Chapter 24
Context-Sensitive Spatial Interaction and Ambient Control

Bernd Krieg-Brückner
Universität Bremen, Germany

Hui Shi
Universität Bremen, Germany

Bernd Gersdorf
Universität Bremen, Germany

Mathias Döhle
Universität Bremen, Germany

Thomas Röfer
Universität Bremen, Germany

ABSTRACT

In this chapter, we first briefly introduce the setting: mobility assistants (the wheelchair Rolland and iWalker) and smart environment control in the Bremen Ambient Assisted Living Lab. In several example scenarios, we then outline our contributions to the state of the art, focussing on spatial knowledge representation, reasoning and spatial interaction (multi-modal, but with special emphasis on natural language dialogue) between three partners: the user, a mobility assistant, and the smart environment.

1 SENIORS IN SPE IN THE BREMEN AMBIENT ASSISTED LIVING LAB

At the Bremen Ambient Assisted Living Lab, BAALL, new technology for Ambient Assisted Living, AAL, will be tested and evaluated for everyday usability. Figure 1 shows the overall layout as it has been realised. The BAALL is aimed at seniors in spe (seniors-to-be), a term referring to people who actively plan their future at a relatively early stage in life (e.g., when choosing an apartment or designing a house for lifelong use) with the expectation to live in this familiar environment for as long as possible. The issue is thus to anticipate the scenarios that may arise from a range of potential age-related physical or cognitive impairments and to plan ways of compensating for these impairments using
technological assistance. Such a home should be designed with a basic infrastructure that allows step-by-step upgrades to be made subsequently with suitable AAL components as required in order to remove the need for major construction or adaptation work. The appeal of the BAALL is that it looks like an entirely normal apartment, albeit a well equipped one; the technological infrastructure is discreet, if visible at all.

The BAALL contains all standard living areas (home office, bedroom, bathroom and dressing area, living and dining room, kitchenette) within a 60m² apartment suitable for two people to live in on a trial basis, constructed according to the design for all principle, modelled as such after the Casa Agevole at the Sta. Lucia research hospital in Rome. One challenge in existing buildings is providing mobility assistance in confined spaces. Only too often so-called barrier-free developments may be suitable for hand-driven wheelchairs but are not necessarily compatible with power-wheelchairs. With respect to doors, the question is not only whether they are wide enough, but whether they can be remotely controlled since switches may be difficult or impossible to reach. This is just one example where we are looking for ways to evaluate the interaction of mobility assistants described in section 2 (and thus their users) with the smart environment outlined in section 3, with particular focus on spatial interaction, see sections 4 and 5.

2 MOBILITY ASSISTANTS

Two mobility assistants have been developed: the intelligent wheelchair Rolland and the intelligent walker iWalker. Both devices provide similar assistance but each for a different target population; see also for a more elaborate description.

2.1 Intelligent Wheelchair Rolland

Rolland is based on the commercial power-wheelchair Xeno, manufactured by the German company Otto Bock Mobility Solutions see Figure 2. We equipped the original wheelchair with two laser range sensors, wheel encoders, and an onboard computer. Various assistants for the wheelchair Rolland are being developed and evaluated to compensate for diminishing physical and cognitive faculties: the safety assistant brakes in time; the driving assistant avoids obstacles and facilitates passing through a door; the navigation assistant guides along a route or drives autonomously; a
19 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the product's webpage:

[www.igi-global.com/chapter/context-sensitive-spatial-interaction-ambient/54672?camid=4v1](www.igi-global.com/chapter/context-sensitive-spatial-interaction-ambient/54672?camid=4v1)

This title is available in InfoSci-Intelligent Technologies, InfoSci-Books, Science, Engineering, and Information Technology, InfoSci-Computer Science and Information Technology, Advances in Computational Intelligence and Robotics, InfoSci-Select, InfoSci-Select, InfoSci-Select. Recommend this product to your librarian:

[www.igi-global.com/e-resources/library-recommendation/?id=16](www.igi-global.com/e-resources/library-recommendation/?id=16)

Related Content

**Context-Aware Service Modeling and Conflicts Discovery Based on Petri Net**
Tao Lu and Dan Zhao (2019). *International Journal of Ambient Computing and Intelligence* (pp. 74-91).
[www.igi-global.com/article/context-aware-service-modeling-and-conflicts-discovery-based-on-petri-net/233819?camid=4v1a](www.igi-global.com/article/context-aware-service-modeling-and-conflicts-discovery-based-on-petri-net/233819?camid=4v1a)

**Kabuki as Multiple Narrative Structures**
Takashi Ogata (2016). *Computational and Cognitive Approaches to Narratology* (pp. 391-422).
[www.igi-global.com/chapter/kabuki-as-multiple-narrative-structures/159636?camid=4v1a](www.igi-global.com/chapter/kabuki-as-multiple-narrative-structures/159636?camid=4v1a)

**Planning Agent for Geriatric Residences**
[www.igi-global.com/chapter/planning-agent-geriatric-residences/10410?camid=4v1a](www.igi-global.com/chapter/planning-agent-geriatric-residences/10410?camid=4v1a)

**Design of Anti-Metallic RFID for Applications in Smart Manufacturing**
Bo Tao, Hu Sun, Jixuan Zhu and Zhouping Yin (2014). *Smart Manufacturing Innovation and Transformation: Interconnection and Intelligence* (pp. 127-158).
[www.igi-global.com/chapter/design-of-anti-metallic-rfid-for-applications-in-smart-manufacturing/102105?camid=4v1a](www.igi-global.com/chapter/design-of-anti-metallic-rfid-for-applications-in-smart-manufacturing/102105?camid=4v1a)