ID12- SUPERVISOR DREDGING EQUIPMENT:
REMOTE AND REAL TIME CONTROL OF THE DREDGING PROCESSES

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Abstract – We present a system for monitoring and supervise ecological dredging. Current dredging techniques can cause serious problems to the environment. This system emerges as a need to improve efficiency and control of dredging activities. To do this, hardware and software elements will be deployed to monitor, record and display in real time each of the relevant actions in a dredge operation.

Keywords – Dredge, Supervisor Equipment, Bathimetry, Web Service.

SYSTEM DESCRIPTION

Monitoring and data acquisition

The Supervisor Dredging Equipment or SDE, has a Data Acquisition Unit or DACU as the system central unit. The DACU has an electronic module based on Arduino [1] board which is responsible for acquiring data from different sensors:
• GPS device.
• IMU sensor (Inertial Measurement Unit) ready to provide direction and position (Yaw, Pitch and Roll) data.
• Mareograph or tide gauge for measuring the sea level.
• Pressure sensor for measuring the dredge's waterline.
• Electrical signals provided by the dredge operation systems.
In addition, the system has two additional elements to complete the monitoring with essential information:
• Multibeam bathymetric probe to make a cartography of the seabed.
• Pictures and video of the dredge work with an underwater HD Camera and another one on deck.
All this raw data is served as data packets via an ethernet communications module integrated into the DACU. Then, data will be received and processed by a computer unit.

Processing and storage software

To store and process the data, the SDE has a mini computer unit with embedded Linux, the Odroid-U3 [2]. This computer runs the supervisor dredging Eco-Dredge software, which is responsible for centralizing, record and process the information collected. It is composed of six different software modules:
1. DACU data receptor module.
2. Multibean probe data adquisition and calculation module.
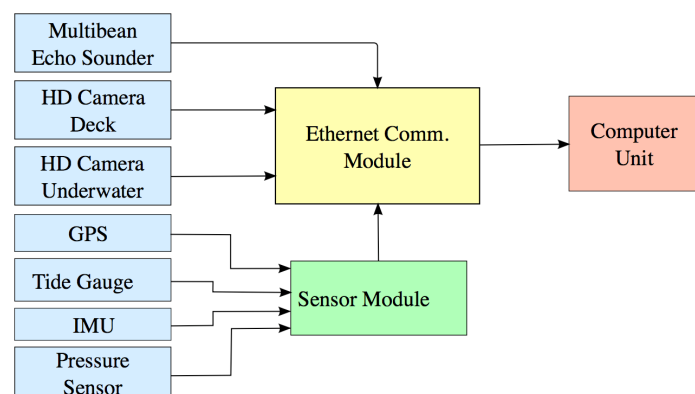3. Video and image georeferencing module.
4. Multibean probe and sensor data synchronization module.
5. Bathymetric autonomous processing module.
6. Recording and storing data module in a MongoDB database.

Web service, visualization and supervision

The SDE offers a web service to access to the stored information in the database or even configure the system. The web service runs in the same computer beside EcoDredge supervisor software and implements a RESTFul [3] HTTP-based protocol. Through an internet HTTP requests API, the service can offer to any client the generated and stored information ready for supervision.

PURPOSE AND BENEFITS

This system offers a quality control tool on dredging activities and pollution generated. At any time, a supervisor can access to key moments and check by visualization and interpretation of the recorded and processed data the status of the work. This offers the advantage of keeping under control the level of pollution generated by the dredging.
It also offers the dredger the possibility to know in real time the status of the seabed by displaying the underwater images and bathymetries. Thus, it could efficiently optimize time and cost of dredging operation avoiding unnecessary dredging steps.

REFERENCES

[1] Arduino Board. http://www.arduino.cc/
[2] Odroid Linux Computer. http://www.hardkernel.com
[3] Fielding, Roy Thomas (2000). "Chapter 5: Representational State Transfer (REST)". Architectural Styles and the Design of Network-based Software Architectures (Ph.D.). University of California, Irvine.

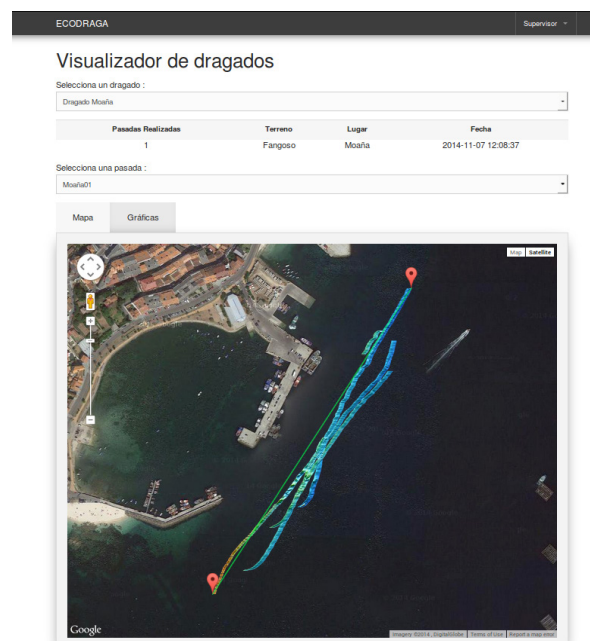Fig. 1: Connection diagram with different systems and sensors needed for monitoring

Fig. 2: Dredge supervisor web page. Among other options, a dredge work and the result bathymetry is displayed over a map.