IEEE MULTIMEDIA COMMUNICATIONS TECHNICAL COMMITTEE

E-LETTER

Vol. 4, No. 11, December 2009

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IEEE COMMUNICATIONS SOCIETY

Context-aware Multimedia Services in Ambient Intelligent Environments

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With the continuous advances in wireless communications and supporting infrastructure, there has been considerable interest in the development and application of multimedia services in a ubiquitous networking environment for improving people's daily life. On the other hand, advances in low-power wireless technologies and MEMS (Micro Electromechanical System) allow the retrieval of context-aware information in an ambient intelligent environment. An ambient intelligent environment consists of a multitude of interconnected embedded systems which are embedded with computational and networking capabilities which form a ubiquitous, unobtrusive and seamless infrastructure to collect the surrounding contexts of a user. Context-aware information can be characterized by the situation of an entity which can be a person, a place, or a media object that is considered to be relevant to the interaction between the user and an application. Our research will focus on the multimedia service provisioning based on user-centric requirements and situation-aware environmental parameters. However, to support context-aware multimedia services in ubiquitous network environments involves some challenging issues. For example, how to notify a user of the up-to-date situation and the associated services' directives, in order to enable the user to actively request an on-demand multimedia service? Due to the diversity of mobile devices and heterogeneous networking technologies, how to manage context information efficiently over various networking and radio technologies? And the interpretation of context-aware information is also a critical issue. Figure 1 shows a preliminary infrastructure for supporting context-aware multimedia services in ambient intelligent environments.
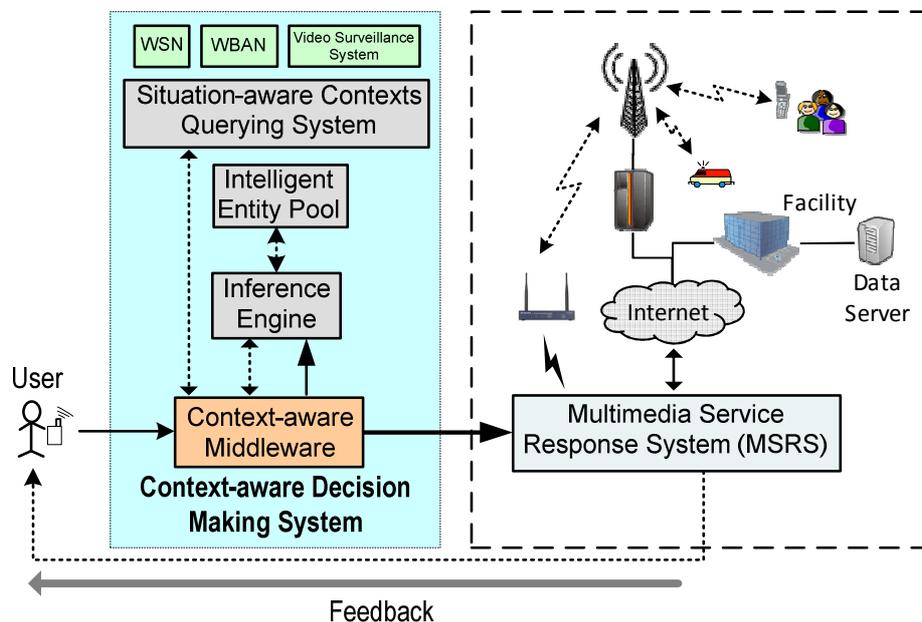
Figure 1 Architecture of Context-aware Multimedia Services in ambient intelligent environments

As shown in Fig. 1, the user sends a situation-aware code to request multimedia services in the infrastructure, where each code is explained into a detailed code expression in the context-aware decision making system. The basic request code can be a single conditional statement or a series of statements of the type

if <situation-aware condition>

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then <multimedia service code (parameter)>
where < situation-aware condition > could be a Boolean concatenation of several context-aware parameters (e.g. "position=(x,y) AND temperature<0"), < multimedia service code> can be any type of multimedia services that the system is capable of. The situation-aware context querying system is used to retrieve the context-aware parameters in ambient intelligent environments, which can be supported by various sensor and surveillance technologies, such as wireless sensor networks, wireless body area networks, positioning system and video surveillance system, etc. For example, in order to get the environmental temperature and humidity, a notification can be sent to the associated sensor network to sense the environment. The interpreted code along with the associated environmental parameters can be input to inference engine to determine the situation and which action(s) should be performed to provide the required service for the object. In order to facilitate inference engine to make a decision intelligently, an intelligence entity (IE) can be retrieved locally or requested from the remote intelligence entity pool system [1]. If the situation is firstly encountered and there is no IE ready for the situation, the intelligence entity pool can dynamically generate an IE to coping with the situation. Then, multimedia service response system (MSRS) provides multimedia services for the user in accordance to the decision made. In order to provide up-to-date multimedia services while the situation is changing, a service summary will be sent to the user, facilitating the user to change or re-write the requested code in an on-demand fashion.

Reference

[1] R. Huang, J. Ma, and Q. Jin, "A Tree-structured Intelligence Entity Pool and its Sharing among Ubiquitous Objects," IEEE CS Proc of the 7th IEEE/IFIP International Conference on Embedded Ubiquitous Computing, pp. 318-325, August 29-31, Vancouver, 2009.

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