

PRESS RELEASE

Product development: decision-making and communication in view of conflicting quality criteria

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Decisions are rarely made easily, especially when criteria are in conflict—the visualization of alternatives helps organize thoughts. A tool by Fraunhofer IGD is making it easier for engineers to find the optimal design of a commissioned product, and allows for transparent, straightforward cost–benefit comparisons that reduce decision-making time.

(Darmstadt) An engineer is designing an electric motor that meets the nominal criteria specified by the client. Her presumption that a different material or geometry might further benefit the motor’s performance is confirmed in simulations. How does she, however, report this to the client, who will be skeptical towards the increased costs associated with the change?

The solution: a clear visualization of the alternatives that offers composite filters to quickly drill down to the preferred design candidates. Dragging a slider to increase acceptable cost, for example, causes the visualization to seamlessly display the effects on the motor’s remaining properties. This enables decision-makers to identify the advantages and drawbacks of specific designs at a glance, without the need for in-depth expertise. Customer and engineer can decide based on the envisioned application: If efficiency, for example, is less critical, a more affordable motor design may be chosen.

The interactive controls of the visualization help clarify decision-making processes and significantly reduce coordination time in the face of multi-criteria cost–benefit trade-offs.

Interactive visualization that focuses on decision-makers

In order for a visualization to effectively support a human analysis process such as decision-making, the real-life domain characteristics need to be taken into consideration. For this purpose, the tasks, work flows, and needs of domain experts are analyzed to derive requirements that have to be met by a visualization. Based on this characterization, suitable visualization approaches can be chosen and tailored to the application domain. The presented visualization was developed in close collaboration with engineers from the Linz Center of Mechatronics over a period of one and a half years. Thanks to this collaboration, a tailored solution was born that can be seamlessly integrated into existing analysis processes and work flows. How this user-centered process has been successfully implemented can be read about in our researchers’ journal article entitled “PAVED: Pareto Front Visualization for Engineering Design”.

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Further information:

Full paper "PAVED: Pareto Front Visualization for Engineering Design":

<https://diglib.eg.org/handle/10.1111/cgf13990>

Presentation at EuroVis 2020:

<https://www.youtube.com/watch?v=QYHaFxfIm0M>

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About CloudiFacturing

This research project was funded by the EU project "CloudiFacturing". The goal of the program is to optimize production processes using cloud-based/HPC-based modeling and simulation. The idea is to provide computer-intensive production engineering and simulation as well as data analysis tools as cloud services in order to increase accessibility and make their use more affordable.

<https://www.cloudifacturing.eu/>

About Linz Center of Mechatronics GmbH (LCM)

Over 90 engineers are working on future challenges in mechatronics at the Linz Center of Mechatronics GmbH (LCM). LCM bridges the gap between university research and industrial application. In cooperation with companies, LCM makes new knowledge available and supports customers in product development up to the transition to series production. LCM offers a unique environment for creative and application-oriented research and development. LCM has a large international partner network, due to the constant participation in international research projects.

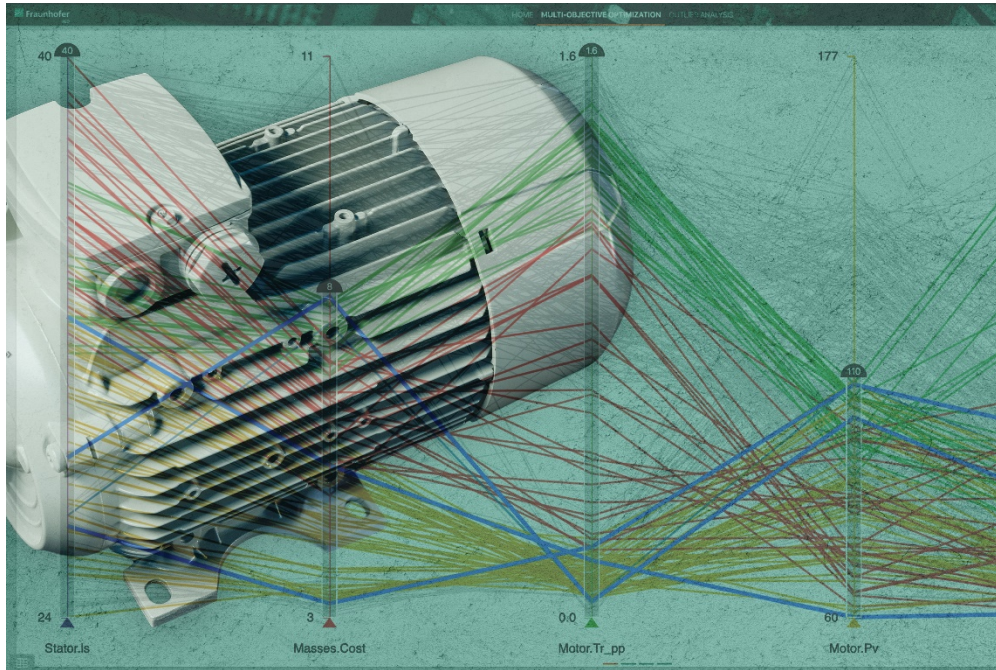
<https://www.lcm.at/en/>

About System Model Space (SyMSpace)

Since early 2000, Linz has become a centre for electrical drive technology. The engineers of the Linz Center of Mechatronics GmbH have developed a software called SyMSpace to improve electrical drive engineering. SyMSpace is used to calculate countless highly efficient motors designs every year. An intuitive visualization of these design results is becoming more important to select the best possible solution for the dedicated use case. The focus of the design study "PAVED: Pareto Front Visualization for Engineering Design", is addressing this visualization issue.

<https://symspace.lcm.at>

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Image (M): What requirements does the electric motor need to meet? Are there parameters that can be neglected to save on cost? An uncluttered visualization helps designers, engineers and customers communicate with each other. (© Fraunhofer IGD/Linz Center of Mechatronics GmbH)

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Institute profile

Founded in 1987, the Fraunhofer Institute for Computer Graphics Research IGD is the world's leading institute for applied research in visual computing— computer science based on images and 3D models. We turn information into images and images into information. Keywords are human-machine interaction, virtual and augmented reality, artificial intelligence, interactive simulation, modeling, 3D printing and 3D scanning. Around 180 researchers at three locations in Darmstadt, Rostock and Kiel in Germany develop new technology solutions and prototypes for industry 4.0, digital healthcare and the smart city. In cooperation with its sister institutes in Graz, Austria and in Singapore, they also take on international relevance. With an annual research volume of €21 million, we use applied research to help in the strategic development of industry and the economy.

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