

SPRING 2007 SEMINAR SERIES

Date: Friday, April 13, 2007

Time: 9:30 am - 11:00 pm

Room: SL 208

Reception at 9:30 am (cookies and refreshments served)

Everyone is invited

Development of an Innovative Neural Network Model for Milling Based on a Systematic Approach for Statistical Design of Experiments

Mr. Gustavo Rengifo, Graduate Student, Department of Mechanical Engineering, Purdue School of Engineering & Technology, IUPUI, Indianapolis, IN

Abstract. An innovative Artificial Neural Network (ANN) model that predicts both cutting force and surface roughness in end milling is proposed and developed. In order to minimize the data collected for training and validation of the model, the Hyper Greco Latin (HGL) Design of Experiments (DOE) technique is implemented. The latter yields fully balanced and orthogonal fraction sets which effectively train the ANN model to the required accuracy. Next, the systematization of the process for determining the optimum data set that adequately represents the milling operation is achieved through a unique statistical approach. First, the probability distributions for the different process parameters or responses are determined. It is found that the end milling process parameters obey the exponential statistical law distribution. Next, for each of selected parameters, the distribution of the experimental data is monitored as the fraction size is increased. The lowest fraction which follows the probability distributions is determined for each of the selected parameters. From the resulting sets (i.e. one minimum set for each of the selected parameters), the optimum experimental data set for training the ANN model is estimated. The statistical analysis of a given fraction set is determined using the Chi-Square Goodness of fits test with a statistical confidence level of 95%.

About the Speaker. Gustavo Rengifo is a Master's candidate at the Mechanical Engineering Department of IUPUI. He received his ME Bachelor's Degree at Universidad Simon Bolivar, Venezuela in 2002. He worked as a research and teaching assistant at the ME department during his graduate studies. He is currently working for Cummins Fuel Systems. His academic advisor is Dr Hazim El-Mounayri and committee members are Dr Hasan U. Akay, Dr. Jie Chen, Dr. Sohel Anwar and Dr. Afan Badar.