

flow. Common control structures include parallel and sequential execution, repetitive structures (while, for, ...), conditional structures (if-then-else, try-catch, ...), etc.

Figure 3 shows a control structure If-then-else. Both tasks and control structures are embedded between the Begin, Task achieved and Task not achieved places. For this reason, the control structures can sequence not only tasks but even other control structures.

Once the architecture-link section is defined, programming a mission is as easy as writing a piece of code using the available control structures and the previous defined tasks (Algorithm 1).

```
Mission{
  yaw = 0;
  while(yaw < 2*PI){
    AutoHeading(yaw, 60);
    parallel{ConstantVelocity(0.8, 60);}
    or{Monitor(distance > 2);}
    yaw = yaw + PI/2;
  }
}
```

Algorithm 1: Example of a MCL mission.

4. Conclusions:

This is an ongoing project to design and implement a flexible MCL easy to be tailored to different AUV control architectures. A generic MCS based on Petri nets have been presented as well as the MCL used to define the missions. The main goal of this project consist on providing the end user with a simple but powerful language for describing the AUV missions.

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ELIMINATION UNITS FOR MARINE OIL POLLUTION (EU-MOP)

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Introduction

This paper introduces a research project called EU-MOP, founded by EU Commission under the 6th Frame Work Programme (DG-RTD), that involves the design and evaluation of an intelligent robot system to respond to oil spills and new spill management tools.

The R&D team consist of 13 multidisciplinary European partners, everyone of which have an outstanding knowledge in their relevant areas.

Background

Oil pollution either from marine accidents or routine ship operations is one of the major problems that threaten the marine environment. Efforts in protecting the environment after an oil spill could cost billions of euros in cleanup and subsequent damage costs, often producing questionable results. The key factor for efficient cleanup operations is to develop an adequate structure focusing on the confrontation of oil when is into the sea and diminish the impact on nearby coasts.

Objectives

In fact there is a direct need for a renovation of anti-pollution methodologies and equipment. Such a goal must be incorporated at all hierarchical levels, taking the necessary legislative and surveillance measures, therefore in-situ techniques that allow for the control and elimination of spills become imperative.

1. Innovative concepts for oil spill management.
2. Novel devices for oil spill confrontation.
3. An integrated framework for oil spill management.

Expected Results

Analysis and assessment tools that complete an integrated framework for oil spill management system, including communications, logistical support and response tactics.

Design and proof of concept of autonomous elimination units for marine oil pollution (EU-MOPs).

An advanced structure for the dissemination of oil pollution response policies.

ABOUT EXPERIENCES WITH DEEP SEA INTERVENTION DURING ONE DECADE

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Introduction

This contribution will deal with the long standing experience of a deep sea intervention system MODUS that has been developed by the authors groups for the deployment of heavy deep sea stations. This stations mainly operated by the partner INGV in Rome/Italy have the purpose to operate for a long term (one year) autonomously or to be linked to shore nodes.

Contents

It will be presented the complex process for the development of this

technology with CAD design, CFD simulation, numerical simulation for the dynamic behaviour and the lab tests. This will be followed by the experiences with MODUS in the field. MODUS has been used within several European projects such as GEOSTAR1, GEOSTAR2, ORION, BIODEEP. Moreover in the Italian projects SN#1, APLABES and MABEL. During this projects we have had more than 70 dives down to 4000 m in different environments, like the Mediterranean Sea and the Antarctic Sea. In the near future it will operate in the Atlantic Sea within NEAREST another European project.



Conclusion

In this contribution the successfully used technology will be presented and discussed. Proposals for future developments will be made.

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DEVELOPMENT OF AN AUTONOMOUS OCEANOGRAPHIC OBSERVATION PLATFORM

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1. Introduction

In spite of the great advance in the knowledge of the Ocean obtained by means of the use of oceanographic ships and anchorages, the sampling of the marine environment is still insufficient. The limitations of the conventional oceanic platforms of observation prevent the sampling of the sea with the space and temporary density required. By such reason and with the aid of the recent technological advances the development of new oceanographic observation platforms has been tried, able to make interdisciplinary measures with a space and temporary high-resolution simultaneously.

The platforms of observation denominated Gliders, the Autonomous Underwater Vehicles (AUVs) and the Autonomous Surface Vehicles (ASVs) are born. This project proposes the development of a oceanic observation platform of low cost, hybrid between the AUVs and ASVs. The platform moves by the surface of the sea and makes vertical immersions obtaining profiles of the water column in agreement with a pre-established plan. These two characteristics of the observation platforms, will lower the production costs prices and will increase their efficiency. The superficial displacement of the platform will allow the navigation by means of GPS and the direct communication and telemetry by means of radio-modem.

2. Discussion and results

Considering that the principle design corresponds to a first prototype on which, necessarily, successive modifications will have to be made, we worked with a mechanical design constituted by a support structure on which the motors of direction and propulsion will be reconciled. This structure is not watertight, which is going to allow to make any type of mechanized.

Inside the support structure a watertight cylindrical module is reconciled that contains the immersion actuator and the electronics control, as well as the power supply batteries. The support structure is made up of a cylinder of PVC of 1.2m in length and 32cm of outer diameter. In one of the ends of the support structure the main motor of propulsion of the Seaeye company is reconciled. In the lateral ones of the cylinder individual motors of the Seabotix company are reconciled. The watertight module contains the immersion group, the electronic modules of reception of signal and engine control, and the power supply batteries. Figure 1 describes the structure of the completely assembled vehicle. The payload has settled down in about 5 kg, approximately, on a gross weight of the platform of 76 kg.



Fig. 1. Complete structure of the vehicle.

In a first stage, the control is made of manual form by means of the sending of the propulsion, direction and immersion orders from a ground station to the vehicle, using an Radio Control (R/C) equipment, as it is described in figure 2. The objective is the study and characterization of the dynamic behavior of the vehicle in aquatic environments, with the purpose of obtaining the necessary parameters for the later development of the autonomous control.

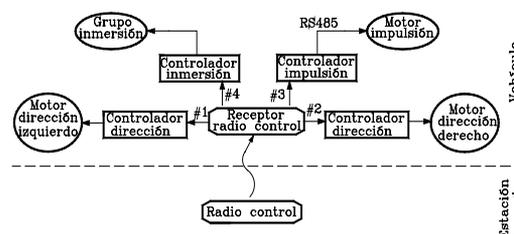


Fig. 2. Diagram of the manual control

On a second stage the control system of autonomous navigation will be developed and the necessary elements for the data acquisition of the water column will be get up during the immersions (temperature, depth and conductivity) and the security elements of the vehicle (supervision batteries status, collision avoidance systems, temperature and humidity inside of the vehicle). In figure 3 the diagram anticipated for the independent control of the vehicle is described. The communication between the vehicle and the ground station is bidirectional and industrial modem T-MOD400 of the company Farell Instruments is used. The central control of the vehicle is made by a module PC104 Vortex86-607LV.

