A Context-aware Middleware for Ambient Intelligence

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Motivation

Background: To reach Ambient Intelligence (AmI), we need the mechanisms that enable sensors and computing devices to provide appropriate data. Furthermore, it is also required to detect the changes of the context. The context-aware middleware platform is an efficient solution.

Objective: Our context aware middleware provides a rapid programming interface for:
1) Collects contextual information from environment objects, sensors (RFID, QR codes, etc.), various interaction devices (camera, etc.), and techniques (gesture recognition, face recognition, etc.).
2) Uses these contexts to provide relevant information and/or services to the user.

Platform Architecture

Sensor data fusion: Collects and transforms the information from the sensors;
Context database: Stores the context data;
Context query engine: Handles the query from the application.
Context KB: Stores the context model based on the ontology based model.
Reasoning Engine: Checks the context consistency and deduces the high-level context. We propose a hybrid reasoning engine base on the ontology reasoning and decision tree reasoning technology.

Bus Shelter Scenario

The reasoning engine
1) Ontology reasoning
Context:
Name: Xu
Time: 7pm
Location: Bus stop
……
Activity: Dinner

2) Decision Tree reasoning