

Process monitoring using machine learning for additive manufacturing

Thomas Gruenberger¹

1-plasmo Industrietechnik GmbH, Dresdnerstraße 81-85, 1030 Vienna, Austria

thomas.gruenberger@plasmo.eu

The presentation gives an overview about diode based and camera based (2D/3D) monitoring systems for laser based powder bed fusion and directed energy deposition and WAAM processes. The presented technologies are independent from feed stock (powder, wire) and energy source (laser, electron beam, CMT, MIG/MAG, plasma) in case of DED. These technologies – sensitive in different wavelength regions in the visible, NIR and SWIR spectrum - can be used for checking part quality, due to the lack of part quality standards additional added value is presented for different user maturity (beginners, .application development, production and scalability to different machines and plants) and the user group of machine builders. Prior to machine learning newest visual computing techniques will be shown to assist beginners and experts. These techniques can be used additionally as a first step for feature analysis detecting important features for machine learning.

Main topic of the presentation is giving examples how machine learning techniques can be used to increase this added value. Supervised learning techniques based on neural networks are presented to model different tasks, e.g. predict reference signals of monitoring systems in case of changing process parameters or predict porosity in a PBF-L process as classification and regression task. Unsupervised clustering techniques will be presented enabling users to look e.g. for irregularities in tons of layer wise image staples. These techniques are based on clustering techniques like e.g. k-means or t_sne transformation. As predictors for the machine learning systems physical explainable predictors are used, this will enable hopefully explainable machine learning models in future. At the end an outlook is presented how AI based systems will enable one goal of the community, push one button and print, in the next 10 years.

Please send your completed Word document to: abstracts@ailu.org.uk