A Cloud-based Robot System for Long-term Interaction: Principles, Implementation, Lessons Learned

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Making the transition to long-term interaction with social-robot systems has been identified as one of the main challenges in human-robot interaction. This article identifies four design principles to address this challenge and applies them in a real-world implementation: cloud-based robot control, a modular design, one common knowledge base for all applications, and hybrid artificial intelligence for decision making and reasoning. The control architecture for this robot includes a common Knowledge-base (ontologies), Data-base, "Hybrid Artificial Brain" (dialogue manager, action selection and explainable AI), Activities Centre (Timeline, Quiz, Break and Sort, Memory, Tip of the Day, . . .), Embodied Conversational Agent (ECA, i.e., robot and avatar), and Dashboards (for authoring and monitoring the interaction). Further, the ECA is integrated with an expandable set of (mobile) health applications. The resulting system is a Personal Assistant for a healthy Lifestyle (PAL), which supports diabetic children with self-management and educates them on health-related issues (48 children, aged 6–14, recruited via hospitals in the Netherlands and in Italy). It is capable of autonomous interaction "in the wild" for prolonged periods of time without the need for a "Wizard-of-Oz" (up

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