Computer model calibration for springback prediction in sheet metal forming

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Abstract

In this talk we apply different methods for computer model calibration to an example in sheet metal forming. We discuss assets and drawbacks of the considered calibration methods and interpret the results.

In many engineering applications physical processes can be simulated by complex computer models also called computer experiments. Deep drawing is such an example, where forming and springback are simulated using finite element analysis. However, the approximations using computer models for this complex process are not always entirely satisfying close to reality. Therefore the simultaneous consideration of physical experiments and computer experiments is of interest.
Computer models can be best thought of as a complex and computationally demanding function which assigns to each setting of input parameters one output value / vector (Santner et al. (2003)). Often not all of the simulation's input parameters can be specified in a physical experiment. Some of the model's input parameters might be unknown constants or they refer to numerical parameters not existent in reality. In the calibration of computer experiments we are interested in finding values of these inputs that produce reasonable simulation results with regard to reality. In this talk we briefly describe different methods for the calibration of computer models such as a bayesian approach to calibration (Kennedy and O'Hagan, 2001, Bayarri et al., 2007)) and a simple nonlinear regression approach (Cox et al., 2001). The presented methods are applied to a real data set for springback prediction in sheet metal forming. We conclude with an interpretation of the results and discuss advantages and disadvantages of the considered methods to our application.

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