

Estimating the effect of operational loading condition from ultrasonic guided wave measurements using an iterated Unscented Kalman Filter

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Slide 1

DA1 Notes:

- Pass sometime explaining (why, what, how) you are presenting.
- Always put references
- Do one repetition
- Be sure that the content will be explainable DALMORA Andre; 05/07/2021



- The pipe is subjected to a force of 220kN which oscillates up to 2Hz.
- A weld with a defect is located between the transducer rings.
- The effect of prestresses significantly reduced the probability of detection of the defect.

Test stand of 4-point bending tests at IMA Dresden GmbH within the project QuantSHM (funding code 100207022) which was funded by the federal state of Saxony via the Sächsische Aufbaubank. (Image provided by Fraunhofer IKTS, a partner in the GW4SHM project.)













- Solving for arbitrary hyperelastic constitutive law, geometry and mechanical loading.
- High efficiency due to lumped-mass and parallelization.
- Non-assembled stiffness: low memory usage and inexpensive "parameter" update.
- Stability: operator non-negativeness must be assured.
- Strategy validated with experimental data.





























Conclusions and Perspectives Conclusions A mechanical and numerical model was presented for wave propagation on loaded structures. It comprises arbitrary hyperelastic law and non-buckling load. The simulation model was validated using experimental data. Reconstruction of loading deformation of the structure is done using the presented direct model and Reduced order Kalman Filter (ROUKF). Reconstruction of loading deformation on realistic cases were presented. Perspectives Further studies on the stability of the model and limitation of search range of estimator to mitigate instability during inversion. Mode selection: sensitivity analysis from estimation using observed data; different base with the *a priori*.



