Visualizing and interacting with multi-objective **tradeoffs** for **sustainable** laser cutting

model dimensions

material efficiency

scrap utilization

structurally important edge

connected pieces for fast assembly

shape of the left-over material
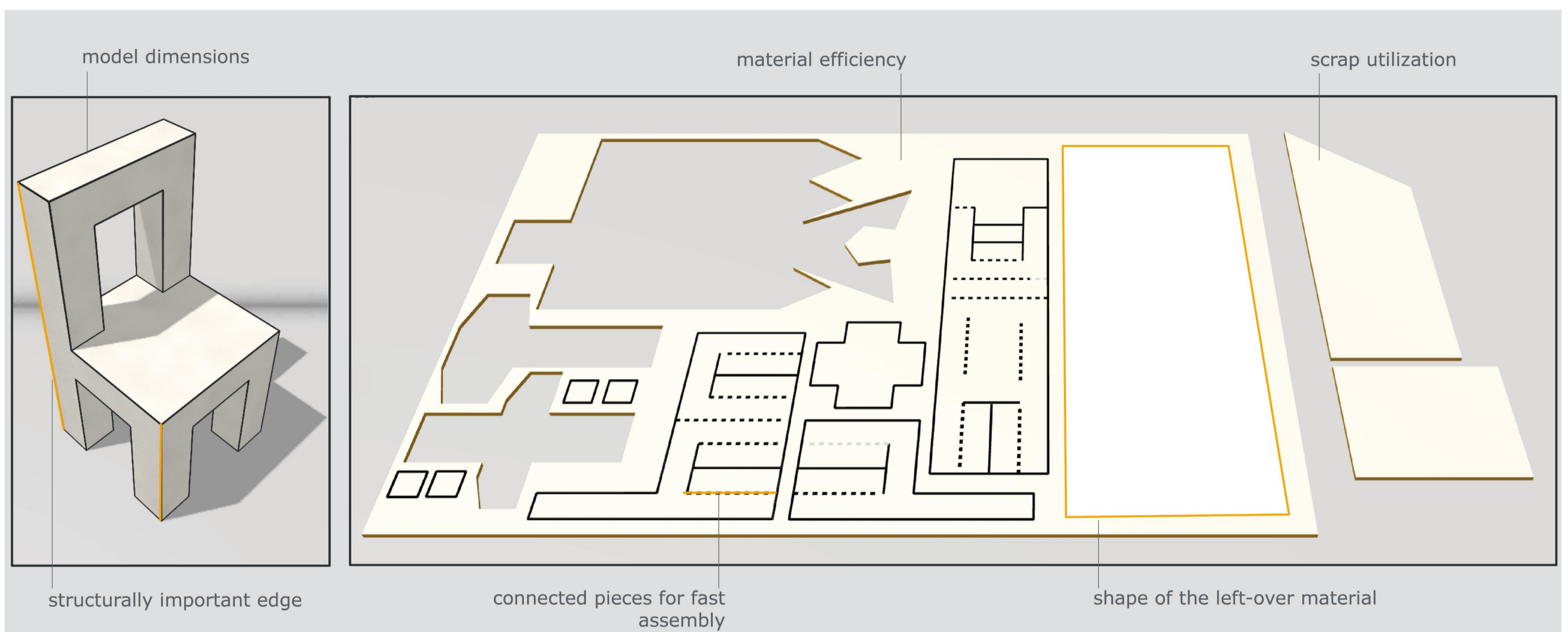
The performance of a laser-cut object is evaluated by multiple aspects. These include the dimensions, structural stability, visual quality, amount of material used, how efficiently the material is used, and the duration of assembly.

Past research provides methods to optimize for individual aspects (Fastforce, HingeCore) or to find a trade-off between two of them (Fabricaide, BoxCutter). However, since all the aspects are interdependent, a global optimization is required. This problem presents an exponential solution space.

Moreover, its nontrivial for users to express a global utility function across multiple trade-offs.

Implement a system

Implement a system that visualizes the dimensions of the model, structural stability, visual quality, material efficiency and the duration of assembly at the same time so users can understand the tradeoffs and find the solution that is globally optimal for them.

Implement Optimization Algorithm

Write an algorithm that optimizes for different metrics generating multiple solutions. Decide which of the pareto optimal solutions to pick and present as suggestions to the user. Visualize these suggestions and allow the user to directly manipulate the results.

Write Code in Typescript

1. You will implement a parametric modelling interface
2. You will write 3D Interactive tools to render and edit 2D plates in a 3D environment
3. You will write an algorithm that deals with an NP-hard problem
4. You will integrate into a medium-size software system (Kyub, 240.000 lines of code, kyub.com)

Develop and test the new system using real-world application scenarios.

And then deploy. Help thousands of users worldwide save time and resources—and thereby extend the scope of personal fabrication to a non-technical audience.

Contact us

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