Genetic Algorithm for Mesh Optimization and Online Monitoring in Rapid Prototyping System

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ABSTRACT

Due to industrial rapid progress and consumer ’ s market fast change, the product design has been asked from “ meet the cost and the quality ” to “ meet the schedule and the market ” . The life cycle for products design and manufacturing are getting shorter and shorter. With the advantages of quick development and rapid response, the rapid prototyping (RP) system has been largely used in today ’ s industry. The combined procedures for RP and design process let the time and cost for the products to reduce a great amount. Two main objects of this paper have been reached. Firstly, to reduce and optimize the STL triangular mesh before the RP process. The amounts for the meshes can influence the computer computational speed and the RP fabrication. For most products design, there is no need such lots of meshes for a smooth surface. By using weight factors, the meshes can be deleted and reconstructed a new closed polygon. The genetic algorithm is then used to get the optimized STL file with fitness evaluation values. Adaptive function is set for the genetic algorithm. Some experiments (Human Faces and shoe model) are made to examine all the RE and RP process. Genetic and slicing algorithm is considered to reduce the existed data points with satisfactory results in STL mesh deduction and reconstruction. Secondly, to combine the PC CCD video camera to get the real time image during the RP process. By using image processing and edge detection, any color errors can be detected. The RP process can be stopped for any errors occurring online. The object of this research is to provide the designer to simplify the STL model. This achievement can give the product model in good precision and get more efficiency for RP manufacturing.

Keywords : Genetic Algorithm, Rapid Prototyping, Stereo Lithography File (STL), Triangular Mesh Optimization, Image Recognition.

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