ITEA 2

INFORMATION TECHNOLOGY FOR EUROPEAN ADVANCEMENT

easy INTERACTIONS

INNOVATION REPORT

New-generation interface technology offers natural approach to human-system interaction

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The ITEA2 EASY Interactions project has developed more natural ways of interacting with complex systems to provide an intelligent and semantic access to information and services as demonstrated across a wide range of domains. By integrating cutting-edge natural-language processing techniques and machine learning with domain ontology, it is now possible to carry out content and information mining at the semantic – or meaning – level. Existing user modelling methods were extended by specific methodologies for the semantic analysis of content.

Human-system interactivity has long relied on devices such as the computer mouse, keyboards, joysticks and display screens. But such use has become more difficult and time consuming in many domains as these tools are no longer able to cope with the growing complexity of today's information and communications technology (ICT) devices.

It is therefore necessary to move from a human-computer interaction paradigm to more pervasive human-system and human-environment interaction paradigms – a major challenge for systems developers.

Personalised human-system interaction

EASY Interactions set out to develop and introduce enhanced and personalised human-system interactivity in application domains such as: the home; mobile applications; transportation; factory and construction sectors; and public-safety applications.

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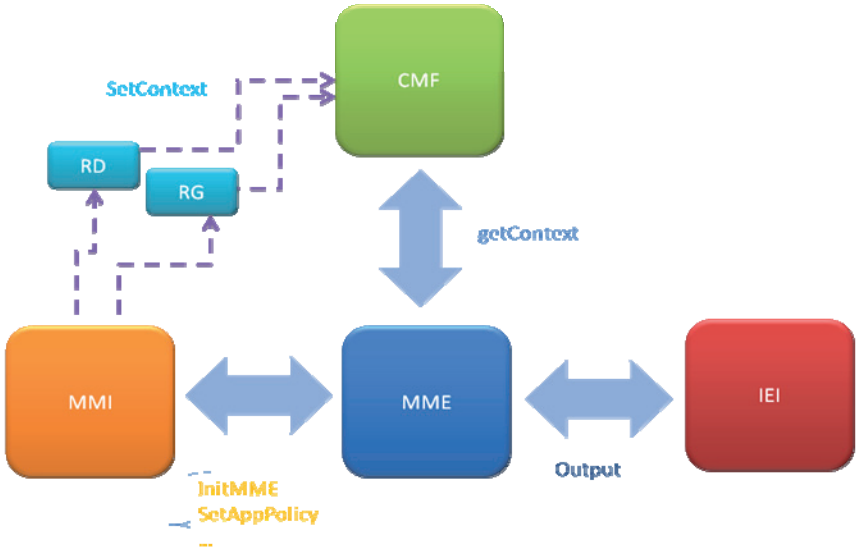
The main goal was to develop more natural ways of interacting with systems using new interaction technologies, with a particular focus on:

- Gesture : recognition based on 3D cameras and inertial sensors
- Speech : voice recognition and synthesis, based on natural-language processing and understanding;
- Vision : 3D rendering and human localisation,

The project focused on how to adapt interactions to context and behaviour of users and the situation. For example, there would be no point in providing speech synthesis in a noisy environment; using gestures and voice in a combined way improves the solution robustness for non-controlled environments

This involved taking into account all sources of context as soon as a sensor exists, as well learning user behaviour and adapting services and user interfaces.

EASY Interactions has developed a number of sub-systems.



These sub-systems are :

- Human System Interaction components. The new generations of user interfaces involved are voice recognition, gesture recognition, vision-based localisation and multimodality between voice and gesture recognition.
- Context Management Framework (CMF) deals with the context sources, recapping and processing this data and providing context information that will facilitate a more accurate multimodal decision.
- Multimodal Engine (MME) is a platform which is able to provide to the final user a better way to interact with applications taking into account the context, the user and the application information

These components were used in 6 demonstrators, covering professional and general public applications.

Involving a broad industrial partnership

The objective of establishing a multimodal framework applicable to several domains required a broad industrial partnership. And, as some of the technology – such as speech recognition – is linked to language, it needed to be proved across several languages. A European consortium offered the best way of meeting these requirements – and also enabled sharing of information across domains.

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ITEA was seen as the best framework for such a project with its technology and industrial orientation.

The project was started in October 2007. EADS Defense and Security took over the lead and involved partners with the necessary technologies –as Robotiker, which offered voice and video gesture solutions, CEA-LIST with video-based localization expertise, Telefonica and VECSYS as speech-processing specialists, CREATIV IT with mobile applications expertise, PHILIPS Innovation Labs 3D display solutions , and Alcatel-Lucent Bell Labs on context-management system.

Other partners, SISTEPLANT and AIDICO were interested in using the results for factory and construction domain applications, EADS DS for public safety domain, MARTEC for transport domain, ALCATEL LUCENT, PHILIPS, TID for home domain.

Usability studies were carried out with the help of the University of Jyväskylä and IDEAN Research, which specialises in user experience and usability research and consulting.

EASY Interactions developed the multimodal engine required from scratch based on several user cases. It was designed to be non dependent of the programming language, based on W3C : EMMA and SOAP interfaces. The result is open source and hosted on the web for all the community. The context-management framework developed in the project was connected with the multimodal engine and the interaction components .

New technologies emerging from the project included:

- The development of geolocalisation technology based on image processing;
- The improvement of speech-recognition systems to handle tougher conditions such as noisy environments, to provide a technology that works for all rather than having to tailor systems for each individual application; and
- The improvement of 3D machine vision algorithms for better performance and robustness

Demonstrating across several domains

A series of applications were developed and demonstrated in several domains:

1. ***Pubic safety*** – allowing intuitive and friendly incident report generation to increase fire-fighter efficiency by filing situation reports verbally using natural speech recognition. A fireman can describe the scene while in the field. Other information, such as location, point of interest are provided by using vision, voice and touch interactions.
2. ***Construction*** – enabling multimodal crane management with an advance interface to command a tower crane by means of gestures and voice, simplifying control, and integrating safety and security features such as safety helmet detection.
3. ***Home applications and entertainment*** – improving interaction with system as well as functionality using a 3DTV demonstrator that offered a new way of controlling video and picture content on screen.
4. ***Intelligent browsing of multimedia content*** using audio indexing to facilitate access to such content, and providing a web tool allowing the user to access favourite multimedia contents anywhere and at any time, using voice commands.
5. ***Industry*** – enabling operators to report faults using speech-recognition technology on the machine without having to move to a computer to enter the details.
6. ***Transport*** – offering new services on an embedded and near real time basis for commuters and travellers, such as timetable consultation, trip organisation, ticket booking and connection between different public-transport networks

The 3DTV application is already being commercialised but the other applications are more mid term.

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Supporting wider dissemination?

An important goal was to accelerate the introduction and widespread use of new-generation user interfaces. EASY Interactions set up an open-source multimodal engine that other projects and companies can use. This engine is ideal in heterogeneous environments and interacting with it is simple, fast and secure. The public state-of-the-art technologies can also be used across industry and will speed up dissemination of these technologies in many domains.

The involvement of small and large enterprises during all the phases of the project will guarantee the penetration of knowledge into industry and the spread of the EASY Interactions technology throughout Europe.

More information: www.itea2-easy-interactions.org