



ADVANCING THERMOPLASTIC COMPOSITE TECHNOLOGIES

The ThermoPlastic composites Research Center (www.tprc.nl) is an open research center for fiber reinforced thermoplastic composites. TPRC performs research in co-operation with national and international partners, such as Fokker, Toray and Boeing, on the processing and performance of thermoplastic composites. TPRC would like to reinforce its research team with an intern or graduation student on the topic of:

MODEL-BASED MACHINE LEARNING FOR LASER ASSISTED FIBER PLACEMENT PROCESSES

Project description

Automation of composite production processes offers flexibility in design, repeatability and increased throughput. However, the process must be completely understood before it can be automated. Consider for example the laser assisted fiber placement process (LAFP), where the consolidation quality of the component is the result of a complex interplay of many known and hidden variables related to the process, material and part design. The usual route is to break down the overall problem into sub-problems such as optics, thermal, rheological and mechanics of material problems. However, due to various assumptions required to solve the sub-problems, and the possibility of having unidentified sub-problems, the solution process becomes intractable. The approach in this study is to use model-based machine learning techniques to construct an abstract model of the process from a set of assumptions. The assumptions can be derived from the existing knowledge base, known variables and their interdependencies, and from the experimental observations of the process (e.g. state of tape width during the process). Ultimately, with constantly streaming experimental data, the internal state of the model can be updated and better predictions of the process output can be obtained.

Tasks

This assignment focuses on setting up the model-based machine learning framework for tape widening effect in LAFP process. The work includes:

- Literature study on tape widening effect in thermoplastic composites with LAFP.
- Develop a test program to characterize the controllable/observable process variables.
- Performing experiments, construct the abstract model and validate the model.
- Finalize the study in the form of a Master thesis.

Practical information

The project is to be performed within a time frame of 8 months and is a collaboration between the Applied Mechanics and Data Analysis group, the Production Technology group and the ThermoPlastic composites Research Center. Please contact Sebastiaan Wijskamp (Sebastiaan.Wijskamp@tprc.nl), Iqbal Rasheed (m.i.abdulrasheed@utwente.nl) or Wouter Grove (w.j.b.grove@utwente.nl) for additional information.