A Web GIS tool for 3D visualization of bathymetric data

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The accurate knowledge of seabed properties is in increasing demand for telecommunication companies, national governments, military forces, academic institutions and oil and gas corporations. Recently the quality of bathymetry and seafloor mapping extraordinarily improved thanks to the employment of Autonomous Underwater Vehicles, which mount on board multiparametric instruments such as high resolution multibeam echo sounders, synthetic aperture sonars, sub bottom profilers, magnetometers, camera laser profilers and environmental sensors.

The fruition of this huge amount of high-resolution information is often limited to advanced experts on GIS software which requires a long and steep learning curve in addition to a properly equipped workstation. With the increasing interest in bathymetry and oceanography from the larger community, the challenge is definitely to improve the visualization and the online handling for users with little familiarity on sophisticated applications.

For this purpose, we developed a Plotly Dash (an open-source Python library) web-based GIS application for real time rendering of 3D high-resolution bathymetric data. An easy-to-interpret and easy-to-manage visualization is obtained through the creation of an interactive 2D map with Mapbox (a provider of custom online maps) for positioning in the world and for selecting bathymetric data. The user can also easily set different visualization parameters such as depth color scales and the stage lighting and shadowing to enhance the seabed details.

For an optimized usability on mobile devices, the web application loads the 3D model obtained from a raster flexible interpolation. The rendering speed is further boosted by automatically varying the 3D mesh resolution in accordance with the extension of the selected region.

Starting from an ASCII file containing depth and coordinates data together with their map projection system, our innovative tool automatically organizes the data into a raster file with the WGS84 spatial reference system. Data collected from different surveys can therefore be effortlessly processed, managed, and visualized.