Title: Inline monitoring in additive manufacturing

Problem statement

Additive manufacturing is a key to sustainable future aerospace as it enables manufacturers to create parts perfectly designed for purpose, reducing unnecessary weight and thus energy consumption in use and manufacturing. So far each part that will "fly" must be inspected manually in a time-consuming qualified process after the printing. Inline monitoring of the additive manufacturing process utilising AI is a promising approach to remove post-printing inspection, reducing the overall time and cost, as well as energy consumption, material consumption and waste. This is done by monitoring printing parameters during the process, enabling the prediction of the expected outcome and allowing for corrective actions early in the manufacturing process.

Inline monitoring, however, is still a comparatively new approach that faces multiple challenges: **technical** i.e. can it properly monitor process parameters, **economical** i.e. will it overall really be cheaper taking development e.g. AI training into account, and **regulatory** i.e. will aerospace authorities accept/qualify a less human-centric process without having the dependencies on the cost/time intensive inspection (that actually should be avoided) to create the required ground-truth information.

Research question(s)

What are the approaches and associated obstacles towards the use of inline monitoring in additive manufacturing and how do different manufacturers/developers/researchers intend to overcome the challenge of qualifying inline monitoring as replacement for post-printing inspection?

Expected type of work

Technical study (evaluation of the state-of-the-art on a case study) or qualitative study (based on interviews with manufacturers and developers).

References

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