

Dealing with geometric constraints in the analysis process

T. Oberbichler^{a*}, R. Wüchner*, K.-U. Bletzinger*

* Chair of Structural Analysis, Technical University of Munich

Arcisstr. 21, 80333 München, Germany

^a thomas.oberbichler@tum.de

The task of form finding is to find a geometry that is in equilibrium under a given set of constraints. These constraints are usually the prestresses in the structure. At the same time, it is desirable - and often also necessary - to formulate additional geometric constraints to find the suitable form or to make the problem solvable at all. Already at the design stage of the Munich Olympic roof, geometric constraints had to be set for the length of the net meshes [1]. The formulation of such geometric constraints and their integration into the analysis process can be a complicated task. In addition to the formulation of the objective function, the variations regarding the design parameters must be determined, which often turns out to be very laborious. The additional conditions can also be incompatible and result in a non-solvable system [2].

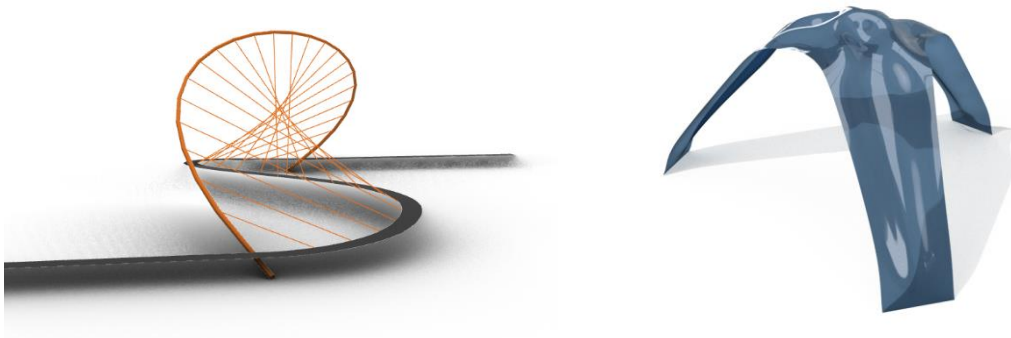


Figure 1: Moment free arc with geometric constraints (left); Reconstruction of a NURBS surface based on the results from a triangular mesh during a structural optimization (right)

The aim of this study is to present and assess possibilities for the generic formulation and handling of geometric boundary conditions in the analysis process. The procedure shall be illustrated by examples in the field of form finding and CAD reconstruction (Fig. 1).

References

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