

**Context** : Building effective pervasive systems involves administration and fine tuning of sensors toward optimal operation.  
**Problem** : Difficulties arise because sensors are prone to inaccuracies through miscalibration, malfunction and component limitations.  
**Solution** : SensorMash, a tool for exploring sensor interactions as a mashup of inputs into a context-aware system.

## 1 Ingredients

The system is based on two filters for fixed decay and user-defined confidence. Initially a sensor reading is given the maximum overall weight value of 1. The filters are applied in series; decay followed by confidence to give a final weighting for each reading. This weight is used to calculate the derived value. The average centroid fusion (the geometric centre of all sensor readings) value is also displayed.

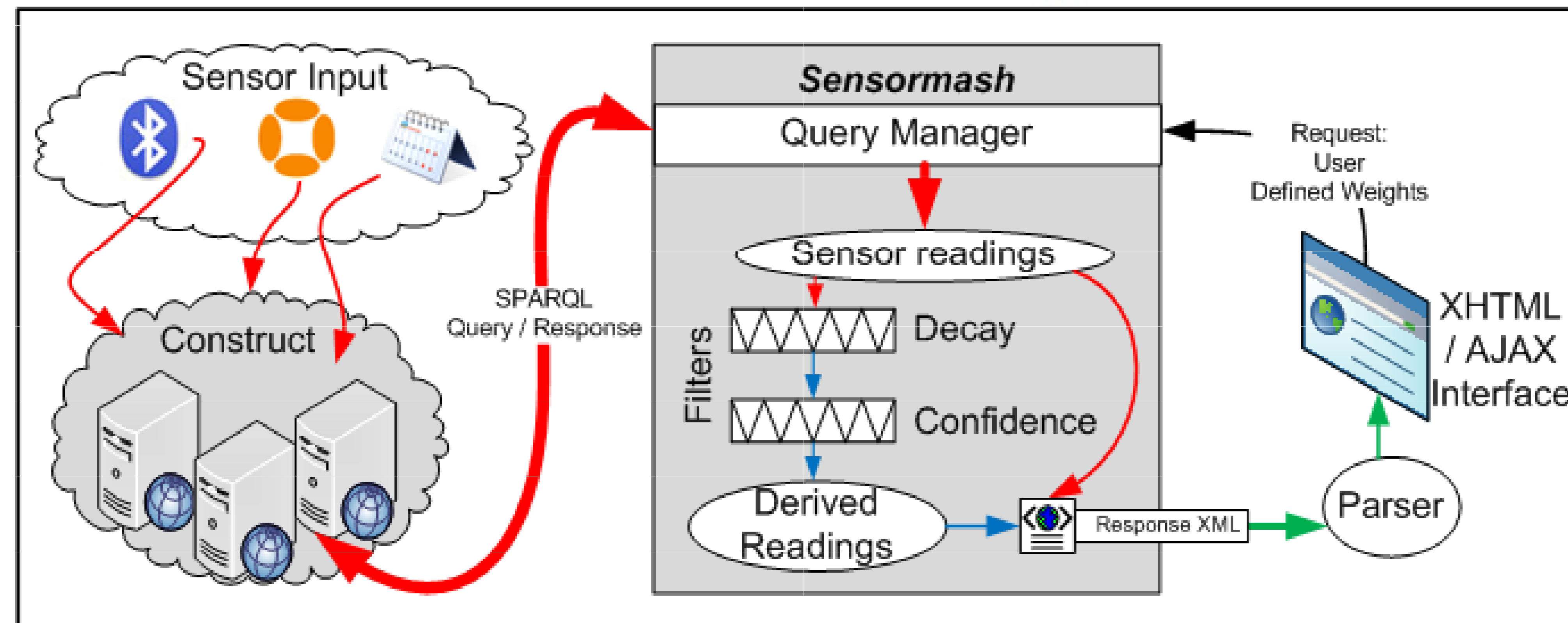
## 2 Recipe

The web-based interface is configured using the metadata for a particular user, and displays sliders for each sensor type. Every few seconds data from each sensor is retrieved from Construct and the filters applied based on the slider input. The derived information and original readings are communicated to the front end interface, which refreshes the display.



## 3 Tasting

The improvements varied from 70cm to 6.5m. Each evaluator was given a maximum of five minutes. In reality, the evaluators took much less than this; 1-2 minutes on average. After the evaluators explored SensorMash they all agreed that it was a useful tool for gaining insight into their pervasive deployment. One user reported: "the use of drag bars is an intuitive and fast way to get users to experiment with different confidence values".



Location	Active sensors	Centroid dist.	Weighted centroid
Location 1 (cube 4)	Bluetooth, Calendar	4.79	3.39
Location 2 (cube 2)	Bluetooth, Ubisense, Calendar	3.04	2.36
Location 3 (meeting area)	Ubisense, Calendar	7.84	2.07
Location 4 (water fountain)	Bluetooth, Ubisense	6.33	3.39
Location 5 (at lifts)	Ubisense, Bluetooth	8.75	2.08

## 4 Digestif

Using the data derived from the user interaction allows us to model cases for weighting sensor readings in various locations. We are currently writing an extension to SensorMash which introduces a precision value. In this version a ground truth value is injected and the system automatically adjusts the sliders to have the fusion algorithm generate the correct value.