

3D Printing Perceptual Models of Preference Using a Fuzzy Extreme Learning Machine Approach

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Abstract : In this paper, 3D printing orientations were determined through our perceptual model. Some FDM (Fused Deposition Modeling) 3D printers, which are widely used in universities and industries, often require support structures during the additive manufacturing. After removing the residual material, some surface artifacts remain at the contact points. These artifacts will damage the function and visual effect of the model. To prevent the impact of these artifacts, we present a fuzzy extreme learning machine approach to find printing directions that avoid placing supports in perceptually significant regions. The proposed approach is able to solve the evaluation problem by combining both the subjective knowledge and objective information. Our method combines the advantages of fuzzy theory, auto-encoders, and extreme learning machine. Fuzzy set theory is applied for dealing with subjective preference information, and auto-encoder step is used to extract good features without supervised labels before extreme learning machine. An extreme learning machine method is then developed successfully for training and learning perceptual models. The performance of this perceptual model will be demonstrated on both natural and man-made objects. It is a good human-computer interaction practice which draws from supporting knowledge on both the machine side and the human side.

Keywords : 3d printing, perceptual model, fuzzy evaluation, data-driven approach

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