W. Yu, J. Lee, K. Han, J. Sohn, M. Jang. A robotic system architecture for interactive smart environment. Gerontechnology 2008;7(2):246. This paper describes a concerted effort to design and implement an interactive smart environment incorporating robotics in our daily environment. Many researchers have proposed a plurality of robotic system architectures emphasizing synergistic combinations of ambient intelligence and networked robotics[1,2]. Although the previous works envisioned an intelligent environment, actual environments are still far less intelligent to be characterized by ambient intelligence, and networked resources are not dynamically configured yet to meet various task specifications. Implementation and management of a precise localization network in the ordinary environment, running a wireless sensor network taking account of the mobility of robots, designing a flexible task manager, and associating a physical environment with a virtual environment for the user interface are some of the reasons that make any smart environment difficult to be realized in the ordinary environment. In this paper, we describe a robotic service architecture that can be applied to a variety of robotic services, taking into account the above technical issues which we encountered when we tried to implement ambient intelligence together with networked robots into the ordinary environment. To make things easier, we have devised a robotic service framework comprising of three conceptual spaces: physical, semantic, and virtual space, which we call ubiquitous robotic space (URS) collectively. Figure 1 illustrates the conceptual structure of the proposed ubiquitous robotic space. The current implementation of the physical space consists of a localization network for assisting robot navigation, a mobility-supporting wireless sensor network, and a URS server that manages the physical components. The semantic space has two functionalities: situation understanding and service generation in accordance with the interpretation of the situation. The virtual space enables the user to interact with the physical space. We have implemented the proposed robotic system architecture for monitoring application in office environments. We found that the proposed robotic system architecture is efficient to develop a robotic service based on IT infrastructure, without which developers may easily get frustrated due to inherent complexity to relate heterogeneous networking technologies and robotic platforms. As it is envisioned that, in the era of aging society, robots and robotic devices will play a key role as providers of labour intensive care, we should consider practical issues related to implementation and management of a smart environment incorporating robotics. The proposed architecture meets the above actual requirements when we build a smart environment into our daily environment. The proposed architecture has been applied to a commercial monitoring solution employing a navigating robot, which may be regarded as evidence of the usefulness of the proposed architecture.

References

1. Baker DI, McKee GT, Schenker PS. IEEE/RSJ International Conference on Intelligent Robots and Systems; 2004; pp 1768-1771

2. Broxvall M, Gritti M, Saffiotti A, Seo B, Cho Y. IEEE International Conference on Robotics and Automation; 2006; pp 212-218

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Address: ETRI, Daejeon, Korea; E: ywp@etri.re.kr

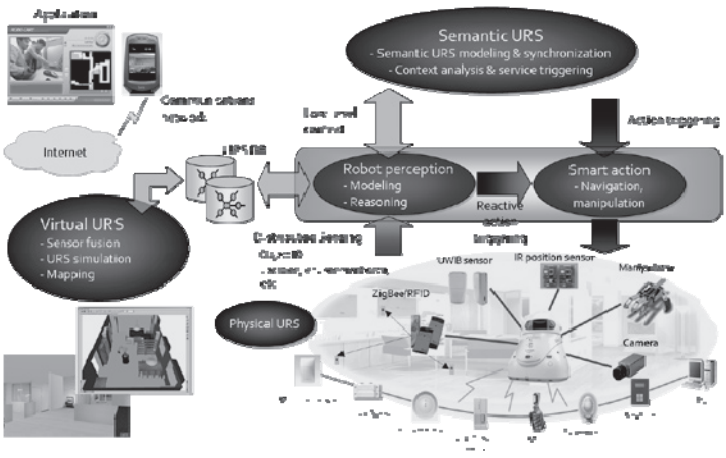

Figure 1 Conceptual structure of a ubiquitous robotic space