Geophysical Research Abstracts,
Vol. 11, EGU2009-12040-1, 2009
EGU General Assembly 2009

A flexible computerized system for environmental data acquisition and transmission

G. Zappalà
ISTITUTO SPERIMENTALE TALASSOGRAFICO - SECTION OF MESSINA OF CNR-IAMC, MESSINA, Italy
(giuseppe.zappala@iamc.cnr.it)

In recent years increasing importance has been addressed to the knowledge of the marine environment, either to help detecting and understanding global climate change phenomena, or to protect and preserve those coastal areas, where multiple interests converge (linked to the tourism, recreational or productive activities. . .) and which suffer greater impact from anthropogenic activities; this has in turn stimulated the start of research programs devoted to the monitoring and surveillance of these particular zones, coupling the needs for knowledge, sustainable development and exploitation of natural resources.
There is an increasing need to have data available in real time or near real time in order to intervene in emergency situations. Cabled or wireless data transmission can be used. The first allows the transmission of a higher amount of data only in coastal sites, while the second gives a bigger flexibility in terms of application to different environments; more, using mobile phone services (either terrestrial or satellite), it is possible to allocate the data centre in the most convenient place, without any need of proximity to the sea.
Traditional oceanographic techniques, based on ship surveys, hardly fit the needs of operational oceanography, because of their high cost and fragmentary nature, both in spatial and temporal domains. To obtain a good synopticity, it is necessary to complement traditional ship observations with measurements from fixed stations (buoys moored in sites chosen to be representative of wider areas, or to constitute a sentinel against the arrival of pollutants), satellite observations, use of ships of opportunity and of newly developed instruments, like the gliders, or towed sliding devices, like the SAVE.
Modern instruments rely on an electronic heart; an integrated hardware-software system developed in Messina is here presented, used in various versions to control data acquisition and transmission on buoys or on ship-based instrumentation.
The data acquisition and transmission system is based on IEEE P996.1 standard boards, implementing a PC-like architecture; basically, it consists in a Pentium family CPU (the fist prototypes used a 40 MHz 386 CPU), a variable number of RS-232 ports to connect measuring instruments and communication devices, an analog to digital converter (8 inputs 12 or 16 bit), power outputs with connected circuit status feedback to drive actuators and switch on and off the measuring systems, satellite and/or cellular phone modem, GPS; the mass storage is supplied by Disk on Chip (DOC) devices.
According to the needs, it can be fully or only partly implemented.
The software environment is Datalight ROMDOS v. 6, an MS-DOS compatible Operating System.
The software has been written in Microsoft Professional Compiled BASIC v. 7.1. and Microsoft Macro Assembler v. 5.0. It enables to fully control the system instruments both in local and remote mode using a special set of macro commands (that can be combined into sequences using a simple text editor) that include also conditional execution of branches; this feature can be very useful in case of partial operativity of the system due, for instance, to low battery level or failure of some instrument.
Available commands include:
• System management commands
• Instrument management commands
• Conditional branch commands
• Data transmission commands
Collected data are locally stored and can be transmitted as e-mails, so increasing their safety against loosing and making the global data path fault tolerant using the peculiarities of the e-mail system.

The first version was used in a network of coastal monitoring buoys funded by the Italian SAM program; a second one to equip an automatic multiple launcher for expendable probes to be used in ships of opportunity, designed and built in the framework of an EU funded program, “MFSTEP”.
Every hour, a “sequence manager” starts a macro-command sequence, that can be different for each time and is remotely reprogrammable; new releases of the software and of the sequences are uploadable to the station without suspending its normal activity. The macro-commands enable to manage the data acquisition and transmission, the mission programming, the station hardware and the measuring instruments.
In the "launcher" version the program also controls real time and position acquisition, comparison against set points-times, launch, data acquisition and transmission, ancillary functions.
The whole system can be connected to another computer (local laptop or remote desktop) using a terminal software; however, to fully and easily use its capabilities, a remote control program has been written in Microsoft Visual Basic, running in Windows environment. This program enables to transfer files to and from the measuring system, set up all its functionalities, and, if needed, take control of all the system operations.
Thanks to the PC-like hardware architecture, it is easy to upgrade the system to more powerful processors without the need to modify the software, which, in turn, can be easily programmed using standard development packages.