

Data Modeling and Calibration of In-Line Pultrusion and Laser Ablation Machine Processes

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Abstract : In this work, preliminary results are given for the modeling and calibration of two inline processes, pultrusion, and laser ablation, using machine learning techniques. The end product of the processes is the core of a medical guidewire, manufactured to comply with a user specification of diameter and flexibility. An ensemble approach is followed which requires training several models. Two state of the art machine learning algorithms are benchmarked: Kernel Recursive Least Squares (KRLS) and Support Vector Regression (SVR). The final objective is to build a precise digital model of the pultrusion and laser ablation process in order to calibrate the resulting diameter and flexibility of a medical guidewire, which is the end product while taking into account the friction on the forming die. The result is an ensemble of models, whose output is within a strict required tolerance and which covers the required range of diameter and flexibility of the guidewire end product. The modeling and automatic calibration of complex in-line industrial processes is a key aspect of the Industry 4.0 movement for cyber-physical systems.

Keywords : calibration, data modeling, industrial processes, machine learning

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