

Method for Evaluating Mechanical Quality and Dimensional Accuracy of 3D Printed Parts  
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Desktop 3D printers are fast becoming a household item. Easy access to additive manufacturing could lead to discrepancies in the quality of 3D printed parts. The purpose of this research is to establish methodologies to systematically evaluate the mechanical quality and dimensional accuracy of 3D printed parts. For the evaluation of the mechanical quality, several plastic specimens were tested on a universal testing machine (MTS Q-Test, Eden Prairie, Minnesota) to generate stress-strain profiles following ASTM D638 standards for plastic components. For the dimensional accuracy, several challenging and unconventional structures were printed. These structures allow to systematically quantify dimensional and geometrical features. The large amount of printing undertaken during this project exposed many issues related to the process of 3D printing itself. This allowed insight into the different techniques incorporated in the process of additive manufacturing which proves to be beneficial when assessing the variation in quality. Existing methods for judging quality were employed initially and an improved and convenient convention was developed. This methodology is in alignment with the recently evolved user-friendly nature of additive manufacturing and intends to bring convenience to its developers and consumers alike. The results of this research will help optimize the processing parameters in order to maximize the mechanical quality and dimensional accuracy of a given 3D printer.

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