

REFLECT AT A GLANCE

Objective

Development of pervasive-adaptive environments which monitor, diagnose and respond appropriately to the cognitive, emotional and physical states of the user.

Application

The application area of reflective technology is wide – it can be used in any situation where computer control is deployed, e.g.:

- Automotive: reflective vehicle, reflective road
- Communication: reflective phone
- Education: reflective learning
- Entertainment: reflective player, reflective computer game
- Urban infrastructure: reflective advertisement display, reflective guide
- Ambient Assisted Living: reflective home for elderly people, reflective kindergarten

Duration: 1/2008–12/2010

<http://reflect.first.fraunhofer.de>

CONTACT:

PROJECT COORDINATION:
FRAUNHOFER INSTITUTE FOR COMPUTER
ARCHITECTURE AND SOFTWARE TECHNOLOGY
PROF. DR. NIKOLA SERBEDZIJA

KEKULÉSTR. 7, 12489 BERLIN
PHONE: +49 (0)30 6392-1873
NIKOLA.SERBEDZIJA@FIRST.FRAUNHOFER.DE

PARTNERS:

- FERRARI S.P.A, MARANELLO
- PHILIPS RESEARCH, EINDHOVEN
- LUDWIG-MAXIMILIAN UNIVERSITY, MUNICH
- JOHN MOORES UNIVERSITY, LIVERPOOL
- UNIVERSITY OF GRONINGEN
- UNIVERSITY OF PAVIA
- INSTITUTE MIHAJLO PUPIN, BELGRADE



REFLECTIVE SYSTEMS

What you feel is
what you get

Sixth Sense Systems

The purpose of the REFLECT project is to develop pervasive-adaptive environments based on the maxim:

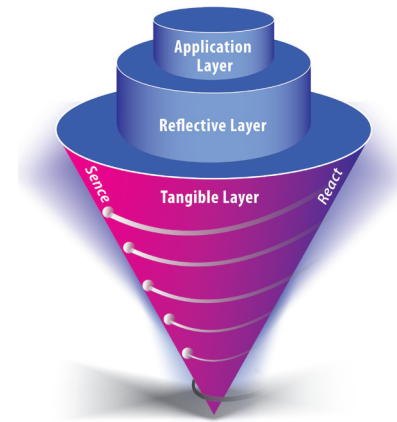
“The best assistant is the one you do not notice”.

Pervasive-adaptive environments monitor, diagnose and respond to the cognitive, emotional and physical states of the user. Our interdisciplinary approach combines cutting-edge achievements in emotional, physiological and neuro-computing, software technology, and man-machine interface, bringing scientists from different fields together for the shared purpose of developing genuine user-centric systems that react to and shape the environment in real time. The new generation of smart systems using reflective technology should understand users’ emotions, needs, intentions as well as social situation and provide appropriate assistance in a discrete and personalized manner.

The reflective approach to system design is both generic and personal. While, the framework of the system supports various applications and task scenarios, its reflective software will adapt to meet the needs of specific users in order to personalise the functionality of the interface and the system.

Introducing awareness of the human senses into computing, a realm known to be rigid and explicit in its present form, significantly enriches technological systems and their communication capabilities. Such emerging systems that are reactive to human senses thus can be interpreted as our technical “sixth sense”.

REFLECTIVE SOFTWARE



Spinning the senses:
Reflective middleware with a closed-loop control

Developing software to control pervasive and adaptive systems includes real-time sensor and actuator control, user and context-awareness, affective computing, self-organization and adaptation. To perform these tasks, a modular middleware architecture is being designed that simplifies the construction of dynamic sense-analyze-react behaviours. It consists of three layers:

- Tangible layer: controls sensor and actuator devices. This layer makes its atomic services available to the rest of the system.
- Reflective layer: combines the atomic services of the lower layer with user profiles and scenario descriptions. This allows for components of far higher complexity, which can evaluate the user’s emotional, cognitive and physical states as well as his environment and propose a system (re-)action.
- Application layer: presents applications scenarios and combines low-level and high-level software components from other layers to runs and controls the whole system.

Such a system can adapt through iterative self-tuning, accounting for both, the state of the user and the influence of the previous system response (closed-loop control).

REFLECTIVE APPLICATIONS

The basic idea of a helping hand can be applied to many complex situations: Driving a car is an obvious scenario. A co-driver usually observes the driver carefully, watches out for obstacles the driver cannot see, provides for a lively atmosphere on longer trips, and generally assists the driver.

The idea behind the reflective vehicle is to overcome the potential shortcomings of a solitary drive providing a friendly co-driver. Its task is to observe the driver and take into account his emotional, cognitive and physical states, as well as the vehicular, driving and traffic conditions, to optimize the vehicle’s configuration and actively participate in the complex process of driving.

The reflective vehicle concept aspires to implement adaptive control in vehicles to achieve more secure, more pleasant and more effective driving.

Further areas of possible application include: reflective mobile phones that offer hints (whom to call, whose call to ignore, etc.) depending on the user’s state and given situation; reflective music players that select music according to the user’s mood; reflective advertising panels that adapt their content and mode of presentation to the kind, number, and interests of people viewing them; reflective homes for the elderly that recognizes the needs and disabilities of their inhabitants so that it can assist them and/or call for help.