

Quantitative Validation of FEM Simulations for Incremental Sheet Forming Using Optical Deformation Measurement

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Keywords: finite element method (FEM), sheet metal, computer numerical control (CNC)

Abstract. The present paper focuses on a new methodology to quantitatively evaluate finite element calculations on incremental sheet forming (ISF). ISF is a new manufacturing process for prototypes and small lot sizes. In ISF, a part is manufactured by the CNC-driven movement of a simple tool, giving rise to very challenging problems concerning the efficient modeling of the alternating contact conditions and the material's response to the cyclic deformation. The quantitative validation of the finite element analysis is achieved by an optical deformation measurement system which has been enhanced by a new calibration procedure, yielding a precisely defined local coordinate system for deformation measurements during forming. In combination with mapping algorithms for large point sets, this allows for a quantitative validation of process simulations and material input data.