About My Research

～The impact of deterioration on natural frequency sensitivity~

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Research Theme

"The Impact of Localized Deterioration on the Sensitivity of Natural Frequencies in Timber Bridges.“

Target Bridge

MEOTO Bridge (Reconstructed in 2020)

Total Bridge Length : 23 m
Arch Span Length : 20 m [1]

Figure１：MEOTO Bridge (Reconstructed in 2020)[1]

[1]https://www.jstage.jst.go.jp/article/jscejj/79/7/79_22-00348/_pdf/-char/ja

Background

Japan's growing number of aging bridges underscores the need for safe and sustainable maintenance.

<Traditional methods (visual checks, hammer sounding)>

- Pose physical risks during inspection
- Result in qualitative, subjective evaluations

<Non-Destructive Testing (NDT)>

- Measures physical properties without damaging the structure
- Enables repeated, safe assessments with greater objectivity

Objectives of This Research

・To analyze the sensitivity of natural frequencies at deteriorated locations and quantitatively assess the relationship between deterioration and vibration modes.

・To identify high-sensitivity areas and apply inverse analysis to estimate the actual condition of the bridge.

What I'm doing now ①

(Modeling Steps)

Individual meshing
→ Compound mesh for
integrated simulation

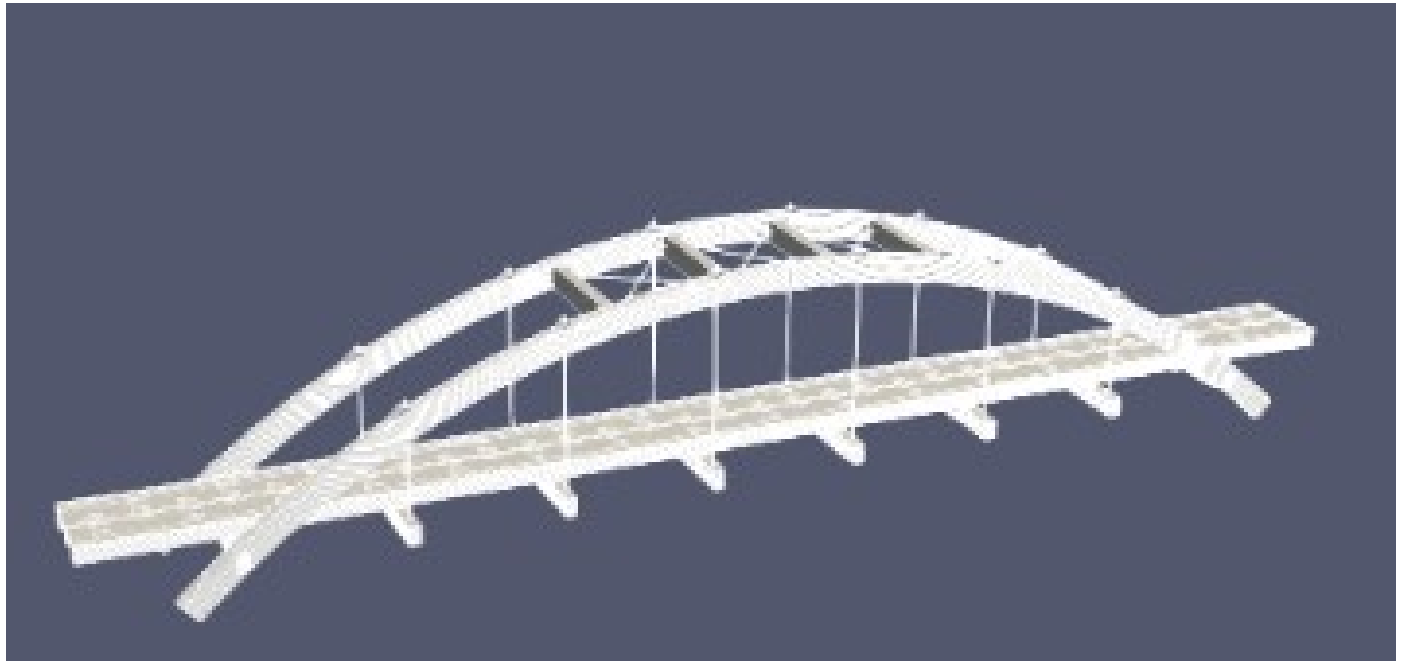

Figure2： Model of MEOTO Bridge

※Compound mesh

… An approach that merges individual part meshes into a cohesive simulation model.

What I’m doing now ②

(Local Coordinates)

I divide the arch into 17 segments and assign each one a local coordinate system using Euler angles.

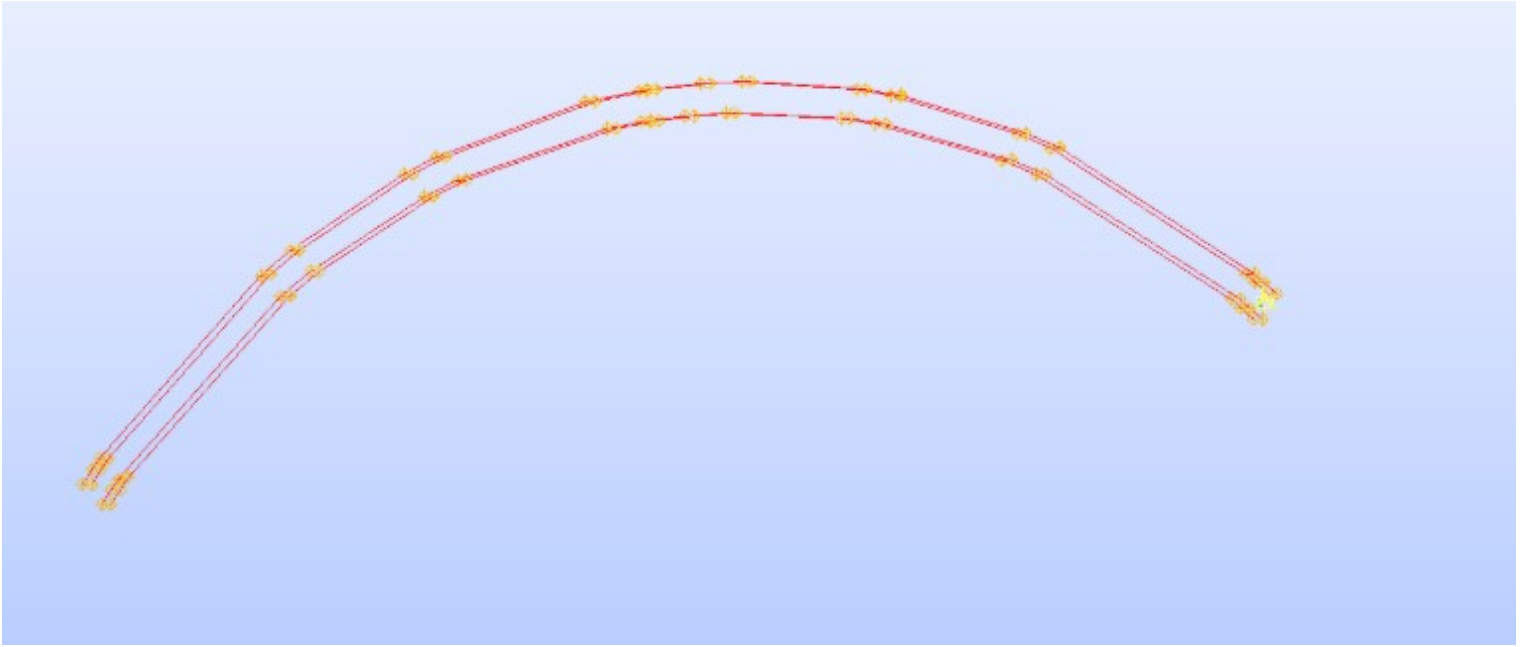

Figure 3 ：Arch divided into 17 segments

My Problem in the future

Regarding deteriorated locations:

Initially, I will determine which specific parts of MEOTO Bridge will be modeled with deterioration.

About estimating deterioration：

By adjusting Young's modulus in stages, I will extract the value that aligns the analytical natural frequency with the measured data.

Thank you for listening !