Title:

Experimental Experimental study of powder layer coatings using Structured Light Sensing in Selective Laser Melting Printer Additive Manufacturing

Abstract:

Metallic additive manufacturing techniques are able to rapidly create parts which were previously impossible to construct with traditional methods. However, minute changes in the printing routine can create large and difficult to detect variations in the final product. Evenness of layers of the powder coating layer are often comprised by powder clumping or caused by previous layer deformation, and current imaging techniques are too slow or inaccurate for real-time decision making. This work provides the detailed development and experimental results of a novel structured light measurement system (comprised of Digital Fringe projection) which dimensionally characterizes each powder coating layer and sintered metal layer. Using this technique, ultra-fast layer height measurements of the powder coating and the sintered metal layer are obtained and saved in a 3d analysis model. A decision making paradigm is proposed which utilizes the in-situ measurements obtained in real time to assess part health, and other factors of the print. In-process part measurements were conducted to identify comprised zones during the part printing process, and were verified with x-ray imaging to access the severity of powder and layer defects causing detectable post-process internal defects The detection accuracy of the structured light system is compared against other state-of-the-art monitoring systems such as neural network imaging and thermal imaging to provide benchmarking of the new method.