Surface Roughness Prediction Using Circular Interpolation Based on Artificial Neural Network in Milling Operation

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ABSTRCT

This paper presents a method to generate tool path and get G-codes for complex shapes depending on mathematical equations without using the package programs that use linear interpolation. Circular interpolation (G02, and G03) were used to generate tool path. This needs to define the tool radius and radius of curvature in addition to the cutting direction whether clockwise or counter clockwise. In addition many other factors had been considered in the machining process of the proposed surface to find the best tool path and G-code. Side step, feed rate and cutting speed had been studied as machining factors affecting tool path generation process. Artificial Neural Network technique had also been considered to find the best tool path depending on the cutting parameters proposed while surface roughness was the characteristic that the tool path process and G-code generation depend on. The impact of the machining parameters on the surface roughness was determined by the use of analysis of variance (ANOVA) that detects more influence for side step (85%, 53%, and 67%). From this study, it has been learned that less side step (0.2) mm and feed speed (1000) mm/min and high value for cutting speed (94.2) m/min give better tool path to be used in machining operations. This study would help engineers and machinists to select the best tool path for their products.

Keywords: Tool path generation, Surface roughness, radius of curvature, Artificial Neural Network.