Inverse FNO from Modal Information to Structural Stiffness

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【Background】

In structural health monitoring, modal information is crucial for capturing dynamic characteristics. However, the task of inferring physical properties such as stiffness distribution from such data is complex, primarily due to the intricacies of solving inverse problems. Traditional approaches, often iterative algorithms, are marked by their significant computational demands and slow convergence rates. Therefore, more efficient and precise methodologies are needed.

【Objective】

This study focuses on employing the Fourier Neural Operator (FNO) to accurately predict structural stiffness distribution from modal data (modal shape, frequency…), showcasing the algorithm's efficiency and precision in solving inverse problems within structural health monitoring.

【Approach】

- Establish the dataset by numerical simulation.
- Train and test inverse Fourier Neural Operator (FNO) by dataset.

【Publication plan】

- R6 JSCE Annual Conference
- A journal paper after the model is refined and tested on real bridge data

【Results】

Inverse FNO can accurately predict the stiffness of discrete members from modal data, especially to localize the position of members with low stiffness.