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AEROELASTIC STABILITY OF LONG-SPAN BRIDGES, I: WIND TUNNEL TESTS

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In the series of articles, the problem of buffeting and aeroelastic stability of long-span bridges is dealt based on the fundamental research carried out by the author in Laboratory of Bridge Engineering at Helsinki University of Technology. The Part I concerns with historical aspects, basic definitions, assumptions and wind tunnel tests of scale models. Experimantal determination of steady aerodynamic coefficients and flutter derivatives of the bridge cross-section are described in detail.

AEROELASTIC STABILITY OF LONG-SPAN BRIDGES, II: THE SIMPLIFIED MATHEMATICAL MODEL

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In the current part (II) of the series of articles, a simplified model is presented to be used in buffeting and aeroelastic stability analysis of long-span bridges. At the model, spectral approach associated to conventional buffeting analysis is combined to linearized torsional flutter and/or galloping analysis of a bridge stiffening girder. The simplifications maid are mainly due to assumption of uncoupled and "well-separated" mode shapes, that greatly reduces the numerical efforts needed to carry out the analysis. In the Appendix of the article, a numerical example is given, in which the results for a 240 m span cable-stayed bridge are compared to the results of detailed numerical model.

KINEMATICS OF GEOMETRICALLY NON-LINEAR 3D BEAM USING KVATERNIONS

Lassi Syvänen

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The set of four Euler parameters is used to describe arbitrary rotations in the calculation of the rigid body motion and the pure deformations of 3D beam. Euler parameters have a property of a non-singular two-to-one mapping to a rotation, and they can be manipulated using quaternion algebra. The quaternion algebra is quite old method and it has been superseded by vector and matrix methods over decades until the present. However, using with Euler parameters the quaternion method turns out to be very powerful tool in the manipulation of arbitrary rotations.