

Software Lab:

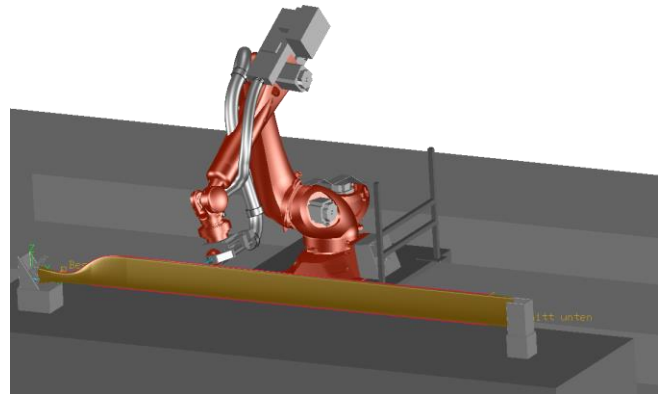
Modeling: ★★☆☆☆
Mathematics: ★★★★★
Programming: ★★★★★

Incorporating effects of flexible wirings into the kinematic simulation of industrial robots

Setting

For more than 30 years, Tebis AG has been developing and delivering turnkey 3D CAD/CAM systems for model, mold and die manufacturing. Tebis customers are mainly active in the automotive and aerospace industries and their vendor firms, primarily in the areas of styling, model manufacturing and die and mold manufacturing. The Tebis AG portfolio includes products for sculptured surface design and volume design. Tebis CAM products then create the data required to manufacture these designs.

Recently, Tebis AG is also supporting data generation to control industrial robots. These are becoming increasingly important in many areas of industrial production. Industrial robots can cover a large kinematic range with high speed and large precision. This kinematic range is only limited by the elastic wiring attached to the robot. Hence, the movement of an industrial robot needs to be programmed such that the wiring does not get damaged.



Task

Develop an application to simulate the elastic behavior of the wiring attached to a robot arm to identify critical stress states during operation.

To achieve this goal, you will have to:

- develop a simple geometric and kinematic model of the robot arm
- carry out a literature study on large strain beam theory and contact mechanics
- implement a large strain beam FEM code, including contact, to simulate the wiring
- visualize your results

Supervisors

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References

- [1] M. Hutter, M. Blösch, R. Siegwart, K. Rudin and T. Stastny, Robot Dynamics – Introduction to Multi-Body Kinematics, Lecture slides, ETH Zürich, 2015
- [2] K.-J. Bathe and S. Bolourchi, Large Displacement Analysis of Three-Dimensional Beam Structures, Inter-

