

IVER2 improvement for oil in water sampling

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Abstract – The IVER2 AUV is a small man-portable AUV manufactured by Ocean Server Technology, Inc. The design of the vehicle allows the user to add new features and capabilities. The one acquired by the UPCT for the Underwater vehicle ready for oil spill (URready4OS) need several improvement in order to be used for oil in water sampling, listed: add an oil probe, equipped a second CPU enable to communicate with the main CPU and the probe, and an underwater modem. New software has been developed to storage in the second CPU the data registered by the oil sensor and main CPU allowing to get georeferenced oil in water data, to receive/send information by the underwater modem and the integration of the vehicle in the command and control software Neptus.

Keywords:- IVER2, oil spill, Rasperry pi, Cyclops Integrator.

INTRODUCTION

Surface oil is not the only effect of an oil spills. Underwater oil plumes can come from bottom leaks and from surface patches forming subsurface plumes as recently been brought into the public eye during the [2010 Deepwater Horizon incident](#). The techniques available to detect and monitor the plume one it has the surface is wide but while is underwater we are blind. The use of AUVs can help to fill this gaps, as has been showed in the Underwater Vehicles ready for Oil Spill where a fleet of vehicles has been used to monitor an underwater oil spill. One of the vehicles used has been an IVER2 Ecommapper although some improvement has been done before been able to be incorporate to the fleet of vehicles. Some constrains was established before starting with the IVER2 enhancement :

- Low cost system.
- Low energy consume system.
- The main CPU and the vehicle hull must be “untouchable”.

The improvement to be done are:

- Design and build a new nose where to incorporate the oil probe.
- Add a second CPU (SCPU) in charge of: Communicate with the main CPU, retrieve the data from the sensors, run the software design to enable the use of the command and control software Neptus and manage the modem bidirectional under water communication.

NEW HARDWARE

Oil Probe

After the screening of available probes for oil in-water sensing the Cyclops Integrator from Turner was acquired due to the integration of three optical sensor (Rhodamine, Refined Oil and Crude oil) in one probe. A new nose was designed to accommodate it in the vehicle ensuring that the vehicle sealing was kepted.



Fig. 1 Cyclops Integrator oil sensor equipped in the IVER2.

Second CPU

The first CPU model selected was the Raspberry Pi due to the low power consume but we found too short to run several process simultaneously getting some “freeze” problems. The appearance of the Raspberry Pi 2 resolved this problem and allowed us to run new developed software of it without any kind of problems.

Underwater Acoustic Modem

The model selected has been the Tritech Micron Data Modem showing a good ration between price and performance, with a maximum data rate of 40 bits per second and range of up to 500m (horizontal, 150m vertical

SOFTWARE DEVELOPED

First of all and following the constrain to don't make any change in the main CPU a new WiFi net to communicate with the SCPU was set, allowing to work in the Backseat CPU without any interference with the IVER net.

The software developed could be split between the one installed on the vehicle's second CPU and the code to be used on the field computer:

- C3 communication. (SCPU)

The SCPU communicate with the oil sensor by a serial connector RS232 allowing to retrieve all the data measured by the probe and storage on the SCPU.

- Communication with the main CPU. (SCPU)

We need to be able to communicate with the main CPU to: get the navigation data that will allowed us to georeferenced the data acquired by the sensor and send to the main CPU backseat command that allow us to control the vehicle by the SCPU. The connector used is a RS232.

- Integration C3 data/navigation data (SCPU)

Once the navigation and probe data has been acquired they are merged to build up a georeferenced data field.

- Integration with the Command and Control software (SCPU)

The command and control software used for the vehicles is Neptus developed by the Universidade do Porto. In order to be able to integrate our vehicle on it we must follow several Net and format rules. This piece of software was in charge in doing so.

- Send/receive underwater data (SCPU and Field CPU)

This software was in charge to send and receive data between the SCPU and the field CPU, allowing to get the data in near real time and send backseat command to the main CPU.

CONCLUSIONS

The hardware integrated and the software developed has increased the capabilities of a vehicle that wasn't able to perform the task needed before the improvement done. Using a low cost SCPU all the hardware acquired has been integrated allowing the IVER2 to measure oil in water, use a new navigation and control software and send/receive data by an acoustic modem.