Chapter 3 - Flexible Lubricated Bearing Model

This chapter contains the methodology and results of a lateral degree of freedom flexible shaft model with lubricated bearings.

Methodology

* Component level model
  + Dynamic model in MATLAB ODE45
  + Contact model
  + Geometric model
  + Slicing method
  + Diagrams of the contact model
    - Show forces, penetration, solid lubricant film (state assumption)
* Tribodynamic model
  + Formulation (take from first chapter at this stage)
* System level model
  + Governing equations
  + Components (flexible shaft)
* Co-simulations methodology
  + Coupled simulation explanation
  + Flow chart of how information is passed between models

Results

* Dry vs lubricated comparisons
  + Time domain analysis
    - Magnitudes of force and displacement (contact and central node)
    - Film thickness comparisons at different speeds based on entrainment speed and load
    - Stiffness comparisons
  + Frequency domain analysis
    - Frequency spectra (waterfall)
* Rigid vs flexible
  + If stability allows, show the necessity of having a flexible model over a rigid model in the frequency analysis
* Detailed lubrication analysis
  + EHL distributions
  + EHL regimes (Greenwood for different speeds and roller cycles)
  + Friction?

Conclusions

Explain the necessity of flexible systems to capture dynamic response of system and all interactions