SIXTH FRAMEWORK PROGRAMME

WINΣoc WINSOC

Wireless Sensor Networks with Self-Organization Capabilities for Critical and Emergency Applications

Avalanche	Cyclone	Volcano	Drought	Diseases
Fire	Typhoon	Lahar	Landslide	Floods
Storms	EarthQuake	Tsunami	Tornado	Hurricane

The Problem

Sensor networks are currently receiving a huge attention as a basic tool to detect emergency events or monitor physical parameters of interest, like radiation, pollution, temperatures, pressures, and so on. One of the main problems in designing sensor networks, especially in cases where the network is placed in areas difficult to reach, is, on one hand, the high reliability required to the whole system and, on the other hand, the potential unreliability of the single sensor. Many technological constraints make in fact the single sensor potentially inaccurate and unreliable, because of the need for battery recharge, small complexity, low cost, etc. The other major critical issues are congestion around the sink or control nodes and scalability. The most common approach available today consists in adapting the protocol stack of communication networks to sensor networks, taking into account the specificities of the application and focusing on energy-aware design. However, requirements and constraints of sensor networks are so different from communication networks that, in many cases, it is better to devise innovative design methodologies which are not necessarily bounded to the old protocols.

Project Objectives

WINSOC aims to develop of a very innovative concept of sensor network that represents a significant departure from current state of art

through a novel, bio-inspired, paradigm for low complexity wireless sensor nodes, enabling self-organisation and distributed processing, without the need of sending all the gathered data to a sink node.

Information Society

European Commission

Methodology and Key Technologies

In order to realise this vision, the project:

- Develop and test innovative algorithms implementing the self-organization capabilities of the low level sensors and devise the most appropriate radio interface responsible for the interaction among nearby sensors; this technology has a rather broad scope and it is especially useful for environmental monitoring

- Develop and test three system level simulators addressing the following applications in environmental monitoring: i) detection or prediction of landslides (according to US government reports, landslides have killed more than 500 people from 1998 to 2001); ii) detection of gas leakage, to prevent hazard situations or simply avoid unnecessary wastes of energetic resources; iii) monitoring of temperature fields, as a way to detect fires or, even better, to predict the risk of a potential fire in a given area. The three simulators will incorporate the emulation of the physical environment under test, for the applications mentioned before, the reaction of the network to hazardous events, the performance of the network in terms of reaction time, probability of detection, estimation accuracy, localization, fault tolerance;

- Develop a reduced scale experiment for testing the proposed approach in the case of temperature monitoring and obtain the deployment experience from landslide detection experiments with in-situ monitoring.

Expected Results

The WINSOC platform will allow easily deploying and managing networks of self-organizing sensor to obtain and relevant information concerning monitoring and surveillance. Such a platform, therefore, will foster the utilization of sensors to address the increasing demand for complex systems resulting from the need of more safety, more security and more automated processes.

WINSOC, therefore, will provide the perfect match between the users' demand of relevant complex systems related to Monitoring applications and the current trend of cost reduction of Sensors and Wireless devices.

WINSOC project, satisfying such requirements, will have several technical and scientific impacts on research and development in heterogeneous fields.

WINSOC project addresses the problem of Global Monitoring, and it will route in that direction. Through the usage of Sensor Networks, in fact, it will be possible to have an economical and reliable system that will allow managing critical environmental risks like forest fires and landslides. The implementation of such a network will also elevate the degree of safety in natural catastrophes as well.

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