

Compound Quality Assessment in Laser Beam Melting Processes Using Layer Images

Joschka zur Jacobsmühlen, Stefan Kleszczynski, Gerd Witt and Dorit Merhof

http://www.lfb.rwth-aachen.de/en/research/industrial/bigs/



Introduction









Build platform Powder container

Field of view: approx. 180 x 140 mm



zur Jacobsmühlen, J.; Kleszczynski, S.; Schneider, D. & Witt, G. High Resolution Imaging for Inspection of Laser Beam Melting Processes 2013 IEEE International Instrumentation and Measurement Technology Conference (I2MTC), **2013**





Sample Layer Image (Crop)







Layer Rating

Energy input influences surface topography







Layer Rating



> Analyze "prominence" of laser scan lines



Objective: decompose surface image









Scan schema





Estimation of Scan Orientation





0 50 100 150 θ[°]





Surface = scan lines (sine shape) + background









Decomposition: Matched Filter (Frequency Domain)





Decomposition







Signal Energy Ratio







Experiments: Qualification of Powder Material







Experiments: Layer Rating







Experiments: Selection of Robust Estimations







Binary Classification: "Was region selected manually?"

1 region per part, 14 layer: sampling with replacement for larger dataset





- Leave-one-region-out
- Manual selection: 5 out of 25
- No selection: loss = 20% (baseline)





- Different parameter settings cause surface topography variations
- Inspection in layer images
- Subjective/manual criterion replaced by image analysis
- Good correlation with energy input
- Application: automatic classification of surfaces in material qualification

Future work

- Robust orientation estimation (global estimate per layer)
- Comparison to more manually annotated build jobs







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