Towards a toolbox for automating the AUV Barabas data flow embracing FAIR principles

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Marine Autonomous Systems have been developing at a fast pace over the last few years, boosting our ocean observing capabilities in different sectors (e.g., ocean science, offshore energy, and defense) and directions (e.g., improved data quality, better spatial coverage, and new solutions for near-real-time data transfer) [1]. Particularly, Robotics Systems are playing a key role in rapidly feeding a new generation of datasets due to their autonomy, adaptative nature, and ability to explore harsh and remote regions [2]. At the same time, new strategies for data management, including data processing and data flow, must be implemented to fully embrace FAIR (Findability, Accessibility, Interoperability, and Reusability) principles [3,4]. Only by doing so, this new generation of datasets will be fully usable by end-users and, therefore, contribute to major initiatives such as Operational Forecast Systems [5, 6] and the Global Ocean Observing System (GOOS) [7].

As part of the Flanders Marine Institute's robotic fleet, the Autonomous Underwater Vehicle (AUV) Barabas (a vehicle from Teledyne Gavia) has already contributed to different research projects, gathering a broad range of datasets, from side scan sonar imagery and optical measurements (backscattering and fluorescence) to key environmental parameters (temperature, conductivity, and currents). However, the journey into the ocean's depths is not without challenges, particularly in the field of AUV data processing. The intricate nature of file formats and the disparity between scientific and navigation time stamps present challenges. To address these challenges, this work explores solutions towards a toolbox for automating the AUV Barabas data processing and data flow.

Inspired by already suggested frameworks for FAIR robotic datasets [1], and established tools that have been broadly used by the marine robotics community (e.g., PyGlider) [8], we are developing a Python toolbox to streamline the generation of standardized NetCDF files, serving as a cohesive repository of information from various AUV modules and sensors. The NetCDF format provides users with a unified, broadly used format for accessing comprehensive AUV-measured variables alongside essential metadata. The toolbox also categorizes data into processing levels, distinguishing between Level A1 (unaltered data) and Level A2 which features processed AUV data enriched with derived parameters calculated from measured data. This automated approach ensures systematic data manipulation, fostering efficiency and precision. The toolbox is structured in a way that it can be improved by external contributors, as an open-source development, and extended to other robotic devices in the future.

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