

DAGSI Research Topic

1. **Research Title:** Creation of Materials, Manufacturing and Design Knowledge Representations via Self-assembly of Ontology Design Patterns
2. **Individual Sponsor:**

Mr. Clare Paul, AFRL/RXCA
AFRL/RXCA Bldg 655
2941 Hobson Way
WPAFB, OH 45433-7750
clare.paul@us.af.mil
3. **Academic Area/Field and Education Level:** Cognitive Science/Knowledge Representation (MS or PhD)
4. **Objectives:** The technical objectives of this topic are to (1) develop, and locally employ self-assembling Ontology Design Patterns (ODP) based on context elicited from user actions, and (2) deploy the ODP Knowledge Representations (KR) as software agents to discover and retrieve contextually relevant information.
5. **Description:** Describing a domain using formal logics enables inference. The ability to infer forms a basis for knowledge representation. Semantic technology (ST) is based on knowledge representation captured in a directed, labeled graph. The same graph structure is also used to capture domain data whereby the two can simply be merged together to form a knowledge graph. Additionally, all nodes and edges are addressable using the Hypertext Transfer Protocol (HTTP). The characteristics of ST enable interoperability beyond syntax and structure, by capturing the meaning or semantics of the data. Driving the need for large-scale, semantic interoperability is the requirement for machines to discover, classify, and communicate vast amounts of modeling and simulation data as well as data from product and process characterization. The communication occurs not only between machines and humans, but more importantly it occurs between machines or KR agents. In this activity, the KR agents would be based on ODPs. ODPs are purposefully limited in domain scope. For example, an existing ODP for materials transformation consists of a small number of KR elements (six classes and 5 properties). By associating the context inherent in user activity (e.g. running a program to model the curing of a polymeric matrix composite or searching for properties of titanium), the relevant ODPs could be identified and assembled (objective 1). This assembly could then further be used to set up KR agents which peruse relevant data and assemble corresponding data graphs which carry information relevant to the user activities (objective 2).
6. **Research Classification/Restrictions:** This research has no ITAR restrictions.
7. **Eligible Research Institutions:** Universities (DAGSI) and AFIT

PA Approval # - in-process, will receive approval by the deadline of 20 July 2018