Virtual Reality Visualization for Underwater AUVs

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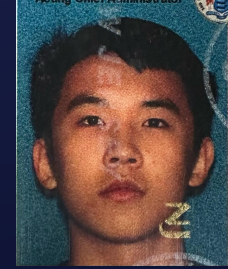August 7th, 2024

The Team

Amanda

🐟 Marlboro, NJ
🐟 Rising Junior at Rutgers
🐟 Mechanical Engineering and Computer Science

Catzby

🐠 Hillside, NJ
🐠 Rising Junior at Rutgers NB
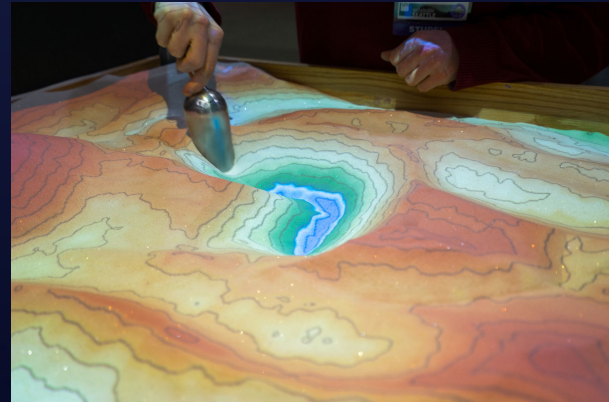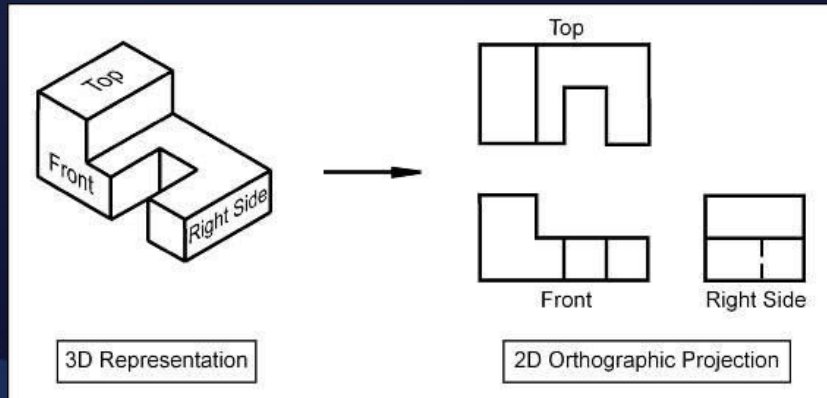🐠 Data Science with minor in Math

David

🎣 East Brunswick, NJ
🎣 Rising sophomore at Rutgers
🎣 CS and Math

Project Motivation

- Viewing 3D data on a 2D screen hides many details
- Need for immersive and interactive exploration of complex datasets

Project Objective and Technology

Goal: To develop an innovative and user-friendly VR visualization tool for 3D glider data from the Rutgers Center for Ocean Observing Leadership (RU-COOL).
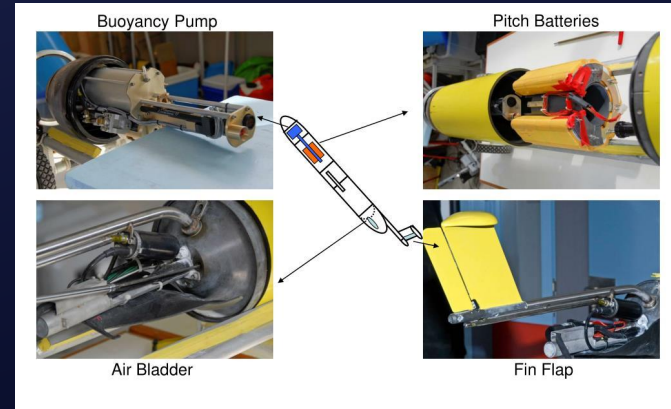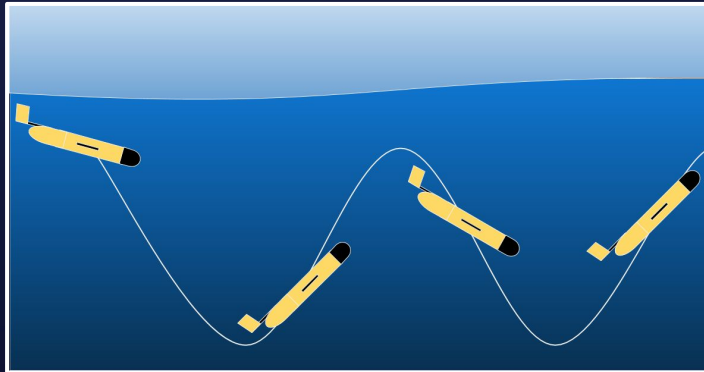
- Data Source: ERDDAP database, RUCOOL gliders
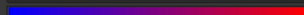- Technology: Unity Game Engine with C# scripting, Meta Quest 3, Meta XR All-in-One SDK
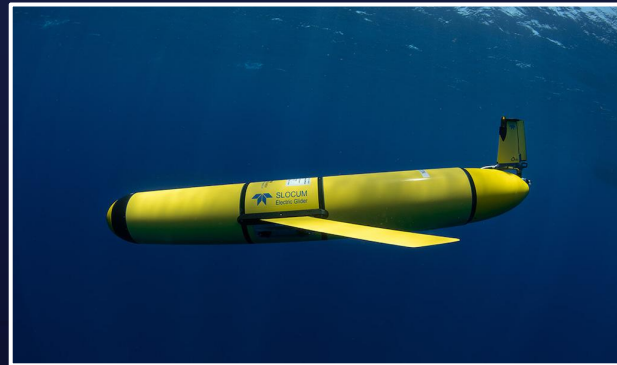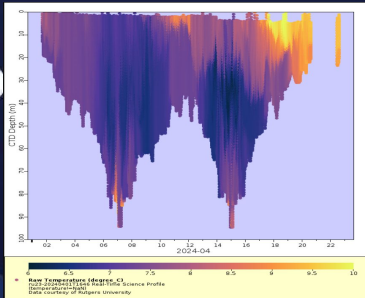
About the Glider

- Mission: Ocean Monitoring
- Integrated Instrument Platform
- Propulsion: Buoyancy changes with ballast engine

Buoyancy Pump · Pitch Batteries · Air Bladder · Fin Flap

Loading Process

Using user parameters, access and download data from ERDDAP
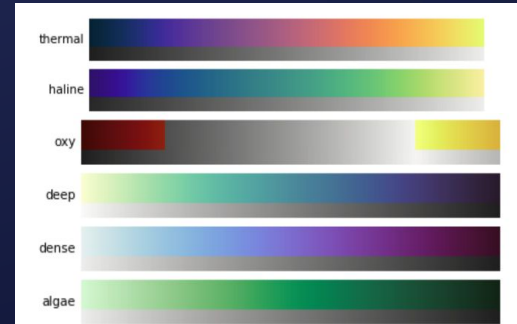
User Specifications	Web Scraping	Data Reading

User inputs basic parameters:
- Dataset ID   b
- Variables of interest
- Gradient file

Data is read from CSV and stored as runtime variables
Gradients are assigned to variables

Loading Process (cont)

Data drawn relative to the 3D world map
User is teleported to position of data

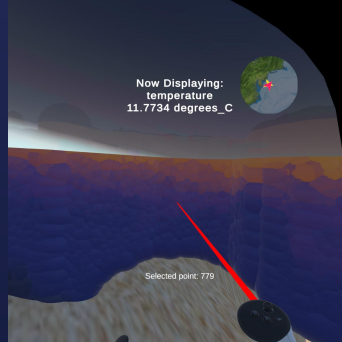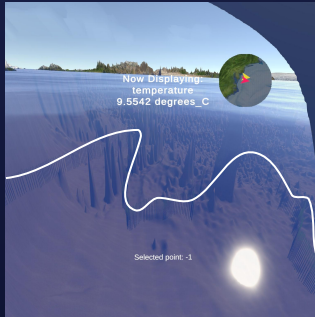Downloaded data is retained
Subsetted data is retained in CSV format
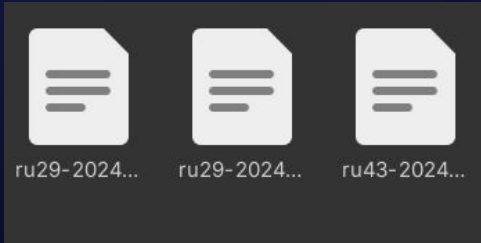
Plotting and Rendering	Interactive Environment	Application End

User can interact with the world
- Toggle variables
- Explore the world
- "Ride" the glider
- Save data subsets

Demo Video

Now Displaying:
time
6.38538E+17 UTC

Open/Close Menu: B Button
Toggle Variable Display: A Button
Detach/Attach to Glider: Y Button
Start/Stop Glider: X Button
Speed up: Right Trigger
Slow Down: Left Trigger
Free Fly Control: Right Joystick
Speed Up: Right Trigger
Slow Down: Left Trigger
Toggle Display Mode: Right Joystick Press
Select Data To Subset: Right Hand Trigger (Laser guide will show up)
Write Subset Data to CSV: Left Hand Trigger
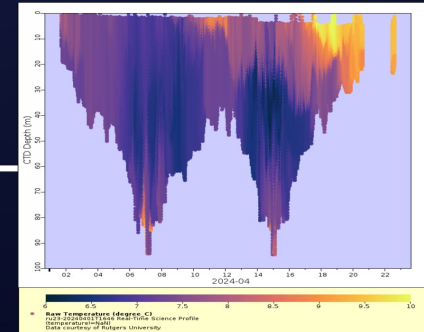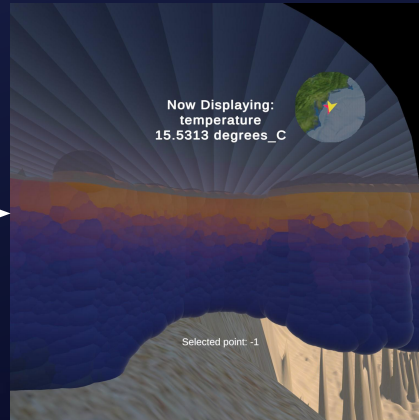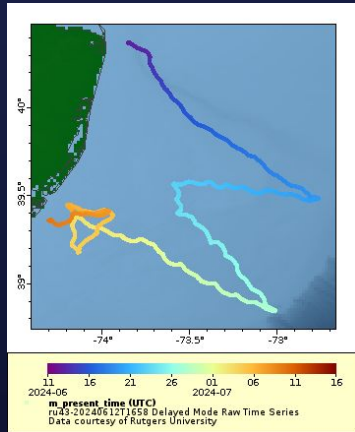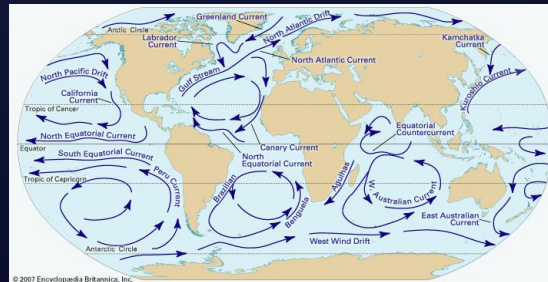
Potential Applications

- Visualization tool for the RUCOOL team
  - Discussed implementing features for observing data
- Mission planning tool for glider deployments
- Interactive learning tool for students

Future Plans and Improvements

- Optimization of data extraction and path creation
- Gauges to display current data
- Implementing ocean current patterns
- Visualization of marine organisms
- Adding a time scrubber for more flexible time forwarding and rewinding

Acknowledgements