Ontology Summit 2015

Track C Report-back

Summit Synthesis Session 1, 19 Feb 2015

Track C Decision Making in Different Domains

- From the Summit theme:
  - Identify a methodology for development of terminologies for multimodal data (or ontologies), developing appropriate ontologies, developing testing methods for these ontologies, demonstrating interoperability for selected domains (e.g., healthcare, situational awareness), and using these ontologies in decision making.

Track C Mission

- Identify key problems in IoT which require (or would benefit from) automated reasoning (motivating scenarios for ontologies in IoT)
  - Decision Support
  - Integration and interoperability of devices (interactions among smart objects)

- Address the challenges for these applications
  - role of ontology languages (expressiveness/tractability)
  - are existing ontologies adequate for supporting these applications?
  - scalability of approaches to semantic integration and automated reasoning

Track C Session 1: 12 Feb

- This session explored several approaches to automated inference in applications ranging from complex event processing and situation awareness to manufacturing.

Session 1: 12 Feb Speakers

- Ontology Based Information Centric Tactical Edge Networking,
  - Joseph Kopena (Bellerophon Mobile)
- From Semantic Complex Event Processing to and Ubiquitous Pragmatic Web 4.0,
  - Adrian Paschke (Freie Universitaet Berlin)
- Process Ontologis for Smart Objects in Manufacturing,
  - Michael Gruninger (University of Toronto)
- Situation Awareness and Decision Making
  - Ken Baclawski(Northeastern University)

Themes: Speaker Presentations

Joe Kopena: Tactical Edge Networks

- Challenges and Constraints (Disconnectivity, Network scale)
- Information Centric Networking
- Use of RDF metadata and OWL Lite
- “A Little Semantics goes a Long Way”

Adrian Paschke: Event Processing

- Semantic Complex Event Processing
  - Event data as declarative knowledge
  - Complex reasoning over situations
- Reference architecture, patterns
- Use of RuleML on events
- Pragmatic Web

Michael Gruninger: Process Ontologies

- Manufacturing process control
  - Use of RFID
  - Process Specification Language
  - Queries; Reasoning
- Not all axioms are created equal
  - Minimal sub-sets of ontology
  - Use of lemmas

Ken Baclawski: Situation awareness, decision making

- Decisions need context- need to formalize Situation
- Situation Theory
- Decision process models
  - OODA Loop,
  - JDL/DFIG,
  - KIDS and KIDS Ontology
- Scenarios
  - Healthcare, customer service, cloud computing, finance

Observations and Insights: Chat Log

- Project Challenges
  - Determining relevance
  - Security considerations
  - Testing effort
  - Human v non human inputs
  - Handling Uncertainty
- Architectural Considerations
  - Networking architectures – Information centric, peer to peer
  - Queries optimization / distribution
  - Use of Rules

Observations and Insights: Chat Log

- Trade-offs
  - Reasoning complexity versus real time processing trade-offs
  - Minimal ontology v lemmas – formal approach?
  - Axiom types v usefulness / applicability to task
- Semantic Issues
  - Observation versus Subject (topic v type hierarchies?)
  - Use of Concept Lattice
  - Sequencing – how to represent
- Tools and Languages
  - Alternatives to SPARQL / RDF?
  - Pragmatic Web v Schema.org
  - Logic translations; other tooling questions

Observations and Insights

- Track Co-Chairs
  1. What kinds of reasoning and decision support do we need for IoT?
  2. What ontologies do we need to support these reasoning problems?
  3. How are ontologies currently being used for decision support?
     - i.e. are they being used directly using an automated reasoner, or are they being implemented together with domain-specific algorithms?
  4. Trade-offs between integration of concepts and applications of formal reasoning

Observations and Insights

- “A Little Semantics Goes a Long way”
- Trade-off between reasoning complexity and real-time processing
  - Only using OWL-Lite for the ontology, and the reasoner being essentially solely focused on ABox reasoning
  - Network and physical connectivity delays tend to be substantial, mostly dwarfing this level of processing.
- Possible Solution
  - There is a pragmatically-definable language-and-reasoner system, beyond DL in expressivity but requiring only selected (or selectable/tunable) features of something like CyCL, CL, or IKL.
  - What exactly that language should be? Probably some combo of explicit taxonomy + cardinality & range/domain restrictions + basic rules + some mechanism for incorporating dynamic data (e.g., "current position").

Track C Synthesis

- http://ontolog-02.cim3.net/wiki/OntologySummit2015_Decision_Making_in_Different_Domains_Synthesis