

The WoT (Web of Things) interconnects various sort of physical objects deployed in the real world (e.g., sensors, actuators, devices, and networks), to the Web in order to promote global interoperability. These devices enable direct acquisition of the context information, and consequently, it is much feasible to understand the current situations of the real world. In the perspective of contributing in the emergence and development of the WoT, we adopt the notion of “Smart Services” that not only enables remote access to resources and their embedded functions, but offers intelligent services as well as adaptation to the application context. As a result, it provides the user with the means to carry out its tasks automatically and in an autonomous manner (e.g., patient diagnostic, itinerary planning, and adjusting home devices settings).

Our approach to context adaptation is based on the contextual aspect and temporal (or dynamic) aspects. The temporal aspect can be expressed with a hybrid proactive-reactive method. The reactive part of the method can be useful when a smart system needs to make a real-time decision. On the other hand, the proactive part is useful in the sense that we can predict the behaviour of the system in the future and act before critical situations happen. With the technological advances of sensors and the growing availability of intelligent objects, context is becoming an essential source of information from which we can understand the different situations and adapt the different smart services. These are available today on Smartphone’s, smart high ways, smart televisions, smart cities, and smart healthcare devices, with the objective to provide customized functionalities without the need for direct user intervention. The key ingredients to make a service intelligent are context diversity, the necessity of a semantic representation to manage complex situations and the capacity to reason with uncertain data. In this perspective, we propose a framework for intelligent services dealing with various contexts, which proactively predict future situations and reactively respond to real-time situations in order to support decision-making. For semantic representation of context data, we use PR-OWL, which is a probabilistic ontology based on Multi-Entity Bayesian Networks (MEBN). PR-OWL is flexible enough to represent complex, dynamic, and uncertain contexts, which is a key requirement for the development of intelligent web services. In this research, we introduce an architecture for intelligent web service associated with PR-OWL. We demonstrate our contribution with an intelligent plant watering use case to show how our architecture supports proactive and reactive context reasoning in terms of WoT.