



## PROJECT RESULTS

# Context-Aware Environments

### for Ambient Services



A scenario for Ambient Intelligence at home

**Ambient Intelligence is an exciting new concept in information technology, in which people are empowered through a digital environment that is aware of their presence and context. The environment is sensitive, adaptive and responsive to their needs, habits, gestures and emotions. The issues posed by ambient intelligence require multi-disciplinary and multi-cultural research, with input from computer science, electrical engineering, interaction design and behavioural studies.**

By adding adaptive user-system interaction methods, based on new insights into the way people like to interact with computing devices (social user interfaces), better digital environments can be created. These context-aware systems combine ubiquitous information, communication, and entertainment with enhanced personalisation, natural interaction and intelligence.

### Architectures and methods for context-aware environments

Ambient intelligent environments support ubiquity, awareness, intelligence, and natural interaction. Ubiquity means being surrounded by numerous interconnected embedded systems, which are *invisible* (in the background). Awareness means that the system can locate and recognise objects, devices and people, and understand their intentions. Intelligence means the digital environment is able to analyse the context, adapt itself to users, learn from their behaviour, and eventually recognise and, perhaps, even show emotion. Natural interaction refers to



Examples of context aware AMBIENCE environments

### Ubiquitous systems with natural interaction

Ambient Intelligence merges two important trends: 'ubiquitous computing' and 'social user interfaces'. It builds on advanced networking technologies that enable robust, *ad-hoc* networks to be formed by a broad range of mobile devices and other objects (ubiquitous/pervasive computing).

providing functions, such as speech and gesture recognition, as well as speech synthesis.

The AMBIENCE project jointly created networked Context Aware Environments. It generated concepts and developed architectures, methods and tools. To validate the concepts the required technologies were integrated into operational systems,

## AMBIENCE (ITEA 00003)

### Partners

- Barco
- CCC
- ENST
- Epictoid
- France Telecom
- Italdesign - Giugiaro
- Katholieke Universiteit Leuven
- Knowledge S.A.
- Memodata
- NetHawk
- Philips Research (NL + UK)
- Telisma
- Thales Communications
- Thomson multimedia
- University of Amsterdam
- University of Paris 6
- University of Vienna
- Vitec multimedia
- VTT Electronics

### Countries involved

- Austria
- Belgium
- Finland
- France
- Greece
- Italy
- The Netherlands
- United Kingdom

### Start of the project

July 2001

### End of the project

October 2003



## PROJECT RESULTS

and were demonstrated on systems for home, office and public building environments.

### Demonstration of challenging results

Challenging results were achieved in the area of ubiquity, context awareness, intelligence and natural interaction. The project achievements were demonstrated in two demonstrators in each operating area, such as the mobile, professional and the home domains.

The two **mobile domain** demonstrators were called "Guide to a Meeting" and "Indoor Navigation". The first demonstrator was created at the Philips Research Lab in Eindhoven, the Netherlands. A location-aware conference delegate support system, it comprised a robust and modular integrated server that used an architecture inspired from the web services model, biometrics access control, wireless connectivity using mobile robot routers to optimise Quality of Service (QoS) and a ZigBee-based Radio Frequency (RF) localisation system. The second demonstrator, developed at the France telecom R&D site in Grenoble, integrates a location-technology-independent location-management system together with a Personal Digital Assistant (PDA)-based indoor navigation application that includes a Scalable Vector Graphics (SVG) player for interactive scalable display of visual navigation data.

The two demonstrators for the **professional domain** were called "Intelligent Meeting Room" and "Smart Design Studio". The first acts as a joint demonstrator; it was developed at the Barco site and connected to a remote office of KU Leuven using a robot (MakTub) mediated link. The other demonstrator was developed at the design studio of Italdesign-Giugiaro and demonstrated a highly interactive design approach for cars through use of a broad range of interaction modes, including speech, gesture, tangible objects and a dedicated digital pen for the wall-sized display used.

Two demonstrators were also created for the **home domain**. These were named "Ambient Intelligent Home" and "Multimedia Browser". The first one was developed at the Philips' HomeLab in Eindhoven, the Netherlands and includes the robotic assistant "Lino". A range of entertainment, communication and personal health applications have been demonstrated, and evaluated in part. The second demonstrator was developed at the Thomson site in Rennes, France. In this, a speech recognition module and a virtual presenter were integrated successfully in a 'movie-recommender' interface, which, as well as content navigation and recommendation modules, used textual feature extraction and vision-based user recognition.

All demonstrators have been recorded on video.

### Major project outcomes

#### Dissemination

- 60 papers presented at international conferences and published in books and journals
- One open workshop and one international conference (EUSAI)
- 10 radio & TV broadcasts and magazine articles

#### Exploitation

- Three potential new products
- One potential new commercial service
- Six new systems for internal use (further research)

#### Standardisation

- Three contributions to three standardisation bodies (Bluetooth, IEEE, OSGi)

### ITEA Office

Eindhoven University of Technology Campus  
Laplace Building 0.04  
PO box 513  
5600 MB Eindhoven  
The Netherlands

Tel : +31 40 247 5590  
Fax : +31 40 247 5595  
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 8,000 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.



Σ! 2023