Thesis: SensorML on SenseTile

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Thesis proposal

Description

A SenseTile is a sensor and processing package including motion sensors, RFID sensors, temperature sensor, audio sensors and pressure sensors among many others. This Masters thesis proposes:

- using SensorML to model the sensors on the SenseTile Sensor Board.
- developing an application to execute this model and gather the Sensor data
- developing a Web Service to allow access to the sensor data.

Sensor Board Modelling

The sensors on the Sensor Board will be modelled as SensorML Process following the SensorML models and xml encodings. These processes take input, apply an algorithm defined by a method and parameter values, and generate output. The Sensor Board itself will be modelled as a SensorML System that contains these processes and the links between them. The model will contain metadata describing the capabilities of the sensor board and sensors.

Model Process Engine Application

The SensorML model of the Sensor will be executed in a SensorML enabled execution engine. The sensorml-data-processing project parsers and process engine will be evaluated as the most likely way to implement this application.

Java classes will be developed that use the Java API USB Sensor Board interface under development as part of the SenseTile project to access the sensors data. These classes will be used by the SensorML model to generate the sensors measurements/observations.

The application is a Sensor Data Producer as defined in the OpenGIS Sensor Observation Service

Web Service

A prototype Web Service will be developed to provide access to the SenseTile Sensors measurements. The swe-common-data-framework project parsers will be evaluated as the most likely way to implement this application. This Service will provide the mandatory Sensor Data Publisher operations.

Items

Mandatory

1. Familiarisation with sensor modelling and OpenGIS SensorML/Sensor Observation Service/The Observations and Measurements Encoding Standard (O&M).

2. Familiarisation with Web Services
   - Can a Restful approach be used in for the SenseTile Sensor Web Service based on the above?

3. Define a SensorML specification of the SenseTile Sensor Board
   - define Senstile Sensor Board in terms of a SensorML system
   - define sensors using the SensorML processes - most likely based on SensorML Detectors
   - The sensors to be modelled are the Ultrasonic Sound sensor, Acoustic sensor, Accelerometer, Pressure sensor and Light sensor
   - Develop a process engine to execute SensorML model to produce sensor data

4. Develop a process engine where the SensorML model is implemented

5. Develop a prototype Web Service to expose the SenseTile Sensors data
   - Basic implementation of Sensor Observation Service Core (GetCapabilities?, DescribeSensor? and GetObservation?)
   - Basic push of sensor data to clients.

6. BON specification of the proposed system. Refinement of parts of the System that need to be coded

7. Check if a BON to SensorML mapping can be done.

8. Develop a test client

Discretionary

1. A restful model/implementation of Web Service

Deliverables

- Deliverables page

References

Papers

References in SensorML are not great because the standard is still quite new.

Main papers on SensorML:

1. M. Botts, G. Percivall, C. Reed, and J. Davidson, "OGC® Sensor Web Enablement: Overview and High Level Architecture," GeoSensor? Networks: Second International Conference, GSN 2006, Boston, MA, USA, October 1-3, 2006, Revised Selected and Invited Papers, Springer-Verlag, 2008, pp. 175-190.
2. X. Chu, T. Kobialka, and R. Buyya, "Open Sensor Web Architecture: Core Services," IN PROCEEDINGS OF THE 4TH INTERNATIONAL CONFERENCE ON INTELLIGENT SENSING AND INFORMATION PROCESSING, 2006, pp. 1—4244.
3. X. Chu and R. Buyya, "Service oriented sensor web."

Practical use:

1. A. Robin and M.E. Botts, "Creation of Specific SensorML Process Models."
   - Draft paper. Using SensorML to describe the sensors as well as the processes that transform the data.

Mailing lists

https://lists.opengeospatial.org/mailman/listinfo : SensorML, and many others