Master's Dissertation at the Div. of Structural Mechanics

HYDROBUSHING MODEL FOR MULTI-BODY SIMULATIONS

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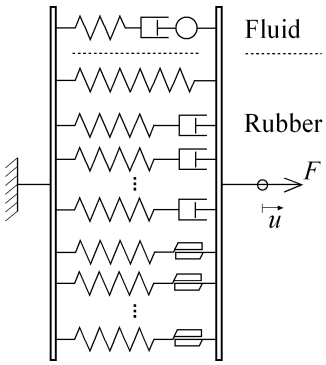
Background
Dynamic simulations of systems including rubber elements are complex, owing to the fact that the dynamic characteristics are dependent on several variables, such as amplitude, frequency, preload, and temperature.

A hydrobushing is a combined elastomeric and hydraulic system which consists of natural rubber and cavities partly filled with a fluid (glycol). The fluid can stream between chambers through channels. By using a hydrobushing, stiffness and damping properties not possible to achieve with conventional rubber bushings can be provided. The dynamic behaviour is characterized by very high damping at a specific frequency, where the fluid comes into resonance. Hydrobushings are useful for controlling NVH (Noise, Vibration, and Harshness).

Multi-body simulations of full vehicles and subsystems are carried out in the automotive industry to analyse durability, handling, and ride comfort. The Multi-Body-System (MBS) code ADAMS is used at Volvo Cars. The component models of rubber elements have proven to be critical for the quality of the simulations.

Assignment
The main objective is to establish a methodology for hydrobushing modelling and parameter identification.



Component model of hydrobushing, including fluid and rubber part.

Major activities
- Propose a hydrobushing model, which models both rubber and fluid
- Develop an automatized fitting procedure that fits the model parameters to the experimental results
- Validate the hydrobushing model by comparison with component testing
- Benchmark the proposed model with the hydrobushing model in ADAMS/Ride

The modelling and identification is performed in MATLAB. The model can be implemented into commercial MBS codes like ADAMS.