

# CS855: Data Visualization (Assignment 1)

## Salinity visualization of sea surface of Indian Ocean

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**Abstract**—This report explains the algorithms used for visualization of sea surface salinity, details the data used and provides the insight of the visualization.

**Keywords**—contour;

### I. INTRODUCTION

This assignment does a 2D scalar field visualization of sea surface of Indian Ocean, performs color mapping, meshing using height map, and contour mapping (drawing 5 contours).

### II. DATASET

#### A. Data Procurement

The salinity data was acquired from INCOIS website. The file format used for reading data is \*.csv. Each .csv contains multiple time steps.

#### B. Data Processing

A separate class DataHandler.cpp was written to parse the .csv input file and fill the grid values accordingly.

### III. VISUALIZATION

There are three phases of visualization:

#### A. 2D Color map

Every vertex in the grid is given a color according to the salinity value at that point. Quadrilaterals were used as building blocks for the color map (fill color interpolated from vertex colors). Two color schemes are implemented: grayscale and rainbow map.

#### B. 2D Contour

The Color map is embedded with 5 contours of different colors (as shown in the legend). Marching Square algorithm was used to draw contours and Break Contours were used to avoid ambiguity.

#### C. 3D Elevation map

The color map was elevated to 3D by mapping the salinity values to the z-axis (Needs to be enabled explicitly). Gouraud Shading was used to produce continuous shading of surfaces. A wire-frame was added for better viewing.

#### D. User Interaction

- OpenGL Perspective mode was used for camera.
- Rotation on all three axis is provided.
- Color scheme can be toggled between grayscale and rainbow by pressing 'C' key. (*Note: Capital Letter C*)
- 3D elevation map can be enabled/disabled by pressing 'E' key.
- A wire-frame can be toggled on/off by pressing 'W' key.
- The consecutive time step can be switched to by pressing 'T' key.

### IV. INSIGHT

- Grayscale provides better/easier visualization results as compared to rainbow maps.
- Salinity values vary considerable on either side of India. Further salinity distribution can also be studied.
- Follow the contour lines to find similar salinity areas in the ocean.

### REFERENCES

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