – the SEMANCO energy model – using the project's ontology mapping collaborative web environment and according to the data-source mapping tables. The process of transforming these data sources is fully automated. Most (around 90%) of the mappings required to transform the data are generated automatically by the collaborative web environment. However, some ontology structures cannot be automatically mapped. In this case, the mappings are manually customised. The resulting RDF data allow for versatile querying of the Case Study data by the SEMANCO tools.

This ontology repository represents a major advance in the project as it brings together the use cases, the ontology development and the data modelling to provide a structure that can be queried by the SEMANCO tools. Case studies and projects other than those presently within the SEMANCO scope can be added to the repository by creation of data source mapping tables to map the new database to the global ontology (the energy model) – updating the energy model as appropriate – followed by semantic integration to generate the RDF database. In this way, the SEMANCO

platform tools become generally applicable.

Alongside the project technical development there has been significant activity in capturing stakeholder requirements using soft systems methods and based on rich picture descriptions of the three Case Study areas. This work, carried out by semi-structured interviews and workshops, has fed into the identification, specification and validation of the Use Cases and has revealed a range of key stakeholder issues. These include the (unsurprising) emphasis that stakeholders place on savings in time and cost and that these are particularly important in business case and early implementation phases of projects. Tool flexibility, trust in underlying data sources and the ability to generate baseline data were all significant issues in stakeholders' minds when reflecting on decision support tools.

Upcoming Highlights

• Two SEMANCO papers will be presented at the 26th International Workshop on Description Logics in Ulm, during 23-26 July 2013.

• SEMANCO partners will be presenting a workshop paper entitled, "Data Integration Driven Ontology Design, Case Study Smart City" at SemCity-13 during 12-14 June in Madrid.

• Aspects of the SEMANCO project will be presented at CONVR 2013 during 30-31 October 2013 in London.

• SEMANCO will contribute to the 1st EeB KPIs Workshop & 4th Workshop on EEB Data Models, organized within the International Conference "ICT for Sustainable Places" which will take place in Nice, 9-11 September 2013.

• SEMANCO prototype platform will be presented in the exhibition "ICT 2013- Create, Connect, Grow", in Vilnius on 6-8 November, 2013.

Visit the SEMANCO website for more details: www.semanco-project.eu

If you would like to become a member of the SEMANCO Dissemination Network, please contact Chris Ennis at c.ennis@tees.ac.uk

SEVENTH FRAMEWORK PROGRAMME