Test preparation and execution of an automotive component in the context of robot-based material testing

Type of work: Bachelor Thesis

Motivation

Universal testing machines, which are used for material characterization, usually only allow the representation of a few special load cases, e.g. the application of pure tensile or compressive loads. Although test systems exist that can represent superimposed loads, e.g. tensile torsional loads, or biaxial load cases, the variability of the representable (multi-axial) load paths is limited. The use of 6-axis robotic systems offers completely new degrees of freedom in material characterization compared to classical universal testing machines. On the one hand, this approach allows complex load paths to be represented by the diverse movement options of the robot systems and, on the other hand, to realize an in-situ adaptation of the applied load by integrating suitable measuring systems. In this context, the control of the robots as well as the data acquisition and fusion of individual measurement systems is a central issue.

Objectives

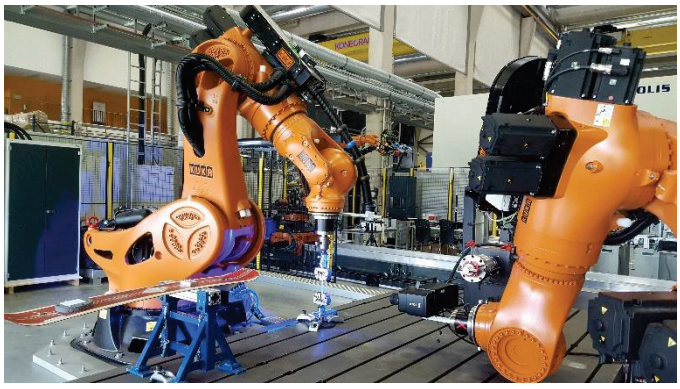
The aim of the work is the development of a test plan and the implementation of a robot-based test using the example of an automotive component. This includes theoretical preliminary work as well as an experimental implementation. Insights can be gained in various areas, such as development and design as well as test planning and experimental implementation of their own preliminary considerations.

Requirements

- Degree in materials science, industrial engineering or similar
- Experience in design and CAD
- Self-motivation and interest in the subject
- Independent and conscientious way of working
- Previous knowledge in the field of economic evaluation desirable
- German or English language skills

Tasks

- Research about component testing and the functionality of automotive components
- Determination of various practical load cases that can be tested robotically
- Development and construction of different test punches and a clamping device for the automotive component
- Testing of the automotive component based on the previous considerations
- Theoretical planning of a conventional test (with the help of a test cylinder and other constructions) for the cost and effort estimation
- Comparison of the two testing methods regarding effort and costs (economic efficiency analysis)



Robot-based component testing using the example of a tensile test

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Type of work: theoretical, experimental

Materials Resource Management