Osdag Screening Task Report

Xarray-based Shear Force and Bending Moment Visualization

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Task: Xarray and Plotly / PyPlot Screening Task

Tools Used: Python, Xarray, Matplotlib, Plotly

1. Introduction

This document explains the implementation of the Osdag Xarray and Plotly/PyPlot screening task. The objective is to extract internal force data from an Xarray-based NetCDF dataset and generate 2D and 3D shear force and bending moment diagrams for bridge girders.

2. Dataset Description

The input dataset is provided as a NetCDF file and loaded using Xarray. The dataset contains a data variable named **forces** with dimensions **Element** and **Component**. The Component dimension stores internal force values such as Mz_i, Mz_j, Vy_i, and Vy_j.

3. Node and Element Definition

Node coordinates are provided through a Python file defining x, y, and z locations for each node. Element connectivity is defined separately and maps each element to its start and end nodes.

4. Task-1: 2D SFD and BMD

Task-1 involves generating continuous 2D shear force and bending moment diagrams for the central longitudinal girder. Element end forces are extracted using Xarray and plotted using Matplotlib with station values obtained from node x-coordinates.

5. Task-2: 3D SFD and BMD

Task-2 focuses on generating interactive 3D shear force and bending moment diagrams for all longitudinal girders. The bridge frame is constructed using node coordinates, and force values are extruded in the Y-direction using Plotly to achieve MIDAS-style visualization.

6. Sign Convention

All force and moment values are used directly from the dataset without any manual sign modification. This ensures consistency with the dataset’s sign convention.

7. Execution Commands

Task-1 and Task-2 scripts are executed within a Python virtual environment using predefined command-line arguments to load dataset, node, and element files.

This submission fulfills all the requirements specified in the Osdag screening document.