Title

Current trends on the application of ontologies in Information Fusion

Abstract

Data and Information Fusion research area studies theories and methods to combine data from multiple sensors and context information to provide decision makers with better support than could be obtained by using a single sensor. Low-level data fusion – focused on the processing of multi-sensor signals and the estimation of single object properties– has received a considerable attention during the last decades, which has resulted in a myriad of successful theories, algorithms and tools. Nevertheless, high-level fusion problems –corresponding to situation recognition and assessment– are still far from being completely solved. The ultimate objective of high-level fusion procedures is to understand the scene in terms that can be easily communicated to human users, to evaluate short and long-term threats, and to support decision making.

Ontologies have recently gained momentum as formalisms to symbolically represent knowledge in high-level information fusion. In the Knowledge Engineering context, an ontology is defined as "an explicit formal specification of how to represent the objects, concepts and other entities that are assumed to exist in some area of interest and the relationships that hold among them". Ontologies are appropriate in domains that require interoperation between heterogeneous entities, such as the Semantic Web and the Linked Data initiative –where representation languages, such as the standard OWL, and supporting tools have been proposed. In addition, ontologies have strong underpinnings in Description Logics (a family of logics to represent structured knowledge). Thus, they offer reasoning mechanisms, which means inferring new axioms that have not been explicitly included in the knowledge base but are logical consequences of the represented axioms.

This talk will explore current approaches and prospective future works involving the use of ontologies to support high-level information fusion processes. The following topics will be covered:

- The Information Fusion paradigm
- Fundamentals of ontologies: definition, knowledge representation, and reasoning
- Semantic Web technologies with application to Information Fusion
- Research works in ontology-based high-level visual information fusion
- Extensions of standard ontologies: spatial reasoning, uncertainty and imprecision management