18th International Research/Expert Conference
"Trends in the Development of Machinery and Associated Technology"
TMT 2014, Budapest, Hungary, 10-12 September 2014

DEVELOPMENT OF OPTIMAL SVM MODEL FOR WEAR RATE PREDICTION

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ABSTRACT
This paper shows the analysis of using different kernel function for development of optimal Support Vector Machine (SVM) model which could be applied for prediction of wear rate of casting parts. Development of SVM model is designed with the three kernel functions: Radial Basis Kernel Function (RBF), Exponential Radial Basis Kernel Function (ERBF) and Polynomial Kernel Function (POLY). For the development of Improved Support Vector Machine (ISVM) model mixture of kernels RBF+POLY from the real operating conditions. In order to select the optimal model the statistical indicators for all models are presented. Results show that the ISVM using ERBF+POLY mixed kernel function show the best results for the practical purposes. The proposed ISVM model with a mixture of kernels is able to accurately predict the wear rate of casting parts.
Keywords: Support Vector Machine, Kernel functions, wear rate

1. INTRODUCTION

SVM is based on statistical learning theory and is a new achievement in the field of data-driven modelling and has been successfully implemented in classification, regression and function estimation [1]. The concept underlying this algorithm is that of observing the relationships that are valid for a finite set of data. By identifying and learning these relationships, SVM acquires the characteristic of generalization, which means that the algorithm will be able to perform predictions for a new data set generated by the same source. Recently, SVM has been widely used to solve various problems in almost all scientific disciplines [2-7].
SVM requires a database that consists of a finite number of data pairs. In this study, the input database consists of the technological properties of flotation balls and measured wear rate data in the milling process. A database obtained by experimental measurement of the wear rate, served in algorithm training. There is no simple and general deterministic functional relationship between the input characteristics of the balls and wear. For determination of these relationships a statistical learning theory is used. Thus, a great number of functions that are based on the SVM algorithm are developed. A trained algorithm is used for estimating the wear rate of floatation balls with new chemical compositions and mechanical characteristics. For the prediction of the flotation balls' wear rate in the process of copper ore milling, the input data are the balls hardness (HRC) and chemical composition and the output data are the balls wear