

DEVELOPMENT OF AN INTEGRATED APPROACH COMBINING ARTIFICIAL NEURAL NETWORK MATERIAL BASED MODELING WITH FINITE ELEMENT ANALYSIS OF FORMING PROCESSES

Brian Scott Kessler

Dr. A. Sherif El-Gizawy, Dissertation Supervisor

ABSTRACT

The use of a finite element model for design and analysis of a metal forming processes is limited by the incorporated material model's ability to predict deformation behavior over a wide range of operating conditions. Conventionally generated rheological models prove deficient in several respects due to the difficulty in establishing complicated relations between many parameters. More recently, artificial neural networks (ANN) have been suggested as an effective means to overcome these difficulties. To this end, a robust ANN with the ability to determine flow stresses based on strain, strain rate, and temperature is developed and linked with finite element – based simulation model. Comparisons of this novel method with conventional means are carried out to demonstrate the advantages of this approach as applied to industrial applications.