

CS855: Data Visualization (Assignment 2)

Velocity visualization of geostrophic currents in Indian Ocean

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Abstract—This report explains the algorithms used for the velocity visualization of geostrophic currents, details the data used and provides the insight of the visualization.

Keywords—*streamline, glyph, vector field, LIC*;

I. INTRODUCTION

This assignment does a 2D vector field visualization of geostrophic currents of Indian Ocean, using hedgehog, streamlines, and LIC, with color mapping

II. DATASET

A. Data Procurement

The velocity data was made available as a part of the course. The file format used for reading data is *.csv.

B. Data Processing

The function `dataHandling()` parses the .csv input file and fill the grid values accordingly.

III. VISUALIZATION

There are three phases of visualization:

A. 2D Vector Glyph (Hedgehog)

Every grid point is given an arrow (rotated solid cone) with its length proportional to its speed and angle same as the velocity at that point. Arrows are colored according to their speed(normalized) using rainbow color map. Two modes are provided with arrow length normalized and scaled.

B. 2D Streamlines

Few seed points (starting points) are uniformly distributed with user defined seed density. They can be randomized by adding a jitter to their creation. Different modes are provided for streamlines: rainbow color mapped, black lines, black lines with transparency uniformly decreasing and dotted lines. They are traced using 4th Order Runge-Kutta method while implementation of Euler algorithm is also provided.

C. LIC

LIC images are provided in images folder and code is available in `src/lic` directory. It needs to be built separately from the previous two features.

D. User Interaction

- Vector visualization mode (glyph/streamline) can be toggled by pressing 'g' key.
- Glyph scaling(normalized/scaled) can be toggled by pressing 'm' key.
- Streamline styles can be toggled by pressing ' ' key (space-bar).
- Streamline thickness can be increased/decreased by pressing 'T/t' key.
- Streamline length can be increased/decreased by pressing '+/-' key.
- Jitter can be introduced by pressing 'j' key.

IV. INSIGHT

- Vector visualization is useful when looking for patterns in data.
- Planet's rotation can be studied using this data.
- It can also help in weather forecasting by deriving details on wind currents.

REFERENCES

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