Semantic Sensor Network Ontology

Michael Compton
Holger Neuhaus
Kerry Taylor
Amit Parashar
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• An ontology about sensors could be
  • an ontology about sensing - all the concepts to do with sensing, all the types of sensing and what is sensed - like an upper ontology of sensing, or
  • an ontology in which to describe particular instances, or classes, of sensors - the functional, physical and measurement aspects - partly what’s on the data sheet.

• Think a vocabulary for sensing Vs the MMI device ontology

• Both of course important and sensors in the latter can be automatically classified into the former.

• We are building one like the second option to
  • encode sensors, reason, task, plan, query, do provenance etc.
  • then linking in domain specific concepts, processing concepts, services, etc.

• so the ontology needs to be general, extensible, ‘plugable’, reusable, etc.
Ontology of Sensors

• Not realistically possible to encode concepts for every aspect of every possible sensor (some of it won’t fit in in OWL anyway).
• So we’ve tried to build a core framework into which can be plugged a suitable domain ontology, suitable location ontology, a suitable uom ontology, etc.
• Has places for bits of, say, MathML, or whatever is appropriate, when describing, non-OWL concepts.
• Also want to have potential to capture multiple levels of detail or abstractions

• Currently has
  • sensors, features, operations, results, processes (simple and composite), inputs and outputs, accuracy, resolution, abstract and physical properties, metadata links, power, ...
Grounding - Physical Aspects

• The SensorGrounding describes everything physical/tangible for the box that is the sensor and everything implementation/concrete for its operations
  • location, mobility, range/field of sensing
  • platform
  • dimensions, materials, wires and connectors
  • calibrations
  • reference documentation and other metadata
  • power - source, consumption, batteries
  • operations - how to invoke, order of arguments, results specification
  • how to contact - network, radio, direct

• Operations are similar to OWL-S in that we separate the specification from the implementation details.
A sensor may have a number of operations (described by OperationModel). Each can be described at an appropriate (or multiple) level of detail.

- **Result** - specification in terms of inputs and conditions, accuracy, latency, resolution, effect (mathematical specification)
- **ResponseModel** - the behaviour of the sensor in terms of physical stimulus and response
- **Process** - description of process flow, more important when combining a number of sensors into a single sensing unit than for a single transducer, still can be important for provenance though.

These are specifications of the processes, rather than individual runs.

More than just single sensors is included by the definition of sensor - it can be extended to include all manner of larger macro instruments or models.
Future work

• We can encode some important aspects of sensors, but lots more to do
• Accuracy
  • depends, for example, on magnitude of measurement and other environmental influences like temperature
  • not always as simple as ±3%, more often a function on influencing factors
  • question, is it enough to simply leave space for XML encoding the function? This doesn’t then include any of the influencing factors in the ontology
• Response model, ranges, input/output, power ... are similar
• Units of measurement
  • need to decide on a system to record units against measurements
  • of course, want to keep the uom ontology separate
• More examples
• Use the ontology in our tool chain
ICT Centre/Information Engineering
Michael Compton
Research Scientist

Phone: 02 6216 7016
Email: Michael.Compton@csiro.au
Web: www.ict.csiro.au