CENTRE DE SISTEMES D'ADQUISICIÓ REMOTA I TRACTAMENT DE LA INFORMACIÓ
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1. SARTI core research themes and interests

The Technological Development Centre for Remote Acquisition Systems and Information Treatment (SARTI), from the Polytechnic University of Catalonia, has as main purposes the development of scientific and technological instruments and the acquisition of data from remote systems, especially for controlling systems (submarine robots), for signal processing and developing and supporting state-of-the-art oceanographic instrumentation. SARTI is also a place with a specific know-how that allows the interaction between engineers and scientists for developing and innovate information and marine technologies.

Intelligent sensors-networks are one of the developing lines of the Oceanographic Instrumentation, where sensors are distributed logically, spatially or geographically over the environment, and all are interconnected through a communication network. The data management and acquisition from the network is based on the standardization of the installation and operational modes, which allows the interchange of instruments between different networks and platforms. The design of underwater vehicles and the control of its systems is a complementary developing line, which provides support to the oceanographic instrumentation.

Signals and images processing has evolved from the acquired experience in the development of low-cost hardware and processing systems for biometric identification, which is another developing area, where improvements and contributions have been made to increase the resolution of current techniques and improve the recognizance ration.

2. SARTI Technological Maturity.

Currently, the maturity of our technology allows us to follow three specific areas: first, the deployment of the underwater laboratory OBSEA, and with it, the integration of a sensors network which acts as a platform for oceanic observation with a remote access to the data via a web page application; second, the development of an Ocean Bottom Seismometer (OBS); and finally, the design of Autonomous Submarine Vehicles.

The OBSEA is a cabled seafloor observatory at 4 km offshore of Vilanova i la Geltru coast, located in a fishing protected area and interconnected to the coast by an energy and communications mixed cable. Currently, four instruments are connected to the observatory: a CTD (Conductivity, Temperature and Depth); a hydrophone; an IP camera; and the last instrument is an Acoustic Wave and Current profiler (AWAC). OBSEA is also a development platform for research projects on sensors interoperability, with TEDS (Transducer Electronic Datasheet), clock synchronization, smart sensor interfaces, SensorML, and currently it is under study the adaptation for tests with ROVs. On this research line, the focus is the integration of ocean observing systems (IOOS) for remote access to sensors and sensor networks via the Web. The aim is to implement a worldwide smart sensors network based on the IEEE 1451 family of standards and the OGC Sensor Web Enablement (OGC SWE). These standards for protocols and descriptions enable the OBSEA to observe and manage diverse instruments as well as to acquire, process, and interpret their data in a uniform and automated manner. To test and simulate these two standards for the OBSEA, two Web servers have been developed. One is based on the Oostethys project, that has been configured using the SensorML description of the OBSEA instruments, and the monitored parameters are provided from netcdf files of the acquired data. The other Web server is a java application capable to run on Imsys microprocessors or normal PC (NCAP). This java API is an HTTP 1451.0 server that implements PUCK protocol capable to discover when a new TIM (instrument) is connected to the NCAP, and provides a standard internet interface with the instruments..

To implement the smart sensor standard IEEE145, as well as other services used in marine measurements, we started the development of a smart module to be used in ALL observatory configurations: autonomous, cabled and buoy based observatories. The smart sensor design is based on a Stellaris LM3S8962/LM3S9B96 microcontroller and provides several services such as: clock synchronization (IEEE 1588), data logging, embedded instrument driver, etc.

In relation to the OBS systems, some instruments have been designed using as a main structural piece a glass sphere of 43 cm of diameter, where all the electronic units are placed as well as the battery pack. A plastic structure covers the glass sphere for protection. Once the experiment is over, the equipment is recovered by sending an acoustic signal with a certain code from a telecommand unit on-board. OBSs are equipped with an acoustic transducer to receive, and electronics to decode the message, and detach the anchor weight through a motor driven unit. Then the OBS rises up to the surface due to its structural floatability. The datalogger is based on the Motorola 68332 microcontroller and it is used to receive the data from the 4 channel 24 bits ADC board, compress the data and store it in a CompactFlash memory card. The autonomy of the OBS is about 2 months in continuous recording. The storage capacity is 4 GB.

The development of the Autonomous Submarine Vehicles is based in the design of a prototype capable to navigate on the sea surface and to make vertical immersions for measuring different parameters of the water column. The vehicle has been equipped with an embedded CPU for controlling the navigation, in addition with a digital compass, a 3-axes inclinometer, and a GPS. The communication between the vehicle and the land station is bidirectional through an industrial modem radio.

3. SARTI projects and funding

• CTM2009-08867 (subprograma MAR).MICINN (Ministerio de Ciencia e Innovación) Universitat Politecnica de Catalunya: Interoperabilidad en redes de sensores marinos y ambientales
•NCIA : ACI2009–0983. FCCI. ACI–PROMOCIONA Subdirección General de Instalaciones y Organismos Internacionales. MICINN: Operatividad laboratorio submarino OBSEA
•VALTEC09-1-0059. CENTRE D'INNOVACIÓ I DESENVOLUPAMENT EMPRESARIAL (CIDEM) Generalitat de Catalunya. Valorització de Tecnologia: Sismòmetre marí digital amb connexió per cable
•TRA2009_0294.Ministerio de Ciencia e Innovación: Redes de sensores submarinos acústicos aplicados al seguimiento de especies de interés comercial
•CTM2006-12072/MAR. Ministerio de Ciencia e Innovación: Acoplamiento hidrodinámico oleaje-corriente, tasas de dispersión e implicaciones interdisciplinarias en la zona costera

4. SARTI most relevant citations

Scientific production
http://eprints.upc.edu/producciocientifica/grup/176449?locale=en
SARTI Web page and Scientific Dissemination
http://sites2.upc.edu/~www-sarti/web/cat/recerca/publi_butletins.php