Editor's Note

This, the fifth issue of the Instrumentation Viewpoint magazine, presents SARTI's research and technological activities during 2006.

This issue has proved much more difficult to produce than previous ones, above all after the publishing of the special issue which came after the Martech workshop in November 2005 , Our group has more things to explain and we are involved in a compromise, with ourselves and our readers. In this issue the magazine also has an electronic ISSN and some of the activities have been developed in collaboration with other research groups or universities such as the National University of Colombia Universidad or the Polytechnic University of Madrid. We encouraged and invited them to participate and this experience of sharing ideas that we are now initiating has allowed us to establish new collaboration links.

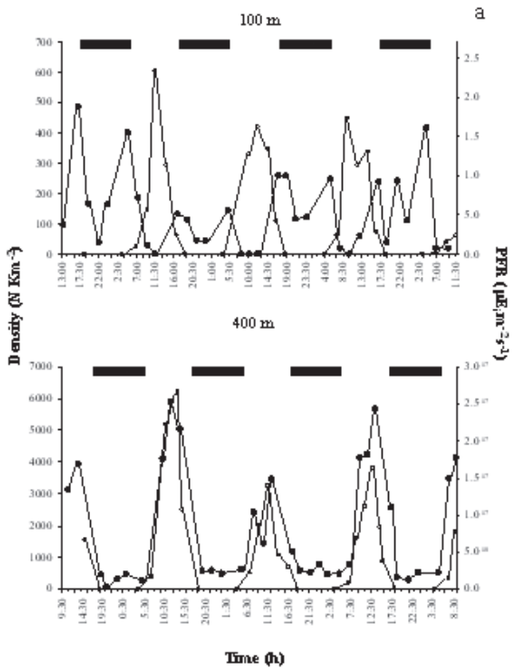
We do not pretend to offer an exhaustive presentation of the activities in this magazine but to outline our work environment. Some of the related activities are a short description of papers accepted and presented in different reputed congresses such as Instrumentation and Measurement and Industrial Electronics IEEE Societies

We would like to take this opportunity to invite you to present your collaborations in the next issue. Our goal is to make Instrumentation Viewpoint a medium where knowledge and research on instrumentation between colleagues can be shared and consequently become a window for all our activities

Best regards from your partner
Antoni Mànuel, PhD
Director of TDC SARTI

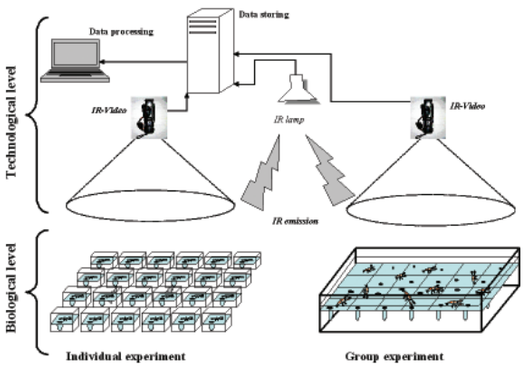
The NORIT project: the incidence of Norway lobster (*Nephrops norvegicus* L.) emergence activity rhythms on its population assessment

The Norway lobster, *Nephrops norvegicus* (L.) is a decapod crustacean inhabiting complex burrow systems in muddy continental shelves and slopes of the Atlantic and Mediterranean Europe. This species is fished intensively in the Mediterranean and is showing signs of overexploitation. Animals perform mergence under optimum light intensity whose timing varies at different intervals during a 24-h cycle. Commercial catches are used as indicators of animal behaviour in the field since they can be captured by trawl nets only when residing outside their burrows, (Fig. 1): crepuscular peaks of catches are accounted on upper and lower shelves (from 20 to 200 m) which are fully diurnal on the 400-410 m slope. Other factors such as size, the stage of sexual development, the presence of food or other conspecifics affect this emergence in a way which is still unknown today. In a earlier project (NERIT), rhythms in behaviour and physiology were measured only in adult males. An intuition yet to be confirmed,was made: the 24-h behavioural cycle of *Nephrops* is subdivided into three temporally distinct performances: in burrow locomotor activity, door keeping (wait at the burrow entrance) and excursion. The duration of each performance can be affected in a different manner by the previously quoted variables. The objective of the NORIT project is to measure



modulation of emergence rhythms in response to sex, size, isolation or grouping and the presence of food. In order to carry out these measurements technology is required. The team is multidisciplinary: the biological expertise will be provided by researchers specialised in behaviour and physiology of *Nephrops* (ICM-CSIC) while the engineering know-how will be provided by experts in telecommunications and electronics (SARTI-UPC). Experimental tanks endowed with artificial burrows will be equipped with innovative and integrated systems for the automated collection of behavioural data (Fig. 2): remote sensing (telemetry), infrared technology and video image analysis.

An infrared-sensible analogical USB videocamera connected to a USB concentrator, which in turn is connected to a PC, will obtain frames every 30 sec over consecutive cycles of 24-h light-darkness and constant darkness conditions from many tanks. An experiment with 10 tanks and 10 USB infrared videocamera is currently being developed. The image acquisition and processing software is LabVIEW. Different virtual instruments have been developed with LabVIEW to acquire image from the low cost infrared usb videocameras, and then to process and extract information about the localization of the animal. The application save this information together with other parameters. This system will be coupled with infrared sensors for the detection of movement located at different distances from the burrow entrance. Each tank is divided into 4 zones were infrared sensors have been placed to check if the animal is actually in these zones or not. The sensors



are connected to a custom electronic board designed specifically for this project. The electronics are composed mainly of the signal conditioning of infrared sensors, a set of analogue multiplexers and a low-cost microcontroller with analogue to digital converters. The microcontroller sends the information from the infrared sensors to the computer by USB where the LabVEW application transform it into information about localization of the animal. Behavioural data will be automatically processed by software in order to obtain time series of events per arbitrary unit of time. At present, success is guaranteed by the accomplishment of the technological objectives since those are integrated but at the same time, independent from the scientific ones. Also, some of the proposed new measuring techniques are important since they will be developed with the ultimate goal of their application in field studies. The development of new systems of remote data acquisition and their integration and adaptation into the already existing ones, will allow us to obtain smaller, more easily manageable and less aggressive devices for behavioural monitoring. With these new systems of probes and receiving hardware, a reduced level of stress to animals will be achieved, a fundamental factor when measuring all different aspects of behavioural patterns connected with emergence in this species. Also, as a result of these new systems, the measurements will be obtained with the highest precision achievable.

Design of a Submarine Observatory.

Some aspects to be considered

Abstract

This article presents the results of the preliminary study carried out to determine the main requirements and conditions to be satisfied in the design of a submarine observatory infrastructure. The main concerns and some suggested lines to pursue are presented for discussion. Project and work is also divided into specialized work units with specific responsibilities over the whole project.

Introduction

Marine research information needs increase in complexity, resolution requirements and volume of information allowing a better study capacity over a broader spectrum of phenomena as physical processes, marine meteorology, geology, geophysics, geochemistry, biogeochemistry and physics – biology interactions among others.

Traditional observation and data acquisition systems, such as ships, buoys and autonomous sensors, may present some difficulties regarding costs, poor volume of data in terms of physical extension and period of time, lack of remote control capacity to change configurations dynamically or low reliability or modularity to better adapt to any condition.