AE6102 - Parallel Scientific Computing and Visualization
Project Proposal(final)
Spring 2023

Team Name: **Sifar** Date: March 13, 2023

Requirements

- `Title`: 3D Visualization and Analysis of Seismic Volumes
- `Participants`

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- `Abstract`:

The project aims to provide a comprehensive and interactive visual representation of subsurface geology by creating three-dimensional images of seismic volumes in `MayaVI` library. The project will facilitate a better understanding of subsurface geology by allowing users to interact with the data in a more intuitive and efficient manner utilizing `TraitsUI` library. Visualization of seismic volumes is a very crucial component of interpretation workflows, be it to pick salt domes, interpret horizons, identify fault planes, or classify rock facies.

- `Outline`:

The project will involve the following steps:

  - Collecting seismic data and processing it to generate seismic volumes.
  - Converting the seismic volumes into 3D models (`numpy` arrays) using a specialized python module `segyio`.
  - Developing an interactive user interface that allows the user to visualize and manipulate the 3D models, using `TraitsUI`.
  - Adding functionalities for analysis using `matplotlib` and `mayaVI` to be able to identify fault planes, classification of rock structures, etc.
  - Adding features such as colouring, slicing, and annotation to enhance the interpretability of the data.
  - Experiments with popular datasets and demonstration of results of our application corresponding to multiple use cases.

- `Deliverables`:

The final project deliverables will include:

  - A comprehensive report detailing the methodology and outcomes of the project.
  - A functional 3D visualization tool allows users to interact with the seismic volumes and view them from different angles and scales, with multiple functionalities for analysis on that seismic volume.
  - An annotated sample of the 3D model to showcase the features and capabilities of the tool.

- `Timeline`:

Date-Date	**Planned Progress**
12/02/2023 - 26/02/2023	Project proposal submission Finalize project based on feedback received during midsem week
27/02/2023 - 12/03/2023	Datasets Research, Data Collection, Research on Surface Geology for Analysis Mechanisms, Data Parsing and Transformation into `numpy` 3D models
13/03/2023 - 26/03/2023	Models and UI Design, Logics Coding Phase using `MayaVi` and `TraitsUI`
27/03/2023 - 09/04/2023	Coding Phase continued, Experimentation on Different factors and tweaks for optimization and better results
10/04/2023 - 23/04/2023	Final report, demo video and optimized code as an open-source GitHub repository.

- `Git repository`: https://github.com/rajagond/AE6102_sifar