SENSE

Smart Embedded Network of Sensing Entities

KEYWORDS: signal processing, software technology, network technology, smart embedded sensors, machine learning, adaptive networks, acoustics, video processing

Introduction

The SENSE project (Smart Embedded Network of Sensing Entities) will develop methods, tools and a test platform for the design, implementation and operation of smart adaptive wireless networks of embedded sensing components. The network is an ambient intelligent system which adapts to its environment, creates ad-hoc networks of heterogeneous components, and delivers reliable information to its component sensors and the user. The sensors cooperate to build and maintain a coherent global view from local information. Newly added nodes automatically calibrate themselves to the environment, and share knowledge with neighbours. The network is scalable due to local information processing and sharing, and self-organizes based on the physical placement of nodes.

Objectives

To create a system in which distributed embedded devices cooperate to form and maintain a self-consistent global world view from local sensor information and which is robust to the addition and removal of devices from the network. The SENSE project will realize such a system, and test it in a rich, realistic environment (the International Airport Krakow). The system is based on intelligent nodes which perceive their environment using audio and video sensors. The sensors form a network to exchange information about the environment at a semantic level, independent of individual sensor types.

Expected Results

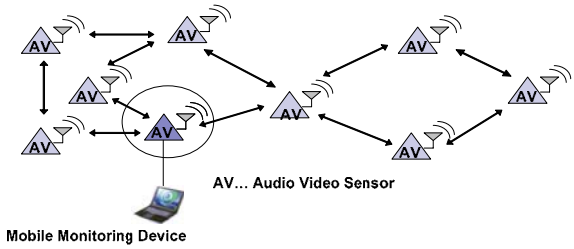
SENSE will progress the state of the art through innovation at all levels varying from raw sensor data to high level abstraction, reasoning and interpretation:

1. **Development of a distributed processing solution to large-scale systems design.** SENSE tackles the problems of scalability and complexity through decentralization of both processing and knowledge, relying upon the fusion of information at a high semantic level to allow computation.

2. **Automatic learning of semantic symbols.** Unsupervised learning is a key feature of SENSE. The sensory input used by the system will be decided by the system itself.

3. **Transferability between application domains.** By providing minimal 'hardwired' knowledge about the specific goals of the system SENSE presents a generic approach to large-scale system development, by featuring flexible adaptation to changes in the environment.

4. **Semantic abstraction.** SENSE decides what is important and what is normal and auto-matically generalizes to provide its own view of the world.



5. **Generic solutions to systems design**. The low level extraction of features ensures that developments in the higher layer are applicable to any form of sensory data.

Partners and their roles

The consortium composition is balanced between academic groups providing excellence in scientific research, industry providing state-of-the-art capability, non-university research providing experience in converting academic knowledge into concrete applications, and a committed end-user. The consortium had been structured to include the major disciplines necessary to produce a real-time system working in a realistic test case:

System architecture: providing high-level functionality from local-level processing in a network of smart nodes (**U "Dunarea De Jos" Galati, Vienna U Tech, Austrian Research Centers, AGH-UST KRAKOW**).

Embedded System design: providing the design of hardware for capture, processing and sharing of sensory information (**U "Dunarea De Jos" Galati, PARAGON, UP Valencia, U Patras**),

Hardware sensory processing: mapping the transformation between sensor data and internal object/event representation in two modalities: vision (**UP Valencia**) and audio (**U Patras, PARAGON**).

Machine Learning includes the autonomous learning of semantic knowledge from the environment, the usage of the semantic abstractions, and the sharing of knowledge between the nodes (**Austrian Research Centers, Vienna U Tech**)

Test bed platform: a prototype implementation of a network of real-time smart sensing nodes (**U "Dunarea De Jos" Galati, Vienna U Tech, PARAGON, UP Valencia, U Patras**).

Application context: installation and testing in a context-rich, realistic environment and allowing for relevant testing and evaluation (**MPL KRAKOW-BALICE, ZDANIA, AGH-UST KRAKOW**).

This project is part of the portfolio of the

Embedded Systems Unit – G3
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For more information please check:

http://cordis.europa.eu/ist/embedded

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IST-033279

FULL NAME
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TYPE OF PROJECT
STREP

PROJECT PARTICIPANTS
Austrian Research Centers (Austria)
Universidad Politécnica de Valencia (Spain)
PARAGON LTD (Greece)
Universitatea "Dunarea De Jos" Din Galati (Romania)
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PROJECT WEBSITE

www.sense-ist.org

BUDGET
Total cost: 2.3 M€
Funding: 1.7 M€

TIMETABLE
Starting date: September 1, 2006
Duration: 36 months