PROPAGATION SIMULATION OF MULTIPLE CRACKS IN ADHESIVELY BONDED COMPOSITE JOINTS

CertBond
COST Action CA18120

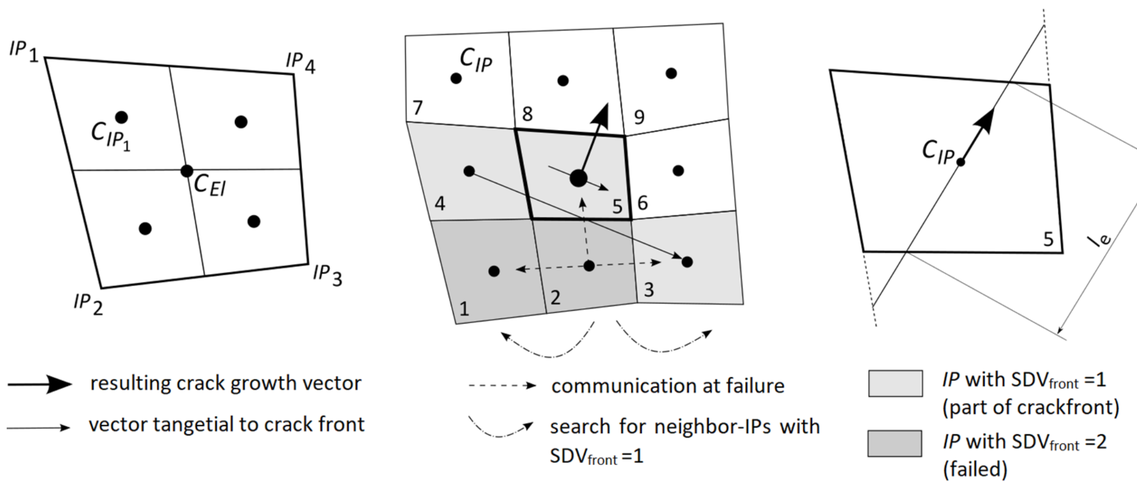
Lukas Münch

Supervisor: Prof. Dr.-Ing. Peter Middendorf

Background of the Institute

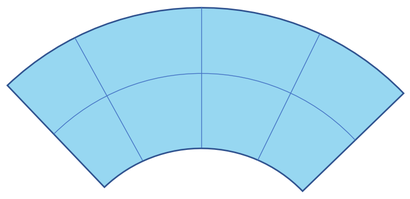
Previously developed simulation method for crack propagation in a single plane

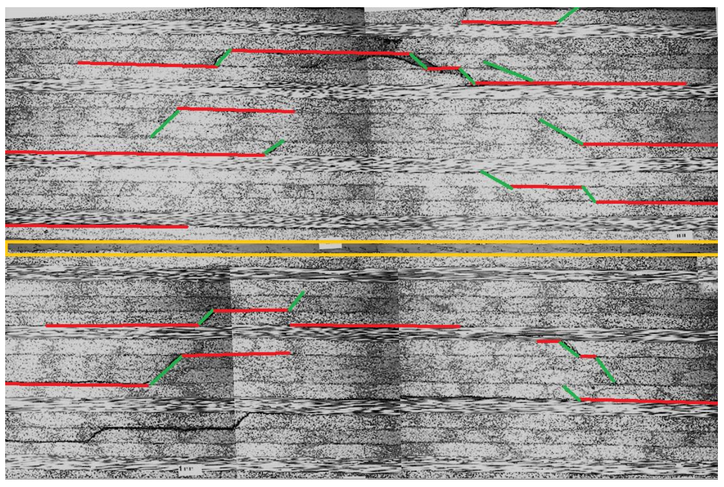
- Extension of Cohesive Zone Model
  - Additional fatigue damage variable
- Adaption of Paris‘ Law
  - Mixed mode ratio dependent Paris‘ Law
- Crack Tip Degradation Approach
  - Apply fatigue degradation to crack tip elements
- Integration into Abaqus Explicit
  - Load envelop and correlation of time with cycles
- Local neighbor depended crack front calculations



Knowledge Gap

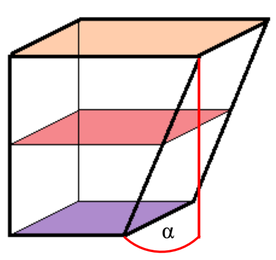
- Extension of method to 3D
  - Will allow for more modelling freedom and therefore potential use cases of the simulation method
- Implementation of multiple crack fronts in the propagation simulation
  - In order to model complex crack initiation scenarios such as impact damage

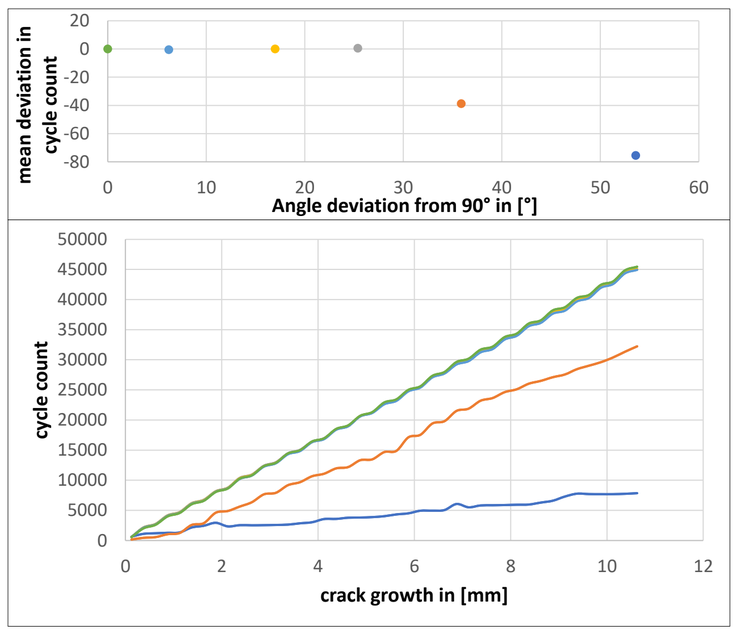




Results

- Adaptation from Abaqus 6.14 to Abaqus 2019
  - Here the previously validated could be matched closely
- Mathematical adaptation of the preprocessor and material model to allow for distorted elements
  - The simulation method can handle distorted elements for low angle deviations
  - For larger distortions some development still needs to be conducted
- The preprocessor can handle multiple instances with the user defined material model.
  - Multiple crack fronts can propagate simultaneously within the simulation





Outlook

- Material characterization for delamination failure
- Validation of model for interlaminar failure
- Simulation of crack propagation with complex crack initiation

Lukas Münch
Lukas.muench@ifb.uni-stuttgart.de
Tel.: +49 (0) 711 685-60532

University of Stuttgart
Institute of Aircraft Design
Pfaffenwaldring 31, 70569 Stuttgart

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