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ASV for Real Time Searching and Survey

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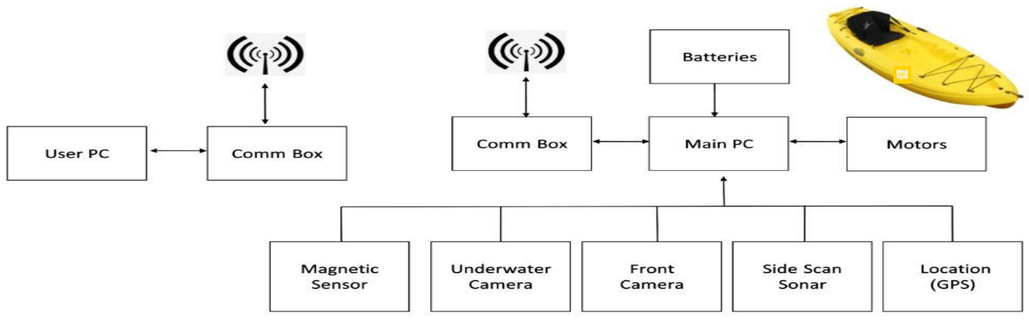
1. Introduction

This project will discuss a means of surveying shallow water reservoirs such as small lakes, drinking water reservoirs, fish reservoirs, and more. These bodies of water are categorized by varying water clarity, depths and many times contain third party interferences such as pumps or nets.

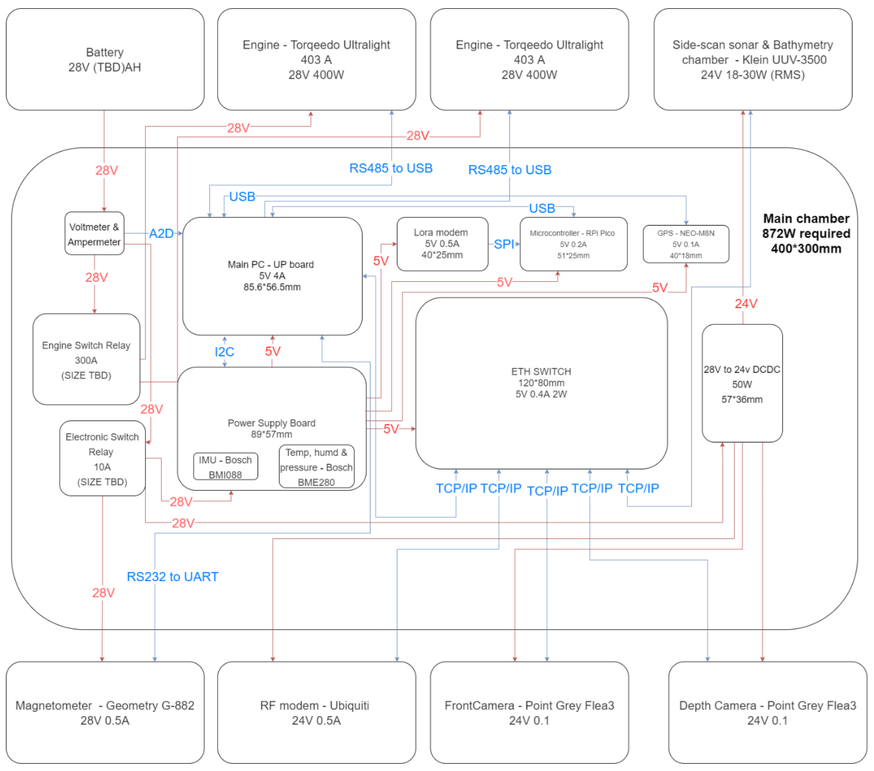
Goals:

- A combination of sensors that will make it possible to receive a clear picture of the area below the water.
- A complete system that is easy to deploy and can maneuver autonomously in shallow water reservoirs.
- ~~Transition of information to a remote position in real-time by WIFI communication for sonar, camera and other data to ensure maximum coverage of the reservoir.~~



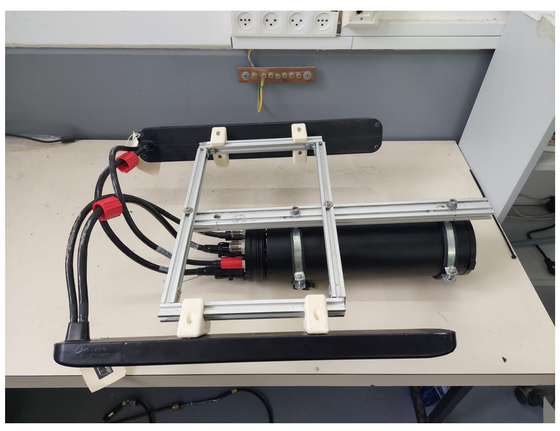
2. Main electronics chamber design

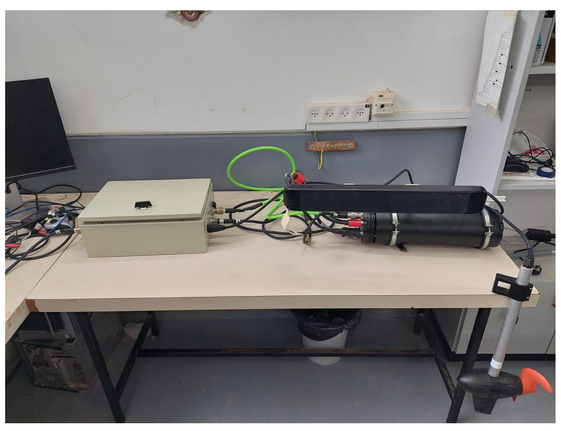
The main electronics chamber contains all the electronic subsystems of the platform such as ~~the~~ UP-board computer, the power supply board, the environmental sensors etc. ~~It also contains the wiring that controls the motors and the sonar.~~



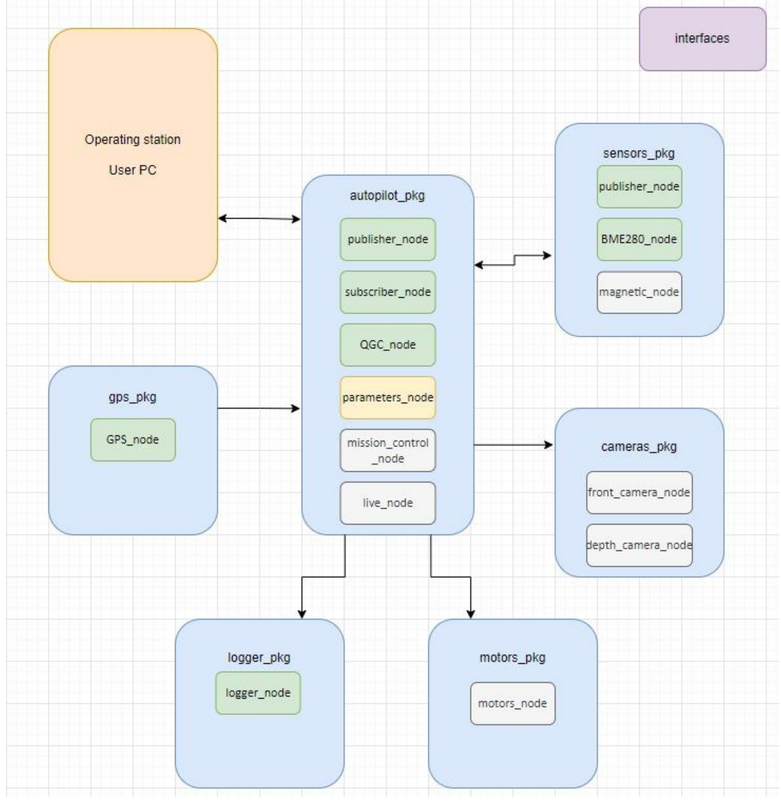
3. Side sonar chamber mounting

~~It was decided that~~ the Side-scan sonar ~~will be~~ placed in ~~it's~~ chamber and mounted with it's transducers below the platform. Waterproof sea-cables connect the transducers to the sonar chamber, and the sonar chamber to the Electronics chamber on-board.





4. Software implementation on ROS2 framework



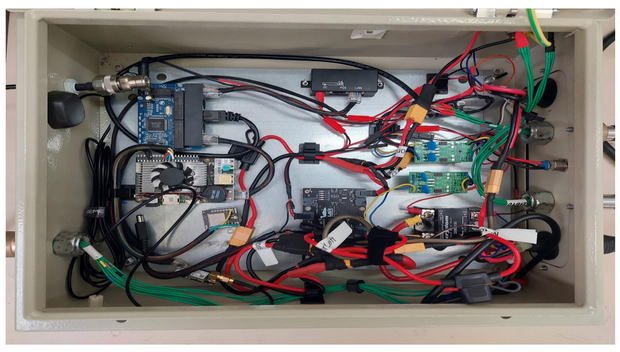
The software ~~side of this project~~ was written in Python under the ROS2 (Robotic Operating System) framework, which handles all communication between the different modules needed for the platform.
ROS2 utilizes a hierarchy of packages and nodes. ~~In this project the hierarchy is:~~

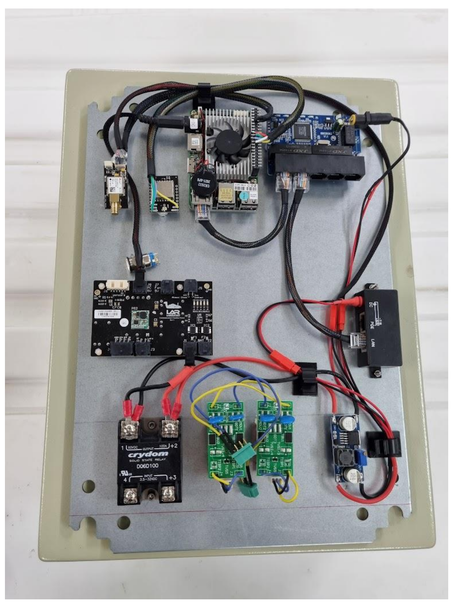
- **Autopilot package**: Responsible for handling the logical and autonomous workings of the system.
- **GPS package**: ~~Receiving~~ GPS coordinates for navigation.
- **Motors package**: A driver controlling the Torqeedo motors.
- **Sensors package**: BME and BMI drivers for environmental sensing and Euler angles calculations for the navigation.

5. Results

- We assembled a fully working main chamber in terms of electricity and mechanics.
- All ROS2 packages and modules have been implemented (except the camera) and are communicating with each other and with the remote operator via Q-Ground (GUI)
- A driver that communicates with, and controls, two torqeedo motors was written.
- Wireless communication was tested up to 1Km without failing.
- The side sonar, electronics chamber and motors have been mounted on the platform.

6. Conclusions and future work





Conclusions:

1. Developing an autonomous vehicle in two semesters as a project, is too limited with time resources.
2. Manufacturing and arrival time of equipment in the project can vary for many reasons.

Future work:

1.Test and improve autonomous navigation module.

2.Create ROS2 package for the cameras.

3. Develop a simulation for better lab test of the system.

7. References

[1] S. Gan and X. Xiang, "Control system design of an autonomous surface vehicle," 2017 29th Chinese Control And Decision Conference (CCDC), 2017, pp. 495-499
[2] Stanford Artificial Intelligence Laboratory et al. Robotic Operating System [Internet]. 2018. Available from: https://www.ros.org

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