

عنوان مقاله:

Prediction of surface roughness using a novel approach

محل انتشار:

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خلاصه مقاله:

Surface quality is a technical prerequisite in the field of manufacturing industries and can be treated as a quality index for machined parts. Attainment of appropriate surface finish plays a key role during functional performance of machined part. It is typically influenced by the machining parameters. Consequently, enumerating the good relation between surface roughness (Ra) and machining parameters is a highly focused task. In the current work, response surface methodology (RSM) based regression models and flower pollination algorithm (FPA) based sparse data model were developed to predict the minimum value of surface roughness in hard turning of AISI 4340 steel (35 HRC) using a single nanolayer of TiSiN-TiAlN PVD-coated cutting insert. The results obtained from this approach had good harmony with experimental results, as the standard deviation of the estimated values was simply 0.0804 (for whole) and 0.0289 (for below 1 μm Ra). When compared with RSM models, the proposed FPA based model showed the least percentage of mean absolute error. The model obtained the strongest correlation coefficient value of 99.75% among the other models values. The behavior of machining parameters and its interaction against surface roughness in the developed models were discussed with Pareto chart. It was observed that the feed rate was highly significant parameter in swaying machining surface roughness. In inference, the FPA sparse data model is a better choice over the RSM based regression models for prognosis of surface roughness in hard turning of AISI 4340 steel (35 HRC). The model developed using FPA based sparse data for surface roughness during hard turning operation in the current work is not reported to the best of author's knowledge. This model disclosed a more dependable estimation over the multiple regression models.

کلمات کلیدی:

Hard turning, Surface roughness, Regression, Flower pollination algorithm

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