Master thesis proposal

Quality assurance in Laser Powder Bed Fusion process by means of in-situ monitoring systems and Artificial Intelligence techniques

Background and aim

Laser Powder Bed Fusion (LPBF) is widely considered one of the most promising manufacturing processes in the field of Additive Manufacturing (AM) for metals alloys. The freedom and complexity in design offered by AM is unique and very beneficial, especially for tooling applications. Greater reductions in process cycle times and part quality are now achievable due to the innovative AM design solutions. Despite the aforementioned benefits, the LPBF process can be prone to defects and process stability related issues during large and complex manufacturing assignments. Such faults, when occur, can seriously hamper the quality of the produced material and the total prospects of the process. It is thus important to utilize means that offer monitoring of the process and its deviations. Today, systems that offer in-situ monitoring capabilities for the LPBF process exist commercially, though their maturity level is still limited in respect to post process capabilities and data evaluation.

The aim of the present study is to investigate and possibly develop a framework based on Machine Learning (ML) algorithms that can post process raw data generated from in-situ monitoring systems developed for the LPBF process. The monitoring systems of interest are primarily the Optical Tomography (OT) and Melt Pool (MP) analysis. The focus of this work will be in identifying and implementing a learning model based on image analysis that can correlate input from the monitoring systems in order to register and cluster potential material and process anomalies.

Tasks

- Literature research on Machine Learning algorithms and image analysis
- Planning of activities
- Development and implementation of ML algorithms
- Reporting, update meetings
- Thesis writing

Timing and reimbursement

The project should start as soon as possible in 2021 (preferably in late January - beginning of February) for the total duration is 20 weeks, full-time.
The student will be reimbursed.

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