Seabed mapping: Based on underwater sonar detection

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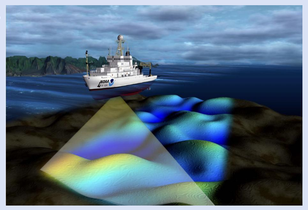
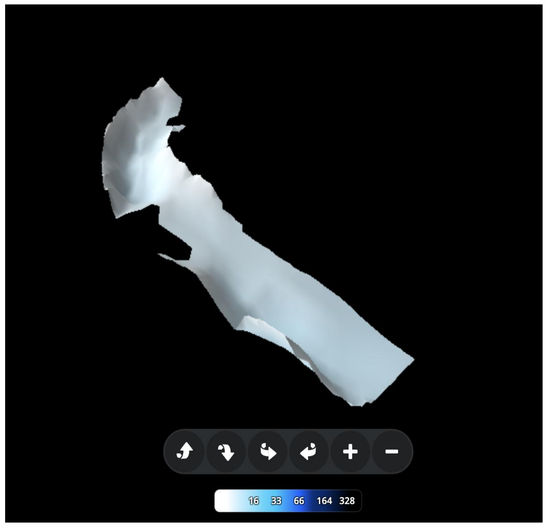
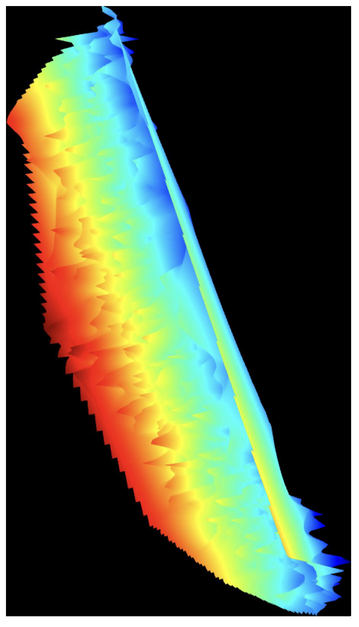
SCAN ME

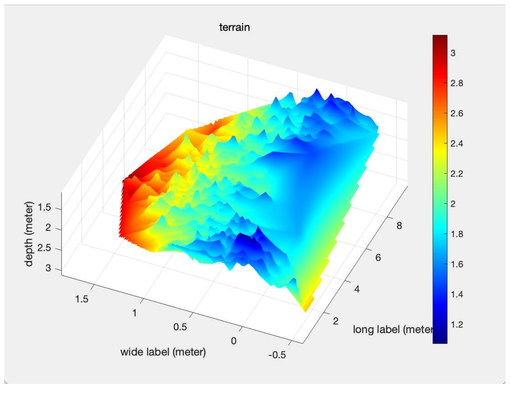
Introduction & Goals

This project primarily utilizes underwater sonar robots to collect underwater data, which is then processed in the backend to generate seabed maps. The main application scenarios include underwater resource research or fisheries exploration of fish schools.



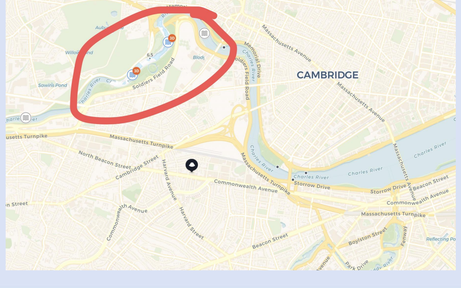






Process

Using the official topographic data of surrounding rivers provided by the underwater sonar robot as a reference, I personally took the robot to the riverside for surveying and data collection. Subsequently, the collected data was used to create a topographic map, which was then compared with the official topographic map.



Algorithm

Data collection: Saved as .csv documents

Data deprocessing:

Noise Filtering: Applied Gaussian or Kalman filtering to reduce environmental noise.

Data Interpolation: Used bilinear interpolation to fill in sparse data points.

Terrain Mapping:

Point Cloud Generation: Generated 3D point clouds based on depth and position data.

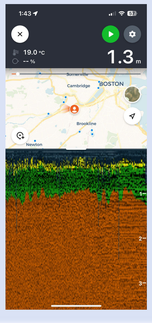
Mesh Construction: Applied Delaunay triangulation to create a continuous terrain surface.

Visualization: Produced contour maps and 3D rendered models for clear terrain representation.

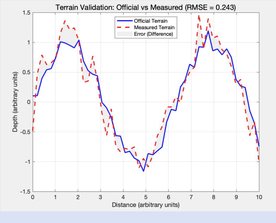
Validation: Verified terrain accuracy by comparing with official maps using Root Mean Square Error (RMSE).

Tools

Deeper fish pro+:
used to collect data.



Matlab:
used to data processing and verifying.



Reference

Smith, J. (2020). Sonar Systems for Underwater Mapping.
Brown, P., & Lee, K. (2021). Fast Fourier Transform in Sonar Applications.
Ping Sonar Documentation (2023). User Guide for Students.