Persim – Pervasive Space Simulation

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Motivation

- **Synthesis** and **realistic simulation** of human activities is becoming very important in **Activity Recognition** research for training and testing activity models and algorithms because of:
  - ✓High cost of building pervasive spaces with correct design and planning.
  - ✓Huge time/effort to generate enough data with specific goal/context .
  - ✓Inability to modify the physical space easily and explore additional goals.
- **Standardization** of datasets representation is needed to:
  - ✓ Enable interoperability and reuse of datasets within and across research communities.
  - ✓ Empower the development of useful tools to meet a variety of research needs.

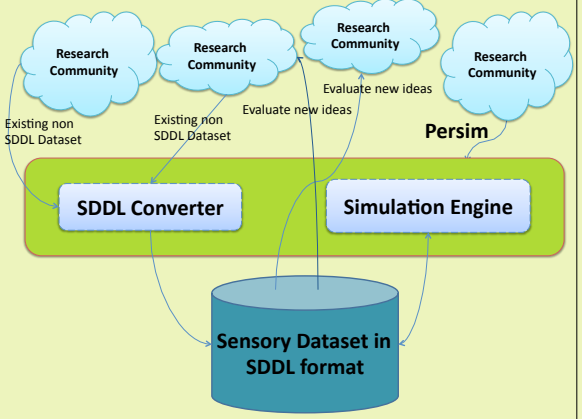


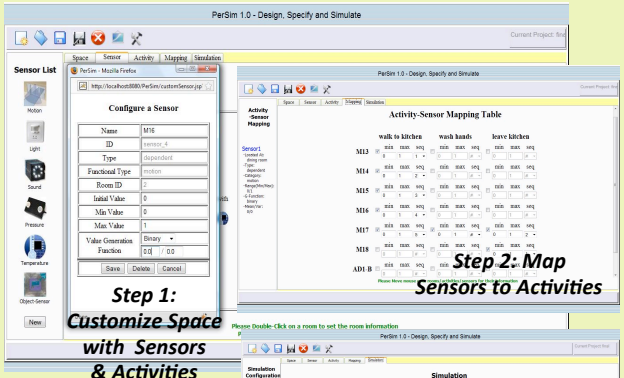
Figure 1. Overview of the Persim Project.

Objective of Persim Project

❑Create a standard representation of dataset – **Sensory Dataset Description Language** (SDDL) driven from careful examination of existing datasets.

❑Develop a powerful tool - **Persim** to create focused simulations of human activities in standardized format to enable the researcher to evaluate activity recognition algorithms with reasonable accuracy.

Persim Simulation Steps



SDDL

Sensory Dataset Description Language

❑ SDDL is proposed as an **XML encoded standard** that is capable of describing target pervasive spaces in terms of physical elements such as sensors, actuators etc. as well as human activities and data collector implicit assumptions.

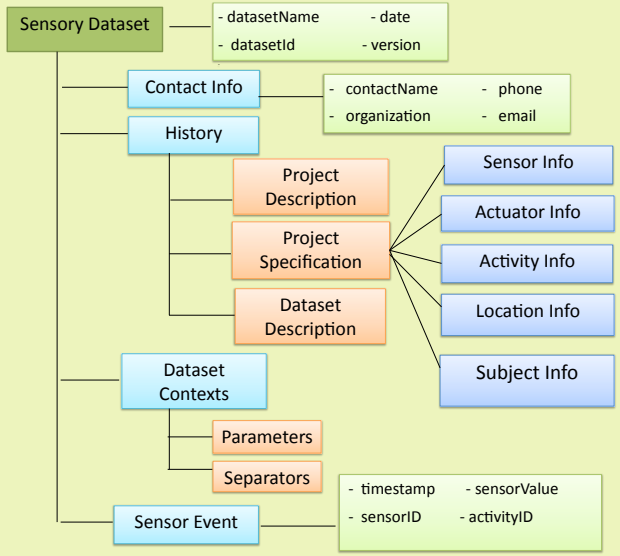


Figure 2. SDDL XML Schema structure version 1.0

Simulation Output

```
<Sensory_Dataset id="p08", name="WSU_t2" version=" 1.0" >
<History>
<Project_Description text="The experiment is performed in WSU Smart Apartm
ent is part of the ongoing CASAS smart home project at WSU. "/
<Project_Specification>
 <Sensor_Info count="8">
  <Sensor id="M13" type=dependent" name="motion"  />
  <Sensor id="AD1-B" type="dependent" name="water-flow"/>…
<Dataset_Contexts>
  <Parameters count = "3">
      <Parameter name="timestamp" index="1"/>
      <Parameter name="sensorId" index="2"/>
      <Parameter name="sensorVal" index ="3"/>
  </Parameters>
 </Dataset_Contexts>
<Sensor_Event>
<Event data ="2010-03-17 16:15:33.415 AD1-B 0.06614
 2010-03-17 16:15:39.278 AD1-B 0.30425
 2010-03-17 16:15:43.259 M18 1.0;
 2010-03-17 16:15:48.135 AD1-B 0.8316
 2010-03-17 16:15:48.887 M18 0.0
 2010-03-17 16:16:00.659 AD1-C 0.891" activity_performed="wash hand"/>
 </Sensor_Event>
</Sensory_Dataset>
```

Meta Data

Sensor Data

Figure 3. A snippet of Simulated Washington State University's CASAS Dataset in SDDL Format

Development Environment

- **Programming Languages:** Java, JSP, JavaScript, XML
- **Application Server:** Apache Tomcat 5.5

Conclusion and Future Works

- The initial prototype of **Persim 1.0** is available download from: ***http://www.icta.ufl.edu/projects_persim.htm***
- We are currently adding space-realism through interactive visualization, which will increase **Persim**'s precision and improve its usability.
- We are also adding a fuzzy logic based verification tool that can determine the degree of similarity between any two SDDL datasets.

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