Context-Aware Middleware and Intelligent Agents for Smart Environments

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Welcome to this special issue on the latest research and development in context-aware middleware and intelligent agents for smart environments. Smart environments—smart homes, smart offices, smart schools, and so on—represent advanced communication and computing environments featuring continually evolving everyday objects for nonexpert users. Smart environments have rapidly emerged as an exciting new paradigm that tends to include different research fields such as ubiquitous, pervasive, and grid computing. Such environments aim to provide computing and communication services in a far more convenient, seamless, and enjoyable way. Users will be able to easily, conveniently, and remotely access and control all information and appliances in their environment, using various services resulting from the integrated cooperation of possibly heterogeneous communication-enabled objects. However, realizing the services' advantages will require appropriate middleware support to facilitate context-dependent intelligent agents, thus leveraging cost-effective design and implementation of smart-environment applications.

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The five articles in this special issue focus on recent advances in context-aware middleware, frameworks, and intelligent agents for smart environments. The first article, "Code-Centric RFID System Based on Software Agent Intelligence," by Min Chen and his colleagues, discusses a code-centric RFID system based on an agent intelligence scheme that can potentially achieve faster service responses. This system replaces traditional ID numbers with codes indicating the service that the RFID tag bearer needs for improved system response.

In "Adaptive Body Posture Analysis for Elderly-Falling Detection with Multisensors," Chin-Feng Lai and his colleagues explore the detection of body behavior modes and accidental-falling incidents by using collaborative sensors. Sensors distributed over the body detect position and motion information, which is transmitted via radio transmission to a computer. Under gravity, the direction of force on each limb of the body varies, so the authors consider these characteristics in their analysis of collaborative sensor detection. Because everyone has different living habits, manifestations of poses differ as well. Therefore, this system uses an adaptive adjustment model to more accurately detect an elderly person's body posture.

The next article, "Context-Aware Emotion-Based Model for Group Decision Making," by Goreti Marreiros and her colleagues, presents a context-aware model of emotions that can be used to design intelligent agents endowed with emotional capabilities for simulating group decision-making processes. Their experiments show that agents endowed with emotional awareness achieve agreements more rapidly than those without such awareness.

In "Context-Aware Middleware for Multimedia Services in Heterogeneous Networks," Liang Zhou and his colleagues present an efficient context-aware middleware system for facilitating diverse multimedia services in heterogeneous-network environments. The authors first present their adaptive service-provisioning middleware for handling the heterogeneity of diverse networks and enabling service provisioning to mobile users and professionals anywhere and anytime. Then, they present a context-aware multimedia middleware framework that supports diverse multimedia services, including multimedia content filtering, recommendation, adaptation, aggregation, learning, reasoning, and delivery.

The last article, "Large-Scale Middleware for Ubiquitous Sensor Networks," by Young-Sik Jeong and his colleagues, discusses the design and implementation of a server-side middleware system called Lamses (Large-Scale Middleware for Ubiquitous Sensor Networks). Using novel functionalities, Lamses collects and stores large-scale sensor data in a ubiquitous sensor network. Lamses provides most of the basic functionalities of existing USN middleware. But it also analyzes collected data and status information of events, generates lightweight large-scale sensed data, and provides suitable event processing.

We hope you enjoy reading the great selection of articles in this special issue!

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