OPTx PLM Injection Moulding Data Visualization

Student

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Initial Situation: The OPTx PLM system is a web-based application designed for the management of injection moulding processes. Built on the Angular web framework and inspired by previous master's research, the application is currently being developed by the academic institutes associated with the University of Applied Sciences in Rapperswil. Throughout the lifecycle of the injection moulding process, fundamental product data is accumulated. OPTx PLM is designed to manage this data and provide a platform for reviewing the injection moulding process. In practice, not all the accumulated data is conducive to the generation of meaningful visual representations, preventing users from identifying potential improvements to the product. A subset of the data is relevant to the analysis of the injection moulding process, although the overall volume remains significant. This thesis attempts to delineate the relevant data points and formulate a visualisation framework tailored for integration into the OPTx PLM system. The implementation of a prototype using the Angular framework is essential to demonstrate the viability of the proposed visualisation concept.

Approach / Technology: In order to understand the problem domain and its challenges, a thorough domain analysis is performed. Findings from the previous master's thesis, the OPTx PLM system and consultations with domain experts are used in this domain analysis. Identifying and categorising the relevant data is the next step. By gaining a comprehensive understanding of the dataset, boundaries can be delineated and preliminary sketches for potential visualisations can be formulated. Extensive exploration within the science department is undertaken to identify effective visualisation concepts and the most optimal approaches are selected. Usability testing is carried out to assess the effectiveness of the visualisation concepts developed. For implementation purposes, a comprehensive technology evaluation is conducted to identify the most suitable visualisation technology for integration into the OPTx PLM system. The construction of a prototype is then initiated, based on the visualisation concepts developed and the technology evaluated.

Conclusion: To summarise the research conducted, the visualisation of the OPTx PLM system data set is challenging due to its diverse nature. The domain analysis indicates that the focus should be on identifying data that deviates from the aspired values. The first concern is to identify data that deviates from expected values, which is achieved through comparative analysis against expected values. Bar charts and scatter plots are very effective for this data comparison task. Given the precision requirements and the subtle differences in the data, both solutions are considered suboptimal. A necessary transformation of the data into a uniform unit is essential to allow comparison using a deviation chart. Finally, a combination of tables and graphs is necessary, as certain domain data is unsuitable for visualisation. Usability testing of the visual concepts developed yields positive results, with users successfully identifying data deviations from expected values. This validation increases the credibility of the research undertaken and the effectiveness of the visual concepts constructed.
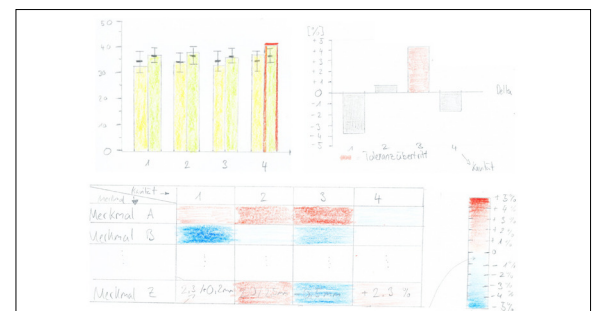
Existing OPTx web app clipping
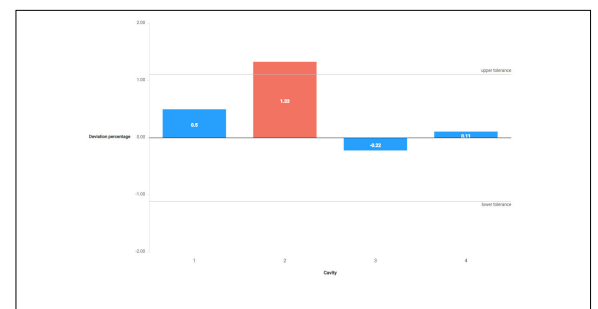OPTx - PLM v0.0.1-SNAPSHOT - Copyright © 2024 OST
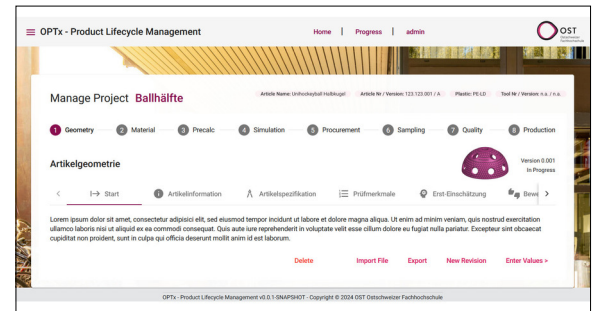
Visualization sketches during the evaluation process
Own presentment

Deviation chart created with Angular
Own presentment

Advisor
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Subject Area
Software and Systems, Computer Science, Plastics Technology, Data Science

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