Abstract:

Metal forming is the craft of reshaping a sheet or billet of raw material to a desired product shape. It has evolved from the work of the blacksmith to a family of large scale industrial processes that play a key role in the technological developments of the previous and current centuries. Current rapid developments in ‘smart factories’ open the opportunity for a revolutionary change to the metal forming practice, through the use of real-time data acquisition systems for monitoring and control of metal forming production processes. Several researchers react to these developments by starting new work on control of metal forming processes. Metal forming control is very challenging, due to strong nonlinearity, elastic spring back and distributed effects of actuators. I will discuss the nature of metal forming and the resulting challenges for the use of control systems in metal forming production. An example of a sheet bending mass production process with strong product-to-product variability is shown. A process estimator is developed which predicts variations in the final bent angle based on variations in process forces. The process control models can be either based on empirical data directly obtained from the production process or based on physics-based numerical models. Both approaches are discussed for the sheet bending process.