Machine Learning Enabled Surface Quality Inspection of Fabricated Artifacts by Using Unstructured 3D Point Cloud Data

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Abstract

Recently, various advanced 3D scanners have been widely used in manufacturing industries to collect 3D point cloud data of fabricated artifacts. The extra dimension of 3D point cloud data can provide more detailed descriptions of anomalies in artifact surfaces than 2D image data. 3D point cloud data can be categorized into structured and unstructured point clouds. Compared with structured 3D point cloud data, unstructured point cloud data can capture the surface geometry more completely. However, anomaly detection and classification by using unstructured 3D point cloud data is more challenging due to unstructured data representation, inconsistent point sizes, and high dimensionality. To deal with these challenges, this talk will present some recent advances in machine learning for anomaly detection and classification by using unstructured 3D point cloud data. The accuracy and robustness of the proposed method are validated by simulation studies and case studies.

Biography

Juan Du is currently an Assistant Professor with the Smart Manufacturing Thrust, Systems Hub, The Hong Kong University of Science and Technology (Guangzhou), China. She is also affiliated with the Department of Mechanical and Aerospace Engineering, The Hong Kong University of Science and Technology, Hong Kong SAR, China, and Guangzhou HKUST Fok Ying Tung Research Institute, Guangzhou, China. Her current research interests include data analytics and machine learning for modeling, monitoring, control, diagnosis and optimization in smart manufacturing systems. Her research has been published on leading flagship journals such as IISE Transactions, IEEE Transactions, ASME Transactions, Technometrics, and Journal of Quality Technology. Among these works, 7 papers have won the best paper awards or finalists from prestigious organizations such as the IISE Data Analytics and Information Systems (DAIS) Section, INFORMS Quality, Statistics and Reliability (QSR) Section, and INFORMS Data Mining Section. She is a senior member of IISE, a member of INFORMS, ASME and IEEE. More information can be found on her website https://sites.google.com/view/juandu/.