

Topic 1 (Werner Retschitzegger):



Lost in Time, Space, and Meaning or How to Gain Situation Awareness in Large-Scale Control Systems

Large-scale control systems, as encountered, e.g., in the domain of road traffic management, typically deal with highly-dynamic environments providing a vast amount of information, stemming from multiple heterogeneous sources, about a large number of real-world objects anchored in time and space. In such systems, human operators are at permanent risk to get lost in the induced information overload failing to be aware of the overall meaning of the available information and its implications. This endangers the timely and correct *identification, resolution* and *pro-active prevention of critical situations* potentially causing serious impacts in the real world.

In the course of a FIT-IT project¹ we are currently developing BeAware!, an *ontology-driven framework for supporting situation awareness* in large-scale control systems. A *situation awareness ontology* should facilitate the definition of domain-independent situation types consisting of constituting objects and relations in-between, heavily building on existing work in the area of qualitative spatio-temporal reasoning. The *situation assessment mechanisms* of BeAware! are responsible for the identification of sets of interrelated objects that satisfy the situation types of interest. To ensure the efficiency of this assessment process, a prior knowledge on relations between objects is encoded within the ontology in order to check the satisfiability of a situation type and assessment shortcuts for inferring relations between objects based on their subsumption lattices and their set-theoretic characteristics are introduced. In this respect, the concept of “conceptual neighbourhoods” of relations is used to assess situations being similar to an existing situation type as well as to assess evolving future situations. Concerning implementation of BeAware!, a pipes-and-filters architecture for ontology-driven information systems is proposed which rely on data asynchronously pushed from their sources. The real-world adequacy of the developed framework is demonstrated in the domain of *road traffic management* using real-world traffic situations from the Austrian highways agency’s (ASFINAG) traffic management system.

For more information about BeAware! please visit the project homepage:

<http://85.10.203.252/page/index.php?id=96>

Ziel dieses Seminars ist es, in Form von Gruppenarbeiten einen Überblick über die spezifischen Probleme der Situation Awareness in Large-Scale Control Systems am Beispiel von Verkehrsleitzentralen zu geben. Es sollen von den Seminar-Gruppen interessante Ansätze in diesem Gebiet vorgestellt werden und insbesondere auch neue Entwicklungen und offene Forschungsthemen behandelt werden. Insbesondere relevant sind dabei die Themenbereiche ontologie-basierte „*Information Fusion*“ und „*Situation Awareness sowie Evolution*“.

Basisliteratur:

- Kokar, M.M., Matheus, C.J., Baclawski, K.: Ontology-based situation awareness. *International Journal of Information Fusion* 10(1) (2009) 83-98
- Jens Bleiholder, [Felix Naumann](#): Data fusion. [ACM Comput. Surv.](#) 41(1): (2008) [anbei!]

Die konkreten Themenstellungen werden bei der Vorbesprechung bekanntgegeben.

Prüfungsmodus:

Das Seminar wird als Block mit Anwesenheitspflicht abgehalten. Hauptgrundlage der Beurteilung sind die schriftliche Arbeit, die mündliche Präsentation, sowie die aktive Mitarbeit.

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