

A multi-criteria decision-making in turning process using the MAIRCA, EAMR, MARCOS and TOPSIS methods: A comparative study

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ABSTRACT

Multi-criteria decision-making is important and it affects the efficiency of a mechanical processing process as well as an operation in general. It is understood as determining the best alternative among many alternatives. In this study, the results of a multi-criteria decision-making study are presented. In which, sixteen experiments on turning process were carried out. The input parameters of the experiments are the cutting speed, the feed speed, and the depth of cut. After conducting the experiments, the surface roughness and the material removal rate (MRR) were determined. To determine which experiment guarantees the minimum surface roughness and maximum MRR simultaneously, four multi-criteria decision-making methods including the MAIRCA, the EAMR, the MARCOS, and the TOPSIS were used. Two methods the Entropy and the MEREC were used to determine the weights for the criteria. The combination of four multi-criteria making decision methods with two determination methods of the weights has created eight ranking solutions for the experiments, which is the novelty of this study. An amazing result was obtained that all eight solutions all determined the same best experiment. From the obtained results, a recommendation was proposed that the multi-criteria making decision methods and the weighting methods using in this study can also be used for multi-criteria making decision in other cases, other processes.

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Evaluation by an Area-based Method of Ranking (EAMR);
Measurement of Alternatives and Ranking according to Compromise Solution (MARCOS);
Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS);
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