QALL-ME
Question Answering Learning technologies in a multiLingual and Multimodal Environment

FP6 IST-033860

http://qallme.itc.it/

QALL-ME
EXECUTIVE SUMMARY

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Abstract

This document presents general information about the EC-funded project QALL-ME. It is targeted to a general audience and it is aimed at explaining the main purposes of the project. We provide motivations for the project, introduce Question Answering (QA) as the proposed backbone technology and sketch the potential for the application of QA in the context of mobile devices.

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Summary

1. Project Details

Acronym:	QALL-ME
Full title:	Question Answering Learning technologies in a multiLingual and Multimodal Environment
Reference:	FP6 IST-033860
Contract Type:	Specific Targeted Research Project
Start date:	October 1st, 2006
Duration:	36 months
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2. The Project

"Where can I eat paella this evening?". Answering this kind of question has recently become a concrete business opportunity, with a large array of services ranging from traditional customer care to more and more articulated web-based assistance services, being offered. Nowadays, voice portals (i.e. services providing speech-enabled access to web-based information) provide users with a broad variety of information (timetables, traffic circulation, weather forecasts, cultural events, etc.), and are experiencing an exponential increment in popularity. The number of calls received by the Italian 892424 service (www.seat.it), for instance, has rapidly grown from 14 million in 2003, to more than 17 million in 2004 and almost to 19 million in 2005. Most of the time, the common factor of the sought after information is its dynamism: the world rapidly changes over time, users ask (and pay) for completely fresh information. Gathering and maintaining all the relevant information, and providing users with complete and updated contents are undoubtedly a bottleneck and an expensive part of the work for voice portals and web-based information services. Improving the overall process can mean the difference between their success and failure.

3. Technology

Open Domain Question Answering (QA) is the core technology behind the project. QA takes a question in natural language and returns an answer from a collection of information sources (e.g. documents, databases). In contrast to the technologies behind today's web search engines like Google and Yahoo, the goal of QA is not to return a document which contains the answer, as in the case of information retrieval, but the actual sequence of words which constitutes the answer (see for example the LCC QA Web demo at http://www.languagecomputer.com/, and the AnswerBus system at www.answerbus.com/). In addition, questions are formulated as a free natural language input as opposed to a keyword query, and are not limited to fixed templates,

as in Information Extraction. As a technology, QA is now mature enough to move from addressing isolated, factoid questions to more natural and knowledge intensive interactions. As for the applicative perspectives, QA is these days recognized as one of the killer applications for the Semantic Web, as both language technologies and knowledge and reasoning intensive processing are greatly required.

4. Research objectives

The general objective of the project is to establish a *shared infrastructure for multilingual and multimodal open domain Question Answering for mobile phones*. The scientific and technological objectives pursue three crucial directions: multilingual open domain QA, user-driven and context-aware QA, and Machine Learning technologies for QA. The specific research objectives of the project include state-of-the art advancements in the complexity of the questions handled by the system (e.g. how questions); the development of a web-based architecture for cross-language QA (i.e. question in one language, answer in a different language); the realization of real time QA systems for concrete applications; the integration of the temporal and spatial context both for question interpretation and for answer extraction; the development of a robust framework for applying minimally supervised machine learning algorithms to QA tasks; and the integration of mature technologies for automatic speech recognition within the open domain question answering framework.

5. Question Answering on mobile devices

The potential of open domain QA will be experimented with and evaluated in the context of *mobile applications for information seeking*, a multimodal scenario which includes spontaneous speech as input and the integration of textual answers with maps, images, and short videos as output. The selected domain is represented by local events in a town, usually available either through specialized web sites or local newspapers and publications.

The purpose is to demonstrate the viability of the proposed QA solutions through their integration in a concrete application scenario. Such integration will follow four principal directions, related to the exploitation of Semantic Web and Multimodal Interfaces technologies for QA. More precisely we intend to achieve 4 integration objectives related to Web services for QA, Wrapper technology, speech-enabled QA, and multimodal QA.

Distributed software architecture will be studied and designed in order both to optimize the communications among the software modules, and to achieve a suitable computational balance among server and client devices. Development tools (e.g. Application Programming Interfaces), possibly compliant with the recommendations of International Organizations, such as W3C, will also be developed.

6. Market potential

Question Answering is a fast growing area of research with tremendous commercial potential. The processing and analysis of natural language questions in Internet-based environments on the basis of shared infrastructure for QA applications that combine advanced multilingual Language Technology will enable user-oriented natural language retrieval, evaluation and navigation of information. The QA functionalities, especially those methods that support interactive communication with users, will ease

its integration into mobile communication applications, for which the primary computer interaction is driven by natural language.
There is enormous market potential for achievements in the directions pursued in the QALL-ME project, as the exponential growth of requests to call centres implies. High precision QA services will dramatically reduce the time required of human personnel to provide answers. As a consequence, the ability to automatically address even a small proportion of such information traffic will offer new revenue opportunities for those companies working in telecommunications and in the web-based information services scenario.

7. Work plan

QALL-ME aims at developing a shared infrastructure for multilingual and multimodal QA, which will include all the basic components that are required for providing the following capabilities:

- Automatically gathering, storing, and updating relevant information extracted from different (structured and non-structured) source data types;
- Dealing with complex multilingual questions, anchored to a spatial and temporal context;
- Dealing with both textual and spontaneous speech access modalities;
- Presenting users with correct, complete, and concise answers extracted from different multilingual source data types;
- Combining different output presentation formats (*e.g.* texts, maps, images).

Figure 1 shows the main modules of the distributed architecture which makes up the backbone of the QALL-ME service.

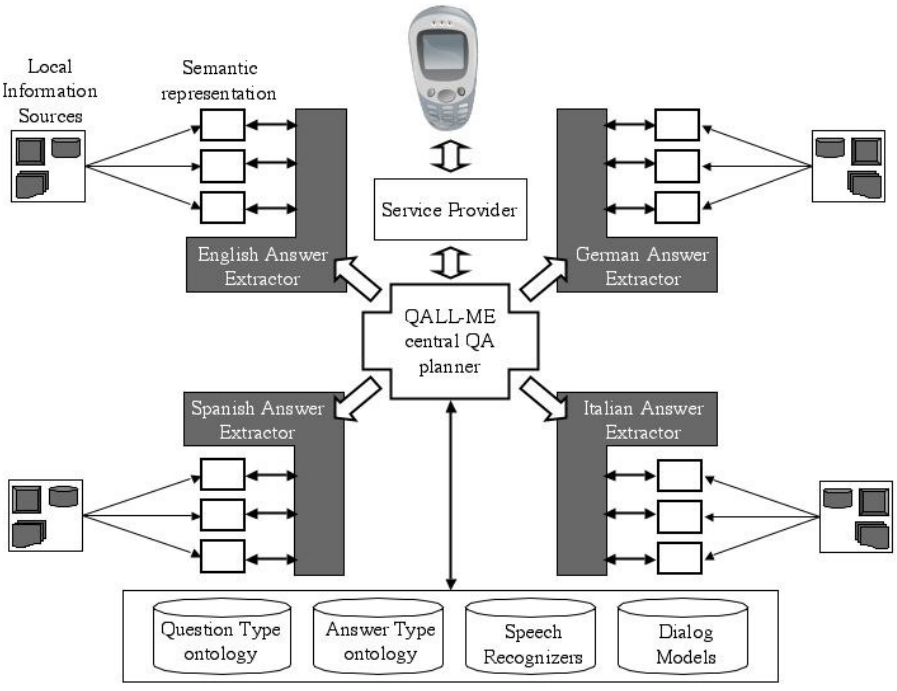

Figure 1: The QALL-ME distributed architecture.

All modules will be implemented as Web Services, according to standard languages for the service definitions on the Web. The Central QA Planner is a Multilingual Question Interpretation component which receives a question as input, processes the question in its source language, classifies the question, and, according to the context parameters of the search query, routes the search for the answer to a local Answer Extractor. Answer extraction is performed on different kinds of semantic representations, depending on the kind of source data from which they have originated (e.g. if the source is pure text, the semantic representation will be an XML annotated document; if the source is a web site, the semantic representation will be a database built up by a wrapper). Answers are then sent back to the central planner, which proposes the best presentation media.
The project lasts 36 months and is organized into eleven work packages:

WP0: Project Management
WP1: User Requirements
WP2: Design of the System Architecture
WP3: Multilingual Question Interpretation
WP4: Data Access
WP5: Multilingual Answer Extraction
WP6: Multimodal Interaction
WP7: System Integration
WP8: Showcase
WP9: Evaluation
WP10: Dissemination and Exploitation

The project is divided into *three development & test cycles*, each including a phase of user and functional specifications (WP1 and WP2), a development phase (WP3, WP4, WP5, WP6, WP7) followed by on-field experiments (WP8) and by an evaluation phase (WP9). The ends of the three cycles (i.e. month 12, month 24 and month 36) correspond to the three main milestones of the project, showing the state of advancement of the QALL-ME framework.

8. The QALL-ME consortium

The QALL-ME Consortium is composed of seven institutions from four member countries (Italy, United Kingdom, Spain and Germany). Four of the participants are academic institutions (ITC-irst, University of Wolverhampton, University of Alicante, and DFKI), while the others are industrial partners (Comdata, Ubiest, and Waycom). In addition, the Consortium has already obtained strong expressions of interest from a number of small web companies, which are willing to provide their data for the QALL-ME show case.

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