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Online Preventative Non-Destructive Evaluation in Automated Fibre Placement

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The strict quality requirements for aerospace composite structures give rise to costly quality control procedures. In automated fibre placement (AFP) these procedures rely heavily on manual work and inspection. This research aims at performing preventative non-destructive evaluation of composite laminate quality based on an online geometric analysis of the placed fibre. A robot mounted laser profile sensor, in combination with robot positional data, is used to create a 3D model of the fibre. These are fused using quaternion coordinate transfer operations with the Robot Operating System, an open source robotics platform.

The 3D model is converted into an image for fast processing using open source algorithms from OpenCV. Deviations in part-product quality are identified in real-time including geometric, positioning and buckling defects due to high-radius curvatures in the fibre path.

Currently the prototype system will give a non-conformance warning to the operator, and in future work it is planned to develop

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automated feedback and control algorithms to correct common defects. The implementation of a preventitive system in an industrial fibre placement process can cut back the time spent on inspection and rework.
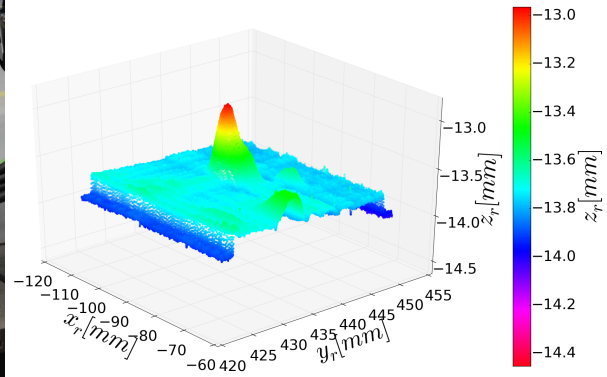

Figure 1: Experimental setup

Figure 2: 3D model of fibre