Motivation and Objective

Inline 3d geometry inspection of hybrid components
- Between hot forming process steps
- Localisation and characterisation of the joining zone
- Non-destructive prediction of residual stresses
- Optical non-contact measurements

Initial Challenges and Proposed Solutions

Red glowing specimen effects optical 3d measurements
- Radiation from self-emission reduces contrast
- Light deflection by refractive index (RI) gradient
- Proposed solutions
  - Bandpass filter on camera lens
  - Reduction of RI gradient through coarse vacuum

Measurement Setup and Accuracy on Cold Standards

Setup
- High-power green-LED (525 nm) DLP projector
- AV Prosilica GT camera with Linos MeViS-C lens
- MidOpt bandpass filter (525 nm +/-10 nm)
- Multi-frequency phase-shift patterns

Measurement Results

Stainless steel 1.4571 pipe heated from the inside
- Temperature of pipe 482 °C
- Measurement from above and the side
- Radius analysis via GOM cylinder fit
- Analysis of 20 measurements each

Future Work

Algorithmic compensation
- Multi camera setup
- Based on ray tracing simulations

Estimation of RI field
- Background Oriented Schlieren setup
- Integration into vacuum chamber

Acknowledgements

We would like to thank the German Research Foundation (DFG) for the financial and organisational support of this project within the Collaborative Research Centre 1153 Process Chain for Tailored Forming.