



PROJECT RESULTS

Enabling adaptive multimodal interfaces

Reducing complex user-interface design cost using a model-based approach



EMODE showed that it is possible to manage multimodal interaction for complex business systems at low cost. Following a model-based design approach, EMODE demonstrated performances three to four times superior to the usual productivity, maintenance and evolution ones thanks to an automation of the development. In case of porting, only specific code has to be redeveloped. EMODE also proved that such sorts of devices and modalities are profitable. Gains are in terms of efficiency, effectiveness and satisfaction. Furthermore, models used for design are reused to manage the interaction, ensuring coherence between user requirements, designers' developments and final interaction.

State-of-the-art adaptive multimodal interfaces providing the user with new means of interaction, such as voice or gesture, and dynamically adapting to user needs, have not yet reached the professional market. User interfaces (UIs) are designed and computed once and for all without any provision for adaptation at runtime. As a result, UIs remains the weak point of many systems, the problem of human-computer interaction not being considered as a central issue regarding the design and

development of complex systems.

We use many different devices everyday – telephones, smart phones, personal digital assistants (PDA), touch screens, personal computers (PCs) with webcams and microphones. We interact with these devices using classical Windows icon menu pointers (WIMPs), gesture recognition such as with PDAs or vocal-command systems – for example voice mail or call menus. We use them at home or in large public application such as information systems.

More restrictions in business

On the other hand, UIs for complex business system are far more restricted. The classical WIMP interaction remains the standard even if it leads to non-natural or long sequences of interactions to access to some functionalities. In the worst cases, operators suffer from a cognitive overload in critical situations: too much information, too many actions to perform or no way to access additional information without losing the context.

Industrial systems providers argue that introducing such modalities and adaptability functionalities are too costly with respect to benefits, usability and reusability or global return on investment (RoI). For

EMODE (ITEA 04046)



Partners

- BASF
- Bilbomática
- CEA
- DaimlerChrysler
- Darmstadt University of Technology
- Dresden University of Technology
- ENST Bretagne
- France Telecom R&D
- Fraunhofer FOKUS
- IKV++ Technologies
- IntuiLab
- Joseph Fourier University Lyria
- Philips Research
- Pierre & Marie Curie University
- Robotiker
- SAP
- Thales Research & Technology
- W3C/ERCIM

Countries involved

- France
- Germany
- The Netherlands
- Spain

Start of the project

June 2005

End of the project

December 2007



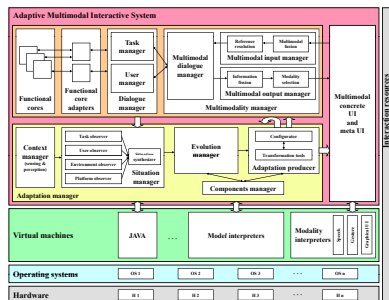
PROJECT RESULTS

example, a grammar for voice-recognition and command systems is about 10 Mb of text. Such an investment is huge for a system and even worse if it cannot be adapted or reused.

Model-driven approach

EMODE demonstrated that a model-driven approach for adaptive multimodal interactive systems is possible and proved a positive return on investment of such approach. The RoI results from the introduction of new modalities and reusability of models thanks to:

- Increased productivity – i.e. time saving in design and development phases of up to three or four times;
- Easier adaptation to new systems thanks to a new interaction architecture;
- Easier adaptation to new customers specific needs; and
- Better maintainability thanks to model manipulation, automatic generation and readability.



Runtime architecture

The second innovation of EMODE was the use of design models during the run-time phase. The use of these models provides coherence between user requirements, expressed in the models during the design phase, and the interactive systems – classical human-machine interface (HMI) plus new interactive modalities. At the end of the design process, the interaction – i.e. the use of modalities to achieve the user’s task – is the real front of the user needs and totally fits without any lack or error thanks to the EMODE approach and models.

EMODE new interaction architecture and model-based approach led to a natural multimodal interaction without users’ frustrations.

Demonstrated in four domains

The approach was evaluated and demonstrated in four domains with different kinds of users:

1. Philips showed the benefit of EMODE’s approach in home-entertainment systems;
2. BASF-AG demonstrated the design and run-time approaches in the context of mobile plant maintenance;
3. Daimler used it for an in-car advanced navigation system; and
4. THALES proved its usability and efficiency in the complex and constrained domain of maritime surveillance.

ITEA 2 Office

High Tech Campus 69 - 3
5656 AG Eindhoven
The Netherlands
Tel : +31 88 003 6136
Fax : +31 88 003 6130
Email : itea2@itea2.org
Web : www.itea2.org

ITEA - Information Technology for European Advancement - is an eight-year strategic pan-European programme for pre-competitive research and development in embedded and distributed software. Our work has major impact on government, academia and business.

ITEA was established in 1999 as a EUREKA strategic cluster programme. We support coordinated national funding submissions, providing the link between those who provide finance, technology and software engineering. We issue annual Calls for Projects, evaluate projects, and help bring research partners together. We are a prominent player in European software development with some 10,000 person-years of R&D invested in the programme so far.

ITEA-labelled projects build crucial middleware and prepare standards, laying the foundations for the next generation of products, systems, appliances and services. Our projects are industry-driven initiatives, involving complementary R&D from at least two companies in two countries. Our programme is open to partners from large industrial companies, small and medium-sized enterprises (SMEs) as well as public research institutes and universities.

Major project outcomes

Dissemination

- 4 book chapters
- 42 publications (journals, conferences and workshops)
- 6 thesis
- Industrial dissemination of EMODE’s results (MD Day’07, industrial contacts)

Exploitation

- EMODE’s approach and tools have been incorporated into partners portfolio (QVT Engine, Leornado®, Intuikit®, ...)
- One trademark: THACADIA® (THALES Collaborative Activity DIAGram)

Standardisation

- CE-HTML (Consumer Electronics-HTML standard)
- Contribution to the W3C web API group and OMG’s QVT Relational Standard
- EMODE’s thematic included into W3C working groups or incubators

