Collaborative Agent-Based Knowledge Support for Empirical and Knowledge-Intense Processes

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Abstract. Independent from specific application domains, similar requirements can be identified regarding information needs during daily work. For coping with generality on the one hand and domain specificity on the other hand the Collaborative Agent-based Knowledge Engine CAKE is currently developed that combines agent and workflow technology in an innovative way. Agent technology is used for integrating various services, whereas workflow technology is used for coordinating collaboration among agents.

1 Collaborative Agent-Based Knowledge Engine (CAKE)

Motivated by requirements derived from different application domains like fire services, agile software engineering, medicine, and geographical information systems a domain-independent system called *Collaborative Agent-based Knowledge Engine (CAKE)* [1] is currently developed aiming at supporting empirical and knowledge-intense processes. *Empirical processes* [2] are mostly unpredictable, unrepeatable, and are subject to change as they are enacted. *Knowledge-intense processes* like identifying, creating, and sharing of knowledge require sophisticated knowledge management strategies.

For enabling domain-specific applications CAKE provides the possibility to expand a general data and process model individually. It makes use of workflow technology for facilitating knowledge intensive tasks required for context-based information support and agent technology for integration of various services.

CAKE requires a lot of flexiblity, e.g. for coping with changes during runtime on behalf of end-users. In particular, context-based information has to be adapted to changing situations of system users. Conventional software reaches the end of its capabilities here, requiring mostly predetermined paths. CAKE overcomes this challenge with the provision of *agile workflows*. Agile workflows offer the options of either modelling single tasks in detail or modelling abstractly, supporting late modelling as well. Technically, this kind of workflows is supported by *Case Based Reasoning (CBR)* [3] search technology: When proceeding to an abstractly planned task the workflow engine allows the corresponding user to retrieve a suitable workflow definition in a special workflow database. In that scope, ad-hoc planning is facilitated during runtime.

Besides widening the flexibility given by agile and knowledge-intensive workflows there is also a challenge to incorporate business-relevant information in form of integration of retrieval engines in order to access distributed knowledge sources. While access to distributed databases and retrieval engines is necessary, incompatibility is often a drawback. For coping with compatibilities CAKE also includes an *agent framework* that enables and mediates arbitrary access and communication to different agent-based services. From a conceptual point of view, CAKE does not only distinguish between *information agents* that provide knowledge and *user agents* that request knowledge, but knows a third kind, namely *collaboration agents* that manage the collaboration between other agents based on *collaboration patterns*. These patterns are technically described as workflow definitions and organise the agents' collaboration. In contrast to conventional agent-based approaches that provide agents to get in contact to other agents for pursuing their goals, CAKE makes use of collaboration patterns to exploit combinations of various information sources and best practices. Collaboration patterns encompass domain-specific and domain-independent search strategies with respect to potential types of agent collaborations. For enabling a convenient usage CAKE hides these strategies from users without the need of specification which agent users intend to request. In order to realise the concepts described above CAKE makes use of agent technology for combining services provided by the workflow engine manager and external services, e.g. retrieval engines. The flexibility of agile workflows is carried forward to the agent framework by providing a dynamic set of agents whereas agents are able to enter and leave the CAKE *agent society* based on the concept of network agent society as proposed by Dignum et al. [4].

In summary, CAKE consolidates both technologies basically: agent technology for providing the integration of various services and external technologies, workflow technology for both coordinating collaboration among agents and supporting context-based information. Particularly, the presented collaboration patterns facilitate the management of agent collaborations based on best practices or on configurable patterns. Furthermore, these patterns enable routing facilities for transferring knowledge within organisations which means high universality to CAKE.

References

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