ID42 LOW COST USV DEVELOPMENT TO STUDY SPRING PONDS

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ABSTRACT

Current practices in bathymetry survey in lakes (available method) are indeed having some limitations. As for instance the size of the equipment that has to be transported and then deployed in the lake. New technologies such as using USV (Uncrewed Surface Vessel or Unmanned Surface Vehicle) start to be common. As they are easy to transport, high manoeuvrability and permit to work in less than 1-m-deep water masses. A quite wide commercial offer has been developed for many uses but as this equipment do not have a high demand, it has a high cost. The USV uses in harbours and open marine waters is quite straightforward because the good visibility and easy access permit rescues of the USV in case of malfunction. Lake surveys have the problem of the densely vegetated margins, riparian vegetation, and sometimes also with floating natural/or rubbish elements. Commonly the survey is tracked away from the margins to avoid the possible problems, that in case of occur are major issues (rescue this non-cheap equipment). In these scenarios it is needed to stablish some rescue protocols as, for instance a robe to the USV to pull, or transport a rescue boat to be sure to recover the equipment.

One of the most common problems is the underwater vegetation entangle in the propellers as normally is not seen by the observers or pilot. Overestimate the power thrust of the propellers can be a solution but commonly the unseen vegetation is more than the expected and the USV ends trapped.

Keeping all the previous in mind, and after the experience developing cheap, and easy-to-replace equipment as the Geophonino-W [1, 2], a wireless multichannel seismic noise recorder system which is suitable for array measurements (Geophysics), or seismic record station for earthquakes, it was developed our low cost USV.

It has a modular design first the floating part, as an aluminium structure with 125mm-diameter PVC-tube floats filled by polystyrene to prevent any accidental sinking. Then a control unit and the battery pack inside a plastic waterproof box, and finally the propellers jailed by a 1mm-light metal grid to prevent its obstruction. The USV can be held many devices as single beam Sonar, side scan sonar, multibeam, CTD-probes, cameras, etc...

The control unit is an Arduino microcontroller ATmega328g, with microSD, GPS NEO-M8N and Bluetooth HC-05 module. It is powered by a 12,6 V Li-ion battery that with a Furuno FCV-600L (50-200 kHz) single beam sonar installed allows a more than 4 hours autonomy. A green-light flash when the microSD card is recording data, and the Bluetooth is used to connect the cellular phone to the test the NMEA-183 string of the Furuno sonar being recorded.

The main advantage of this development respect to the commercial ones is that we can fixed and upgraded without limits. We can have a set many of different USV adapted to more or less vegetated lakes for the less price of one commercial one. Any loss of equipment is a problem but in this case is less a matter than when a high cost, inventoried, high technology piece of equipment is lost, and it has to be justified.

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Keywords – Spring Ponds, USV, bathymetry.

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