

## RASCALLI

### Responsive Artificial Situated Cognitive Agents Living and Learning on the Internet

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The project RASCALLI aims at the development and implementation of cognitively enhanced artificial companions (Rascalli agents) that adapt to the user's interests and preferences and accordingly support the user in finding information from the Internet and other domain-specific knowledge resources such as relational DBs and RDF data stores. To do so, we combine natural language processing, question answering, web-based information extraction, semantic web technology and interaction driven profiling with cognitive modelling, especially with memory structuring and reasoning, making use of insights from the cognitive model DUAL [1].

In the overall architecture of a Rascalli agent, we distinguish between mind, body and environment aspects. The environment is constituted by the user (each Rascalli agent has a single user), some accessible parts of the Internet (accessibility depends on the links a Rascalli agent knows and the processing tools it has at its disposal), domain-specific knowledge bases and other Rascalli agents. Body stands for a number of computational tools that determine the perception and action capabilities of an agent. The body tools mediate between the mind and the environment.

The mind – implemented as the DUAL/AMBR cognitive architecture – includes a long term memory (LTM) where general and episodic knowledge is stored, and a working memory (WM) constituted by the active part of LTM, perceptual input and goals. The DUAL mind operates only on represented knowledge and has only a mediated connection to the body and the environment. Thus it contains a partial, selected representation of the environment at the abstract conceptual level and experiential memories related to the specific episode like organization of the interaction of a Rascalli agent with its environment, see [2] for more details.

Apart from the internal knowledge sources, i.e., DUAL's LTM and WM, there are the following channels through which the Rascalli agents gain their (external) knowledge:

1. Via specialised tools, Rascalli agents have access to domain-specific knowledge bases. In the current application these are three music-related data bases, the one comprising approx. 60 000 tracks from 6 000 artists, the other one is a collection of similar artists, and the third one provides information about the personal background of individual artists, such as family relations, pets, etc. While the former two have been provided to the RASCALLI project from the outside, for the latter a seed-based relation extraction mechanism has been developed in the RASCALLI project in order to extract relevant information from web documents, [3]. The different knowledge bases have been aggregated within an RDF triple store comprising about 30 million explicit RDF(S)/OWL statements, and a time-efficient reasoning mechanism is in place.

2. Via different user interfaces, Rascalli agents gather information about interests and preferences of their users. This is done by logging user actions and by aggregating the stored user actions to profiles which on the one hand constitute a major part of the mind set of a Rascalli agent, and which on the other hand are used to identify (dis-)similar Rascalli agents. The latter is important for the Rascalli agent to identify other Rascalli agents which may be helpful in fulfilling one's own tasks, and thus should be contacted. We distinguish the following user interfaces: a) An Embodied Conversational Agent interface, where the Rascalli agent is realized as a 3D human-like cartoon character capable of displaying multimodal behaviour. Through this interface the user may pose questions and assess the answers given by the Rascalli agent. b) Two domain-specific web applications that allow the user to browse the domain-specific knowledge in an intuitive way. In particular, the user may search for artists and tracks, listen to the music, indicate her liking or disliking of an artist or track, and also access background information about individual artists. c) Each Rascalli agent has its own web page where the user amongst others may provide her agent with links (URLs, RSS-feeds) to information sources which she considers to be of relevance for the agent.

So far, the efforts of integrating the external knowledge and the tools with a DUAL mind have led a) on the DUAL side to the development of new mechanisms, see Kostadinov et al. (2008) subsections 3.2-6; b) to the implementation of a weight mechanism on top of RDF graphs in order to model spreading activation on the RDF data store, and thus make available some DUAL functionality for handling large data sources; c) the implementation of a platform [4] which supports the creation of different Rascalli agents from a pool of mind and tool components, and allows the different agents to run in parallel on

the same platform instance, thus supporting exploratory work on various aspects of cognitively enhanced artificial companions.

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## **Literature**

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