KTH SOLID MECHANICS SEMINAR; Tuesday, May 3rd, 13.15; KTH Solid Mechanics Seminar room

John Leander "Reliability-based fatigue assessment of existing steel bridges"

The aging bridge stock in Europe and other developed countries is an impending economic burden. Many bridges have reached their expected service life and increased traffic volumes and axle loads accelerate the deterioration. To support decisions on remedial actions and to prevent precipitated decisions of refurbishment or replacement, accurate and reliable methods for condition assessment are required. This presentation shows the ongoing work to improve the methods for fatigue assessment of existing steel bridges. The overall aim of the work is to provide methods that can accurately predict the safety of a structure and thereby provide an extended theoretical service life.

A prediction of the fatigue life involves an estimation of the load, the response of the structure, the resistance and a prediction model. All parts are afflicted with uncertainties which make a reliability-based approach eminently appropriate. Probabilistic models for fatigue assessment based on linear damage accumulation and linear elastic fracture mechanics (LEFM) are presented. They enable considerations of the uncertainties in the input variables and the prediction models. The work is focused on the utilization of measured response from real bridges to reduce the uncertainties related to the loads and the structural response. Monitoring campaigns of bridges such as the Söderström Bridge in Stockholm and the Götaälv bridge in Gothenburg have rendered measured data enabling accurate estimations of the response, contributing to increased accuracy in the fatigue life predictions.

The influence on the estimated fatigue life of different modelling options has been calculated by the first order reliability method (FORM). The output has enabled an evaluation of the importance of different modelling options based on the reliability. The result of the study indicates the importance of the different parameters, which need special attentions and which need less attention. The study highlight issues that need further investigations to improve the accuracy in fatigue life predictions.

John Leander is a researcher at the Division of Structural Engineering and Bridges at KTH. He received a B.Sc. in construction engineering from Uppsala University 1999. From 1999 to 2008, John Leander has been working as a bridge engineer at Tyréns AB, a consultant company in Stockholm. In 2008 he started as a Ph.D. student at KTH and defended his thesis in 2013. Since then, John Leander has been working at KTH sharing his time between research and teaching.

John Leander has authored or co-authored nine papers in international journals and frequently serves as a reviewer. His interests in research span in situ monitoring of bridges, fatigue assessment, fracture mechanics, and probabilistic assessment methods.

The Söderström Bridge in Stockholm.

The Götaälv Bridge in Gothenburg.