Preface

The appeal of being able to ask a question to a mobile internet terminal and receive an answer immediately has been renewed by the broad availability of information on the Web. Ideally, a spoken dialogue system that uses the Web as its knowledge base would be able to answer a broad range of questions. A new generation of natural language dialogue systems is emerging that transforms traditional keyword search engines into semantic answering machines by providing exact and concise answers formulated in natural language instead of today's long lists of document references, which the user has to check by himself for relevant answers.

Daniel Sonntag presents the anatomy of the fully operational SmartWeb system (funded by the German Federal Ministry of Education and Research with grants totaling 14 million euros) that provides not only an open-domain question answering machine but a multimodal web service interface for coherent dialogue, where questions and commands are interpreted according to the context of the previous conversation. One of the key innovations described in this book is the ability of the system to learn how to predict the probability that it can answer a complex user query in a given time interval.

Daniel Sonntag's book presents a question-answering software architecture that exploits two central ideas: the creation of a meta structure for building, exploiting, and maintaining the ontologies necessary for effective question-answering dialogue, and the specification and demonstration of how adaptivity during the interactive question-answering task can improve the exploitation of this new architecture to incrementally improve the quality of the question-answering process. The overall idea of exploiting meta structures for knowledge management is at least as old as the ideas from the formal philoso-

phy literature on self-reference and higher order logics, so the contribution here is not focused on any new tricky reinterpretation or formal maneuvering. In fact, the key contribution is the construction of an explicit architecture that supports algorithmic processing at the meta level, in order to exploit knowledge about knowledge, e.g., ontological knowledge and structure of dialogue, to improve both the effectiveness (good answers) and efficiency (faster answers) of the question-answering process.

All this is presented in the context of a concrete implementation as a component of the large SmartWeb system, which not only explicitly articulates the scaffolding of the meta architecture, but demonstrates a variety of modern techniques as the basis for implementation: for example, the definition and construction of a dialogue management system based on the application of constraints. And finally, this dialogue architecture supports the deployment of an adaptive process that, since explicit reasoning about the structure of a dialogue is possible, can dynamically improve performance by amalgamating the object-level dialogue histories. The summary of these contributions is captured within a detailed evaluation methodology applied to the question-answering implementation, which provides a kind of case-study guide to the deployment of the overall architecture, as well as a demonstration of the abstract value of the meta representation and adaptivity methods.

Daniel Sonntag's work within the SmartWeb project has laid important foundations for Theseus's efforts towards semantic web technologies for the Web 3.0. Theseus is the German flagship project on the Internet of Services, where the user can delegate complex tasks to dynamically composed semantic web services by utilizing multimodal interaction combining speech and multi-touch input on advanced smartphones.

In summary, Daniel Sonntag provides a detailed and careful analysis of the background and application of two very powerful and potentially complex ideas (meta data/reasoning, adaptivity/learning) within a framework that helps not only examine the theoretical trade-offs in their application, but demonstrates how their value is obtained in a working system. It is hard to ask for more than that.

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