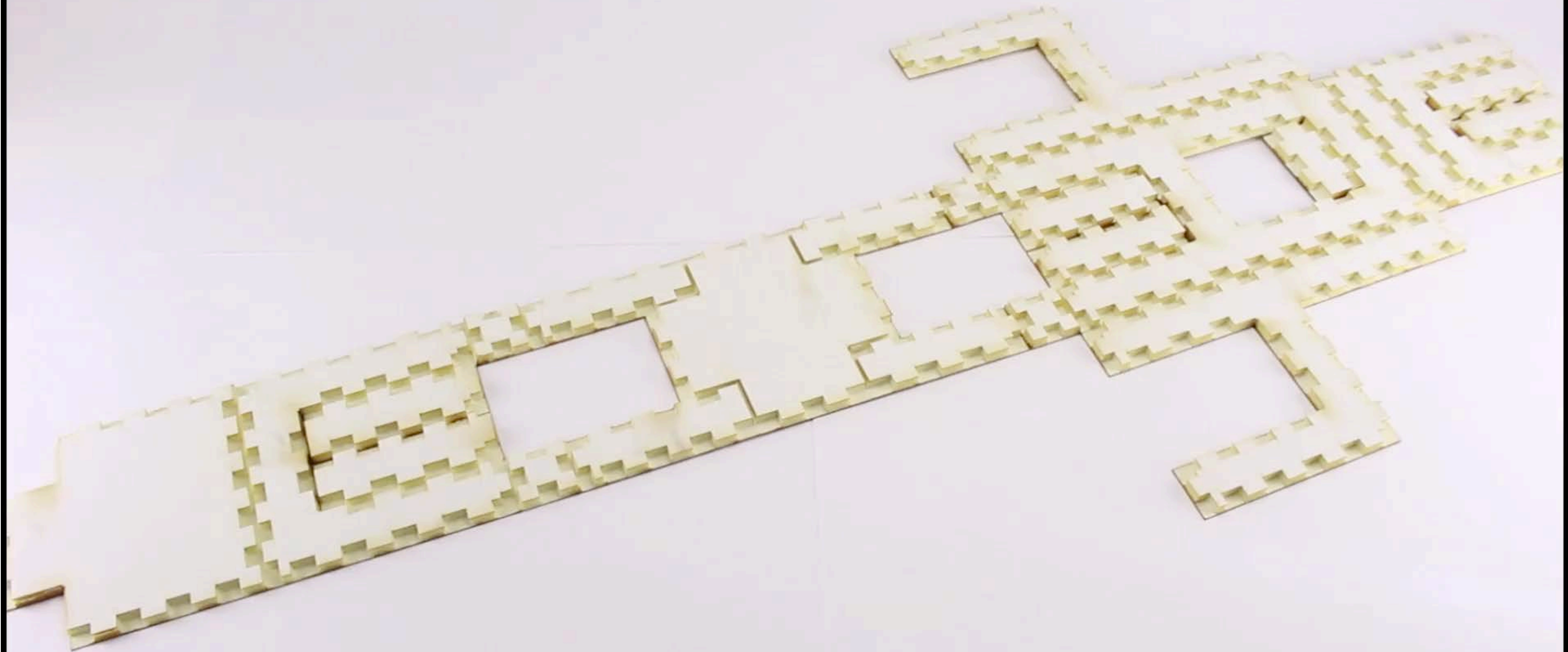


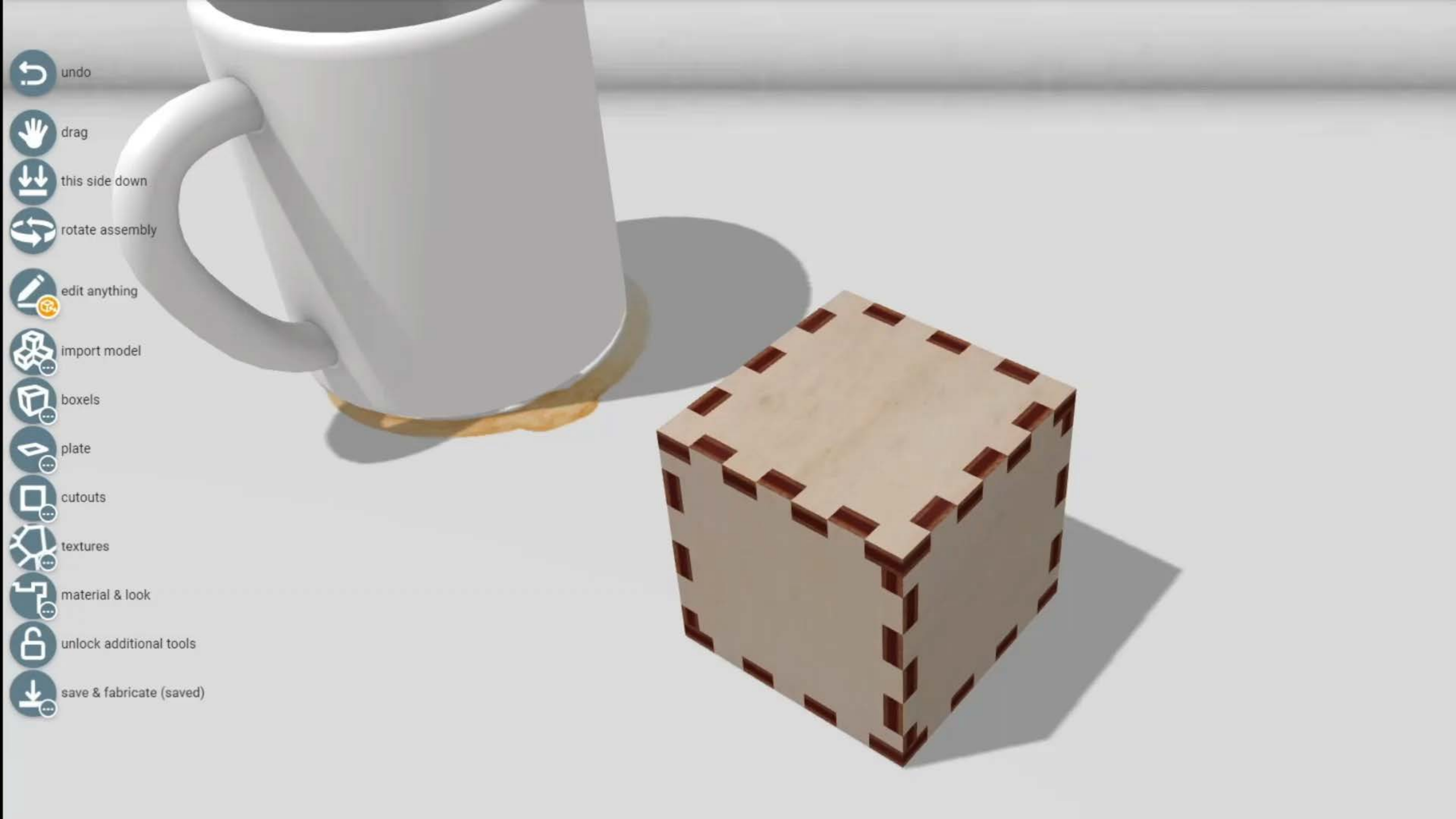
A 3D model of a chair, constructed from a yellow foam core with a grid-like pattern of laser-cut slots. The chair is shown from a perspective view, highlighting its complex, lattice-like structure. The model is positioned diagonally across the frame, from the bottom-left towards the top-right.

Fast Fabrication of 3D Models by Folding Laser-Cut Foam Core

Oliver Adameck, Lukas Fritzsche & Jonas Noack
Supervisors: Prof. Patrick Baudisch & Muhammad Abdullah

4x





undo



drag



this side down



rotate assembly



edit anything



import model



boxels



plate



cutouts



textures



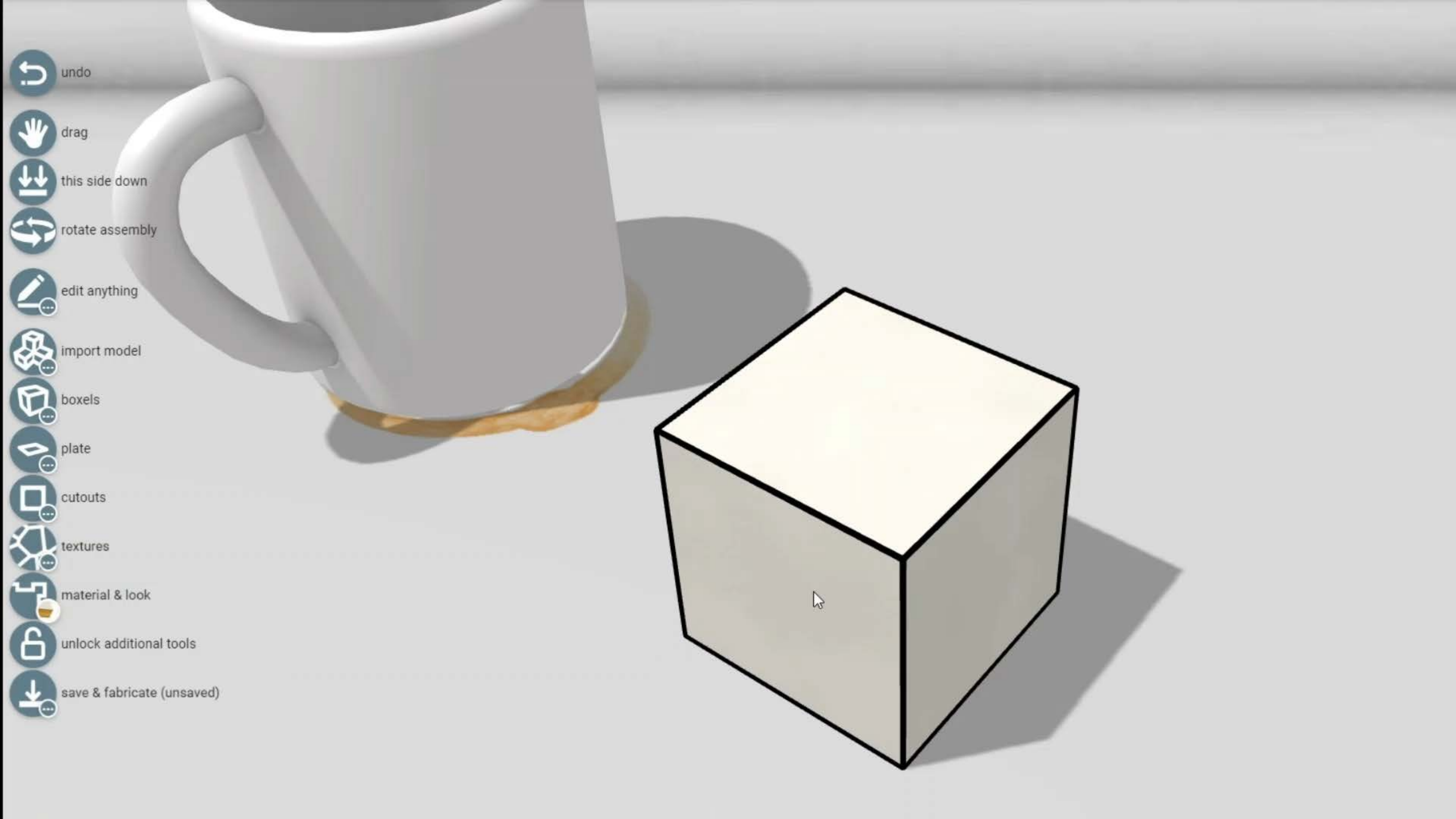
material & look



unlock additional tools



save & fabricate (saved)



undo



drag



this side down



rotate assembly



edit anything



import model



boxels



plate



cutouts



textures














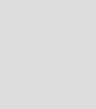

material & look

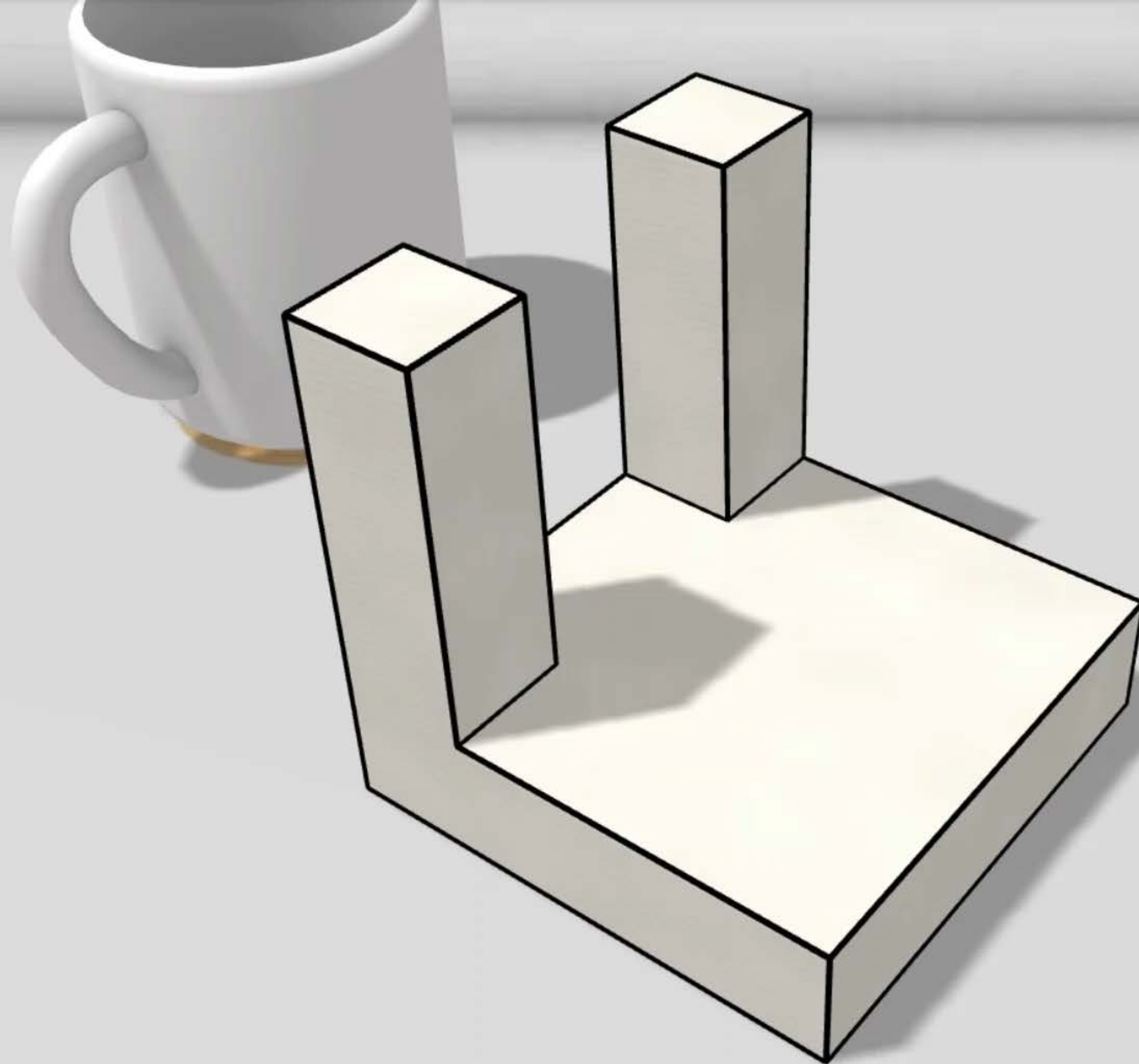


unlock additional tools

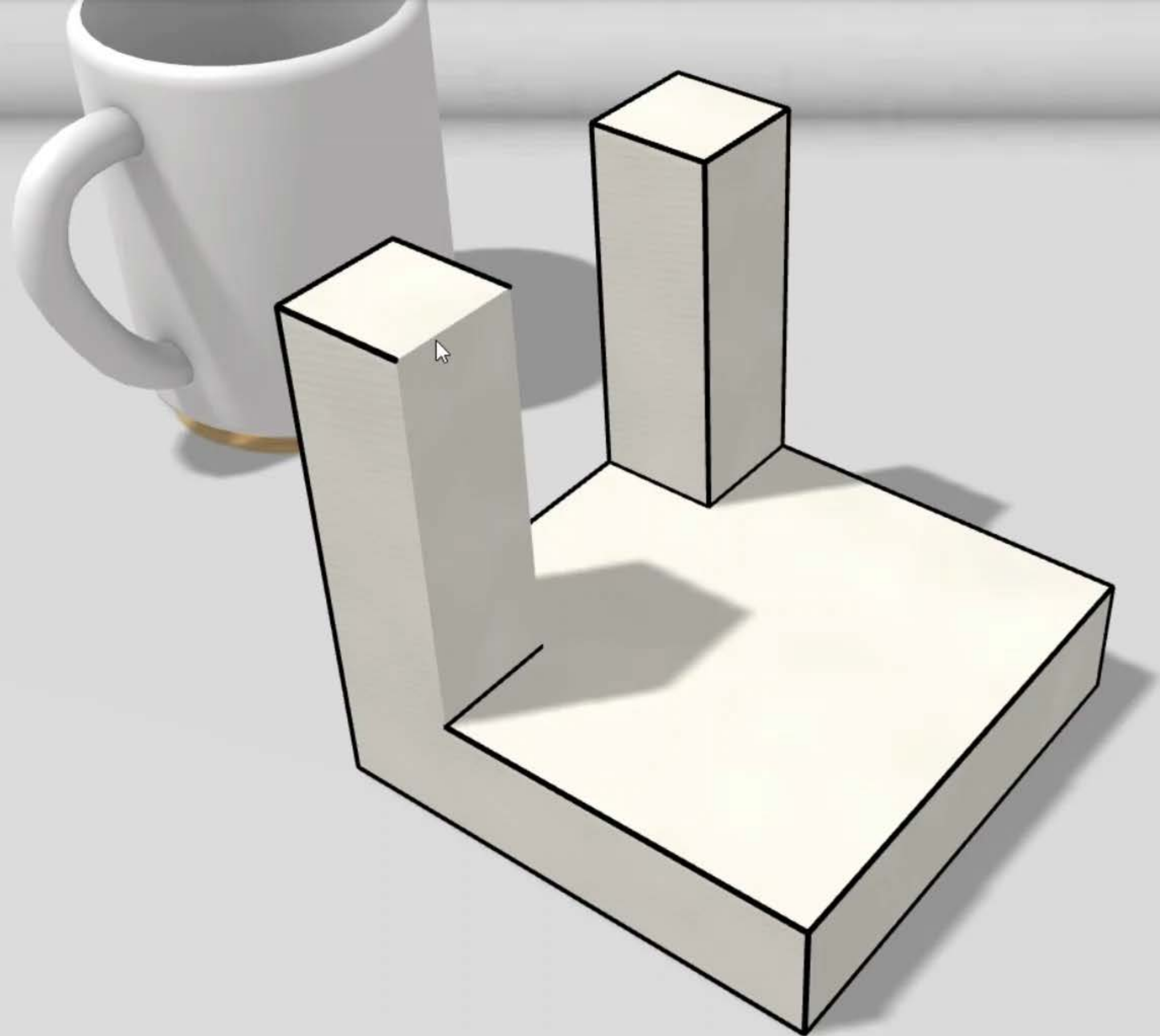


save & fabricate (unsaved)

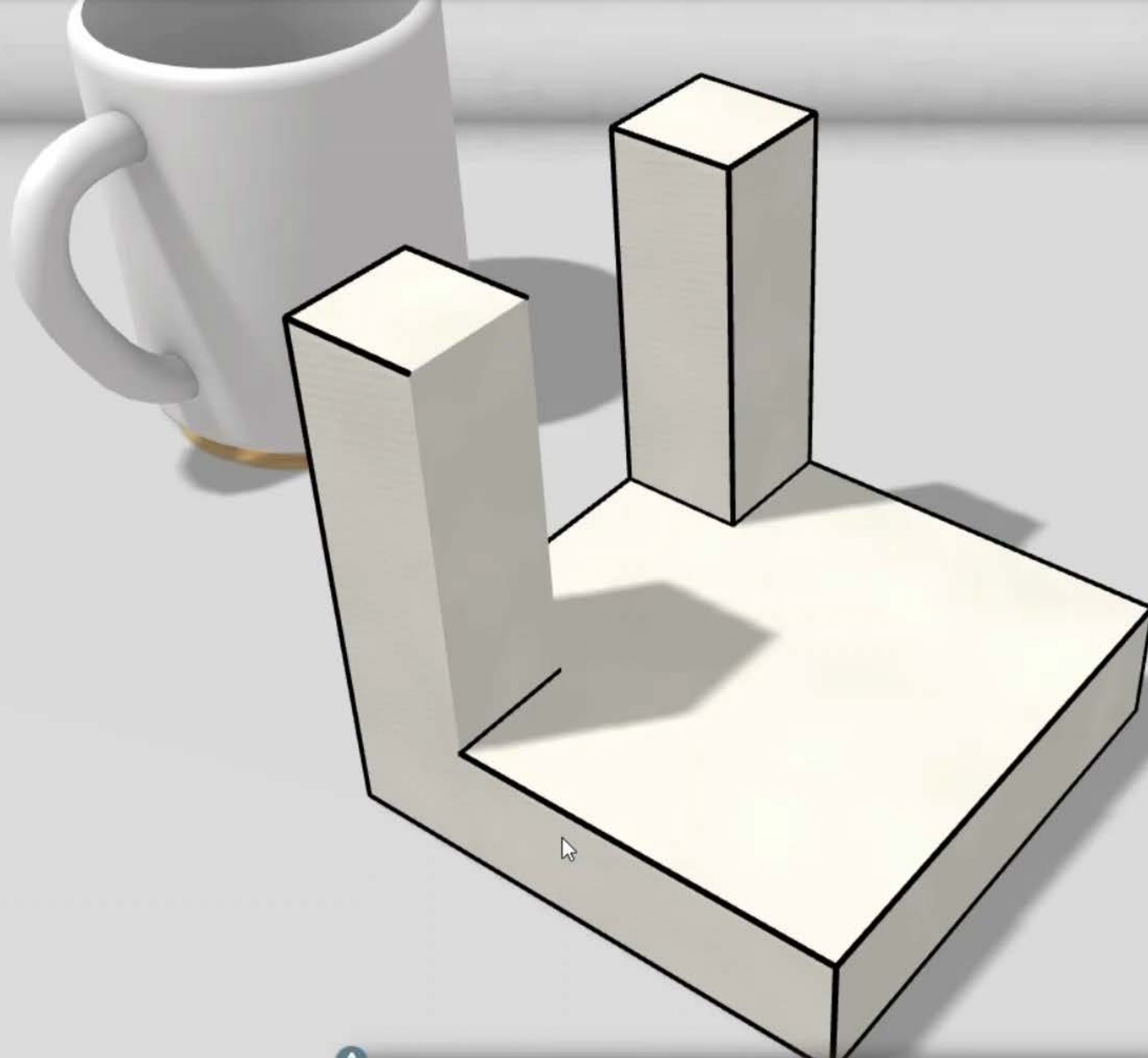
-  undo
-  drag
-  this side down
-  rotate assembly
-  edit anything
-  import model
-  boxels
-  plate
-  cutouts
-  textures
-  material & look
-  unlock additional tools
-  save & fabricate (saving...)




-  undo
-  drag
-  this side down
-  rotate assembly
-  edit anything
-  import model
-  boxels
-  plate
-  cutouts
-  textures
-  material & look
-  unlock additional tools
-  save & fabricate (unsaved)

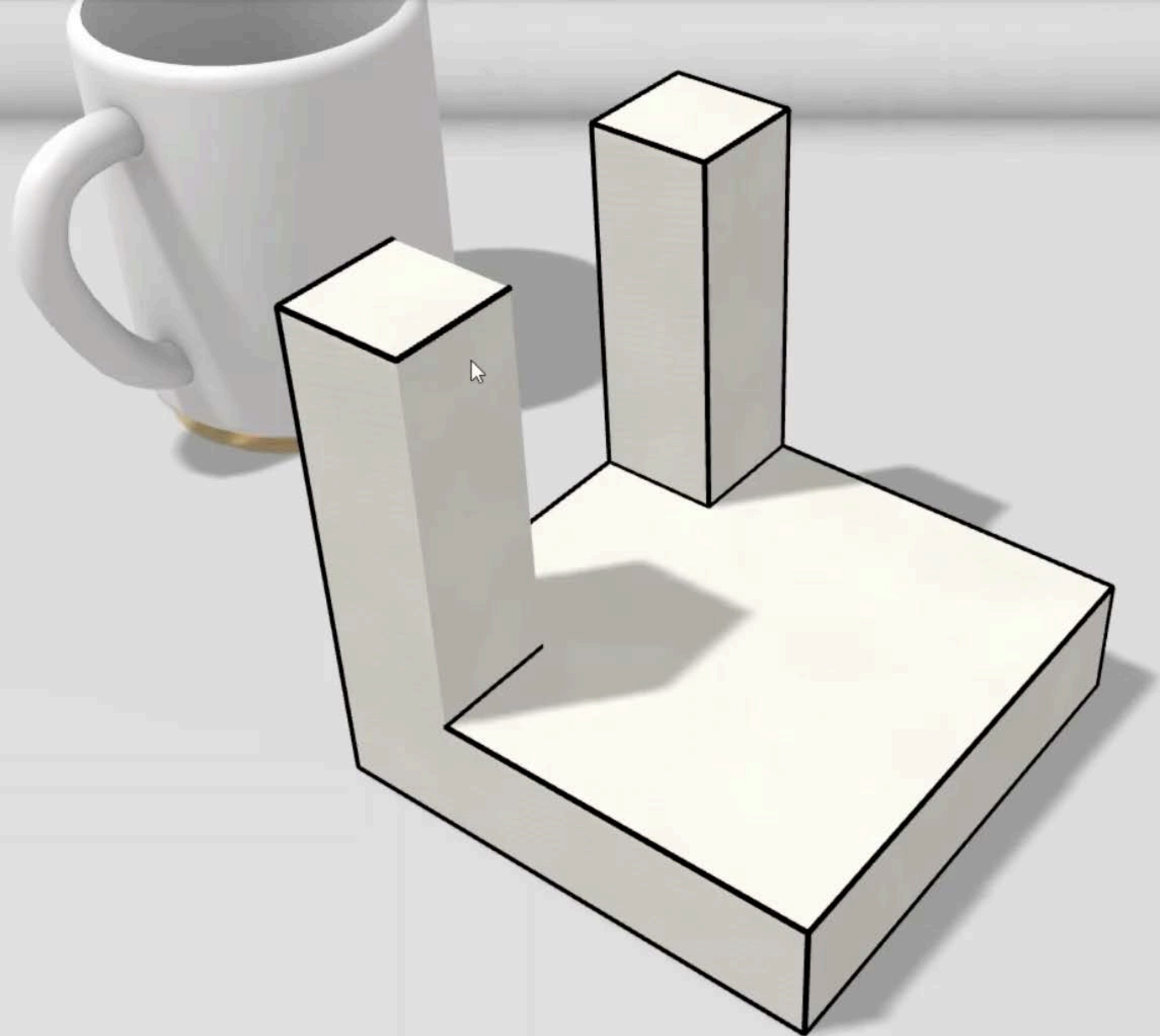















-  undo
-  drag
-  this side down
-  rotate assembly
-  edit anything
-  import model
-  boxels
-  plate
-  cutouts
-  textures
-  material & look
-  unlock additional tools
-  save & fabricate (saved)

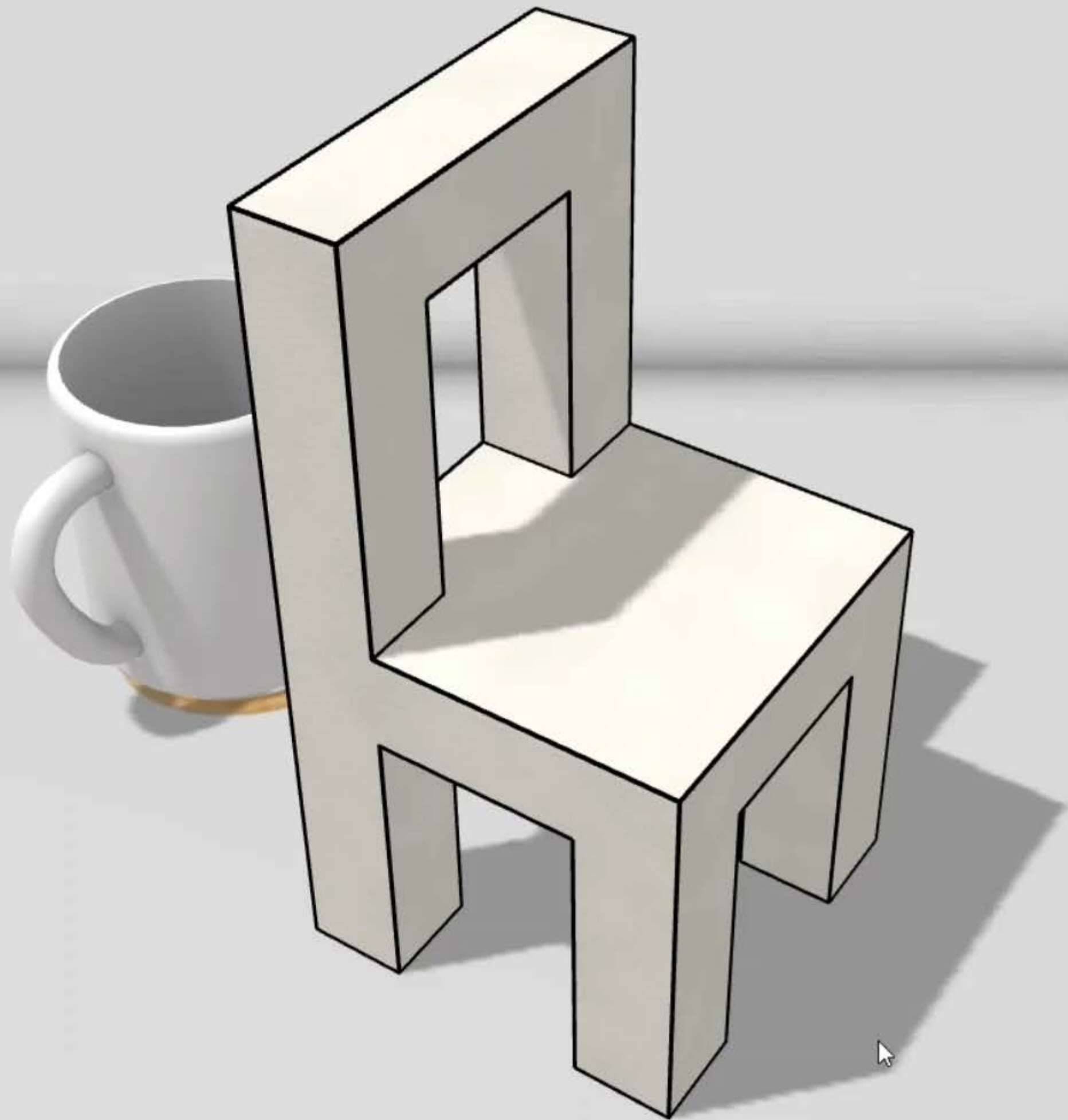













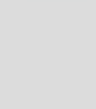

 The Connect Edge Tool currently doesn't support this because two plates overlap.

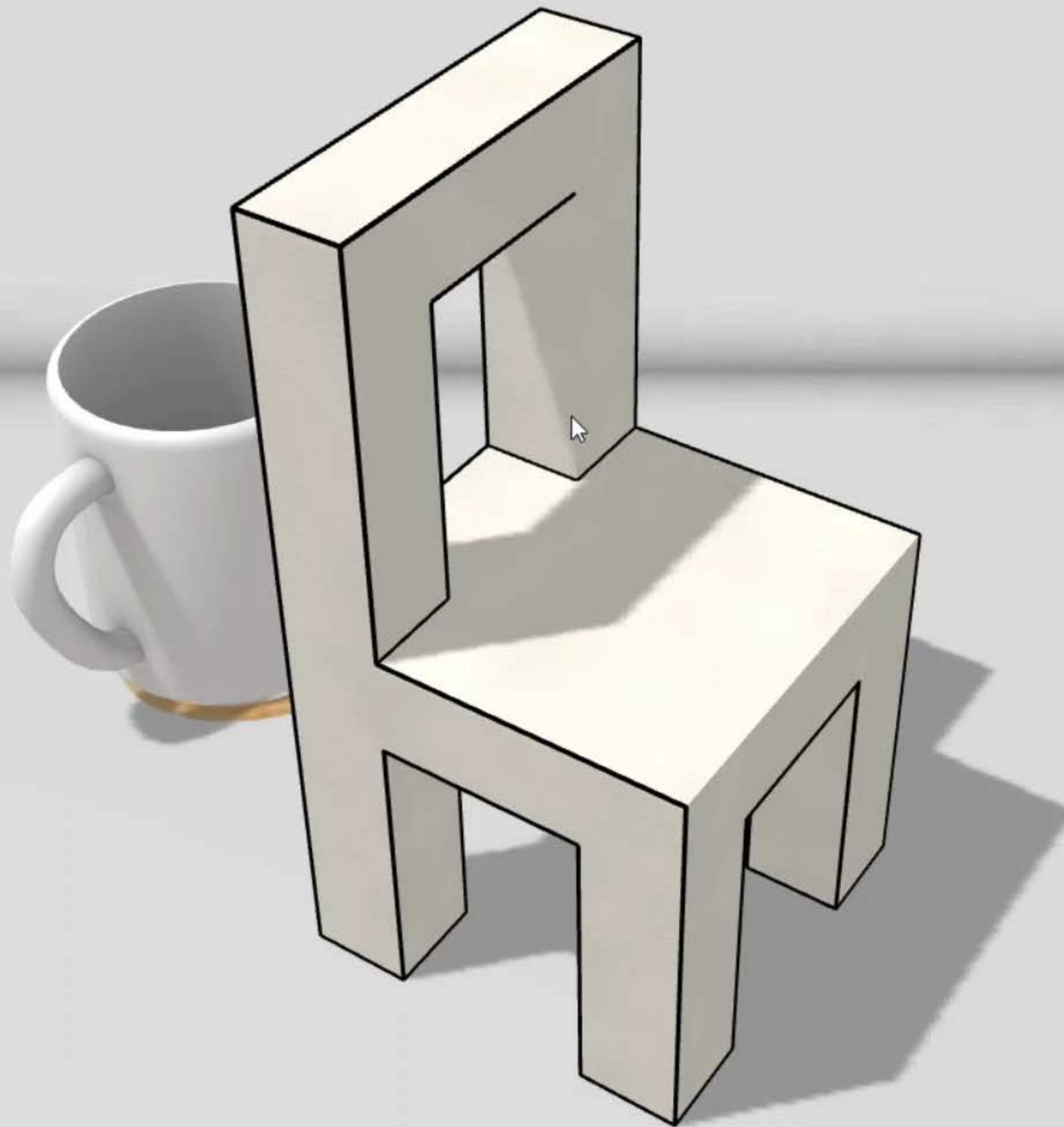
-  undo
-  drag
-  this side down
-  rotate assembly
-  edit anything
-  import model
-  boxels
-  plate
-  cutouts
-  textures
-  material & look
-  unlock additional tools
-  save & fabricate (unsaved)






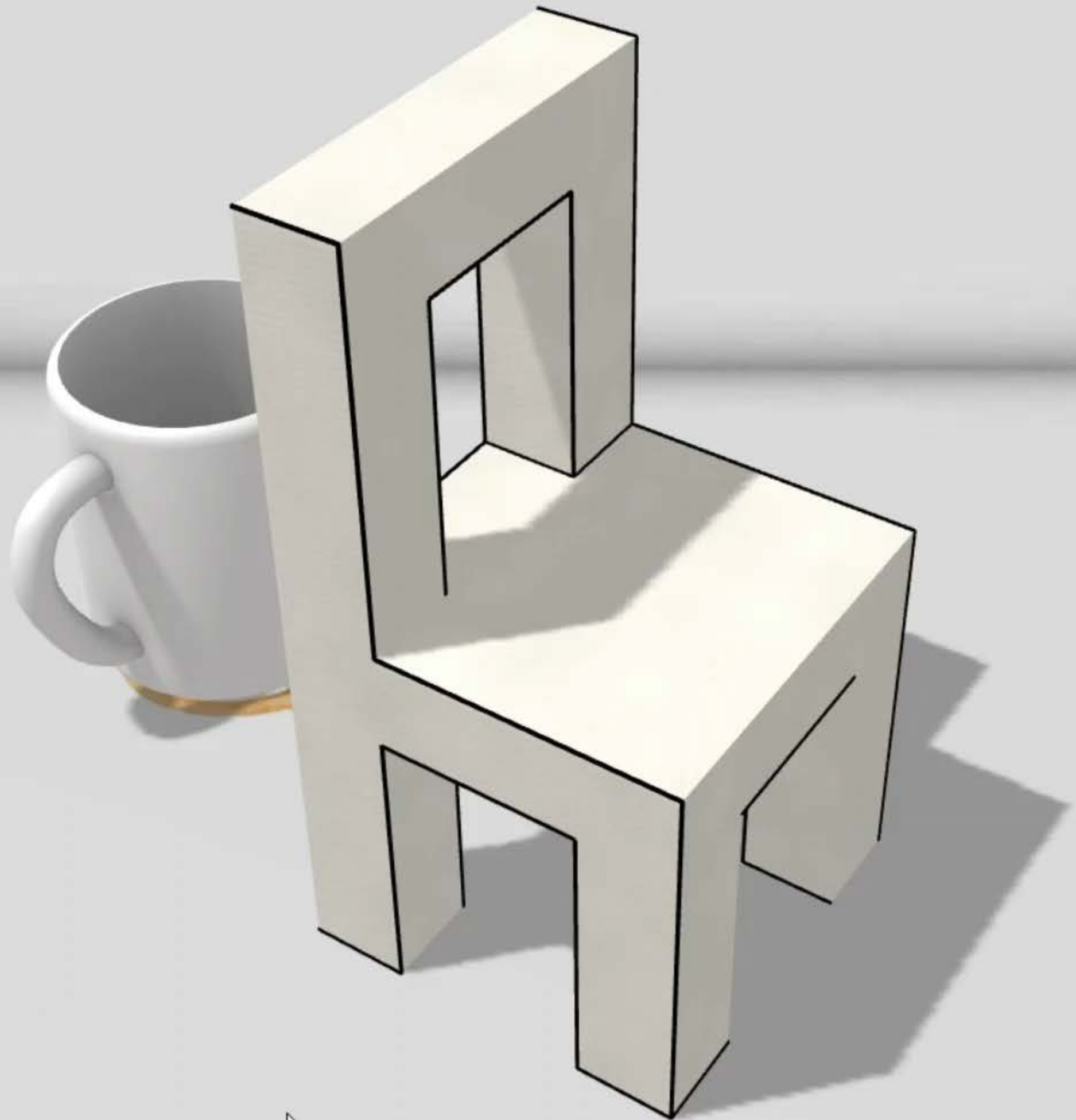
-  undo
-  drag
-  this side down
-  rotate assembly
-  edit anything
-  import model
-  boxels
-  plate
-  cutouts
-  textures
-  material & look
-  unlock additional tools
-  save & fabricate (saving...)

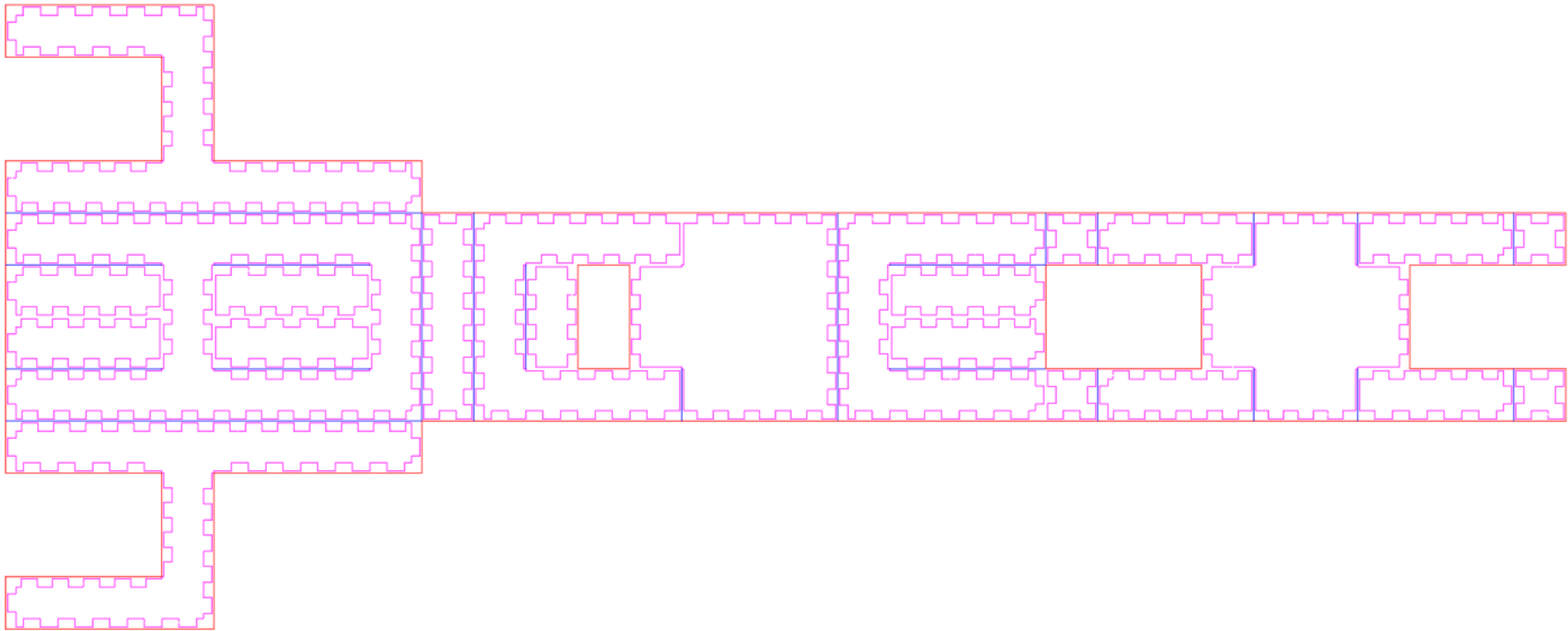


-  undo
-  drag
-  this side down
-  rotate assembly
-  edit anything
-  import model
-  boxels
-  plate
-  cutouts
-  textures
-  material & look
-  unlock additional tools
-  save & fabricate (saving...)

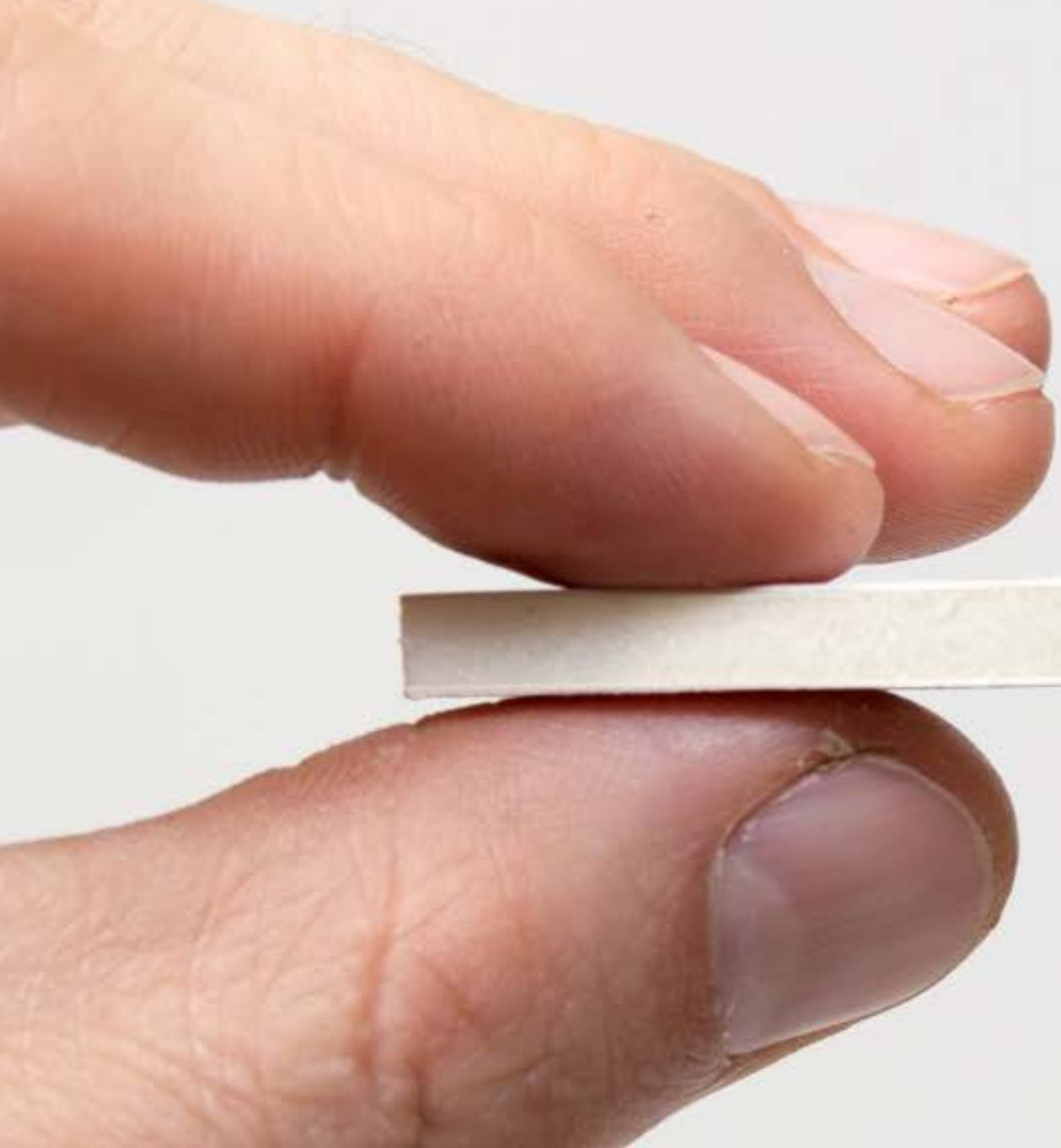


-  undo
-  drag
-  this side down
-  rotate assembly
-  edit anything
-  import model
-  boxels
-  plate
-  cutouts
-  textures
-  material & look
-  unlock additional tools
-  save & fabricate (saved)





foamcore

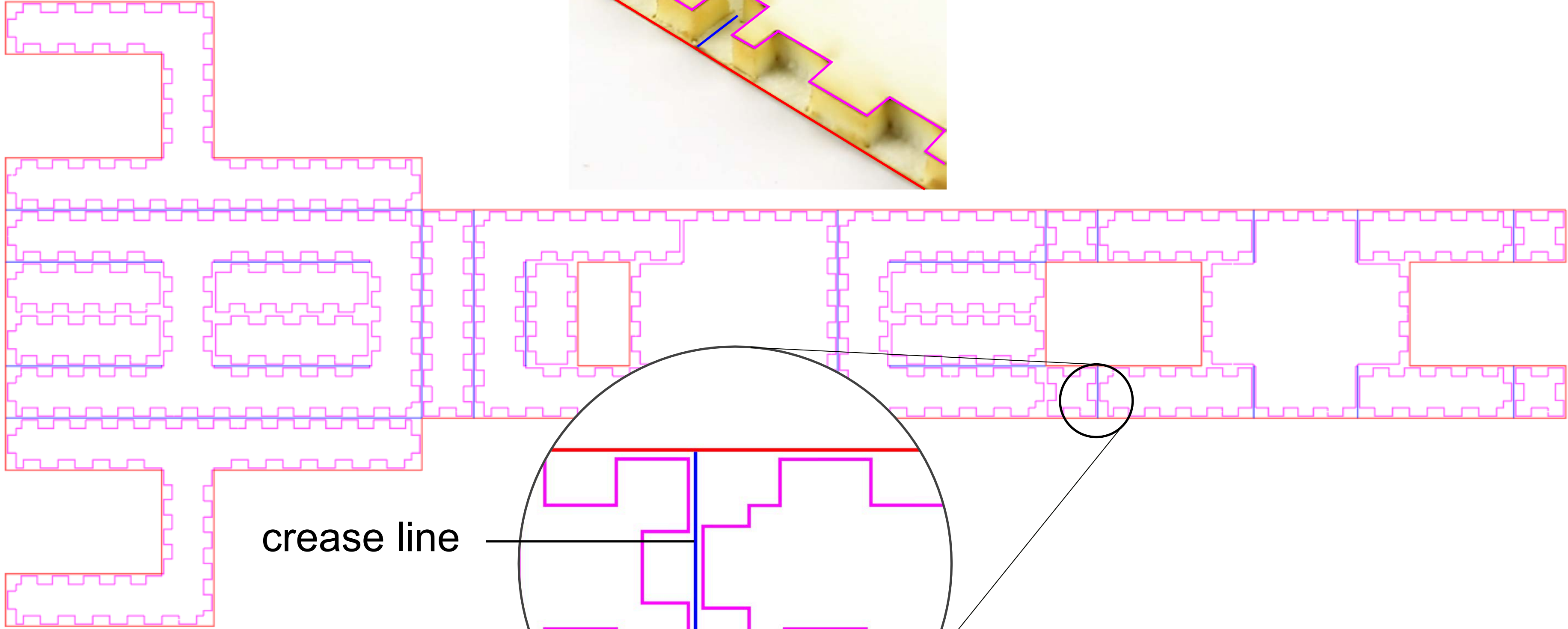
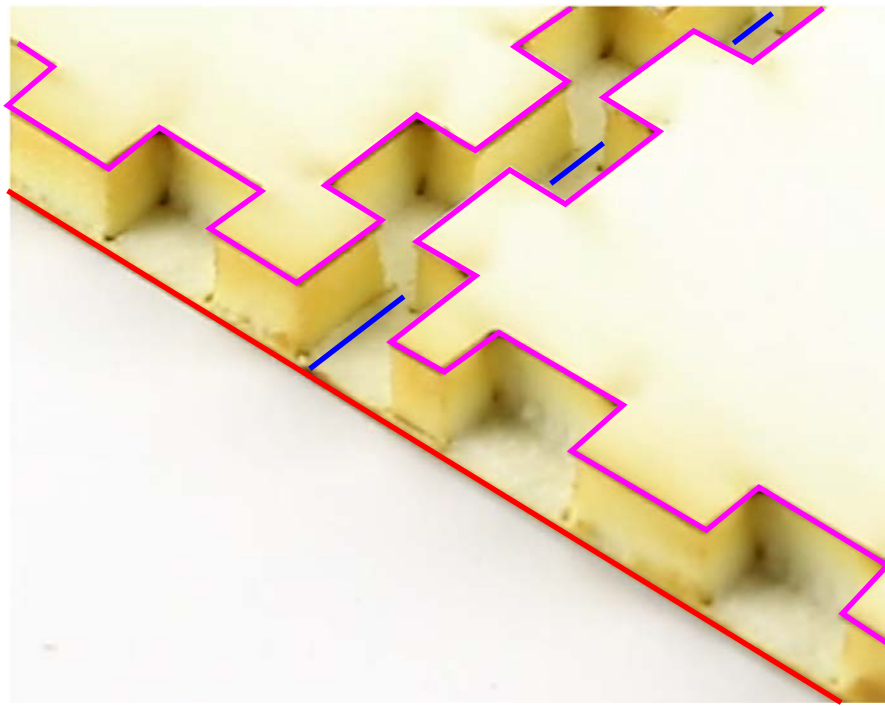


paper

foam

paper

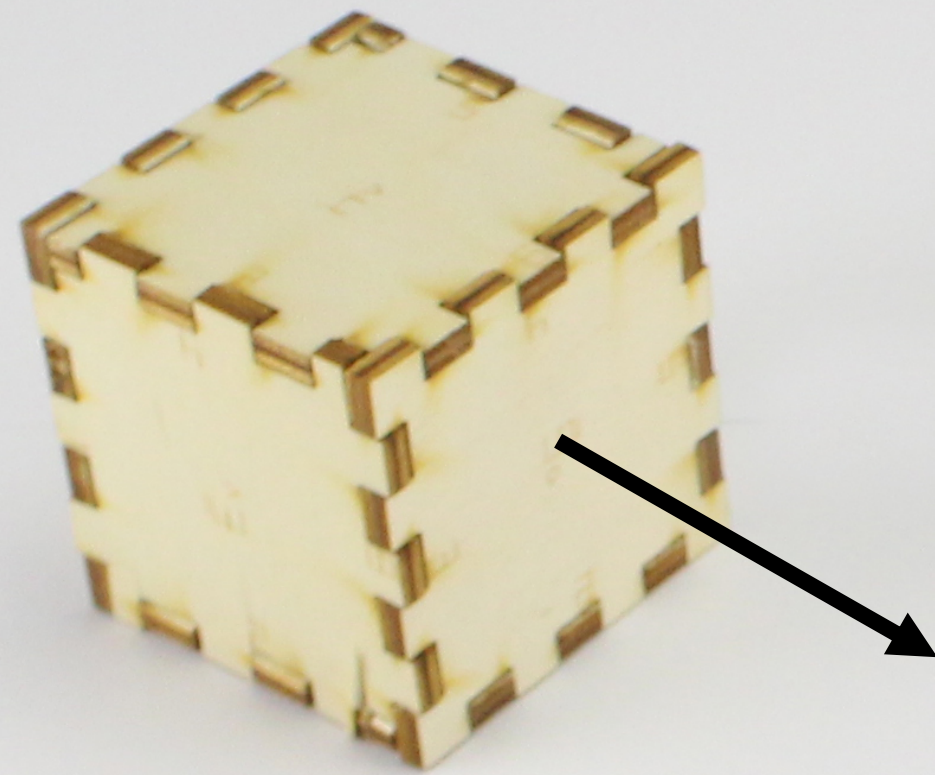
foamcore [kappa line]



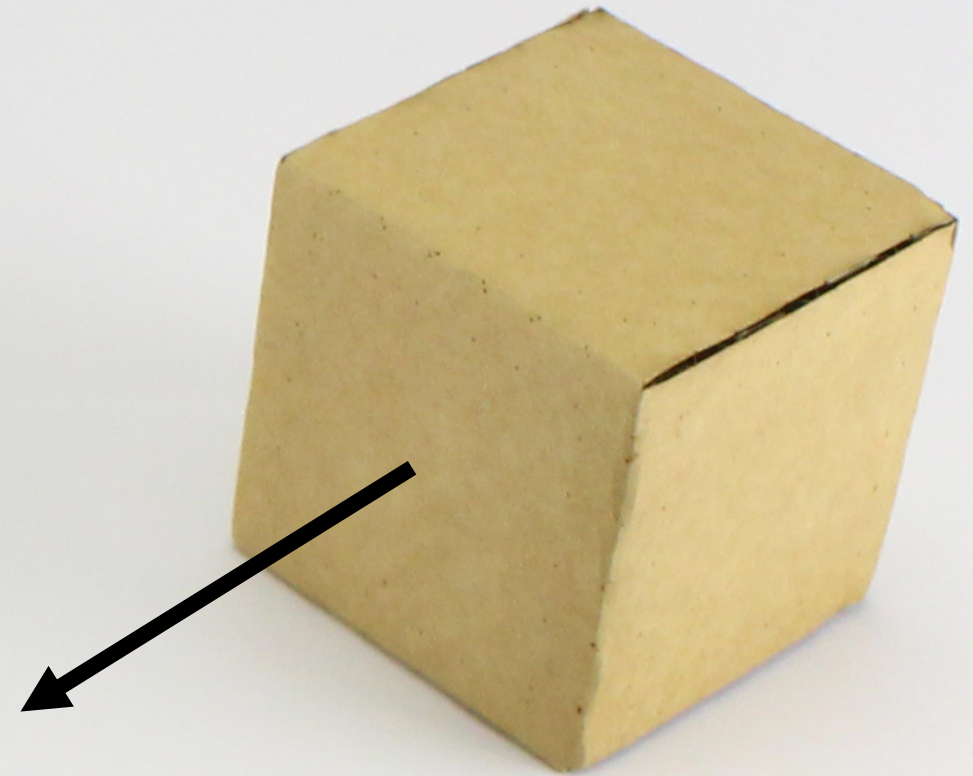
crease line

finger joints

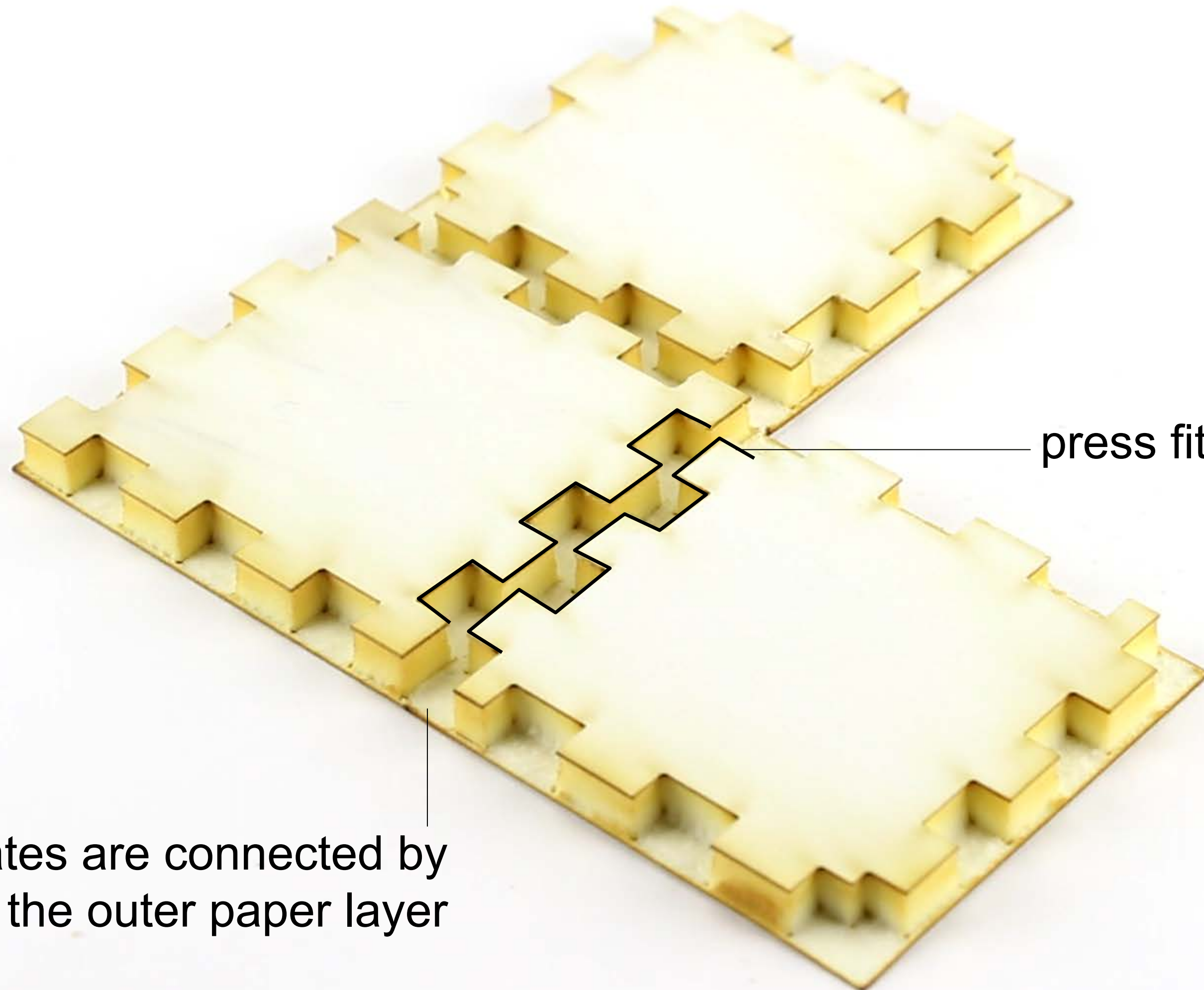
cut line



press fit finger joints

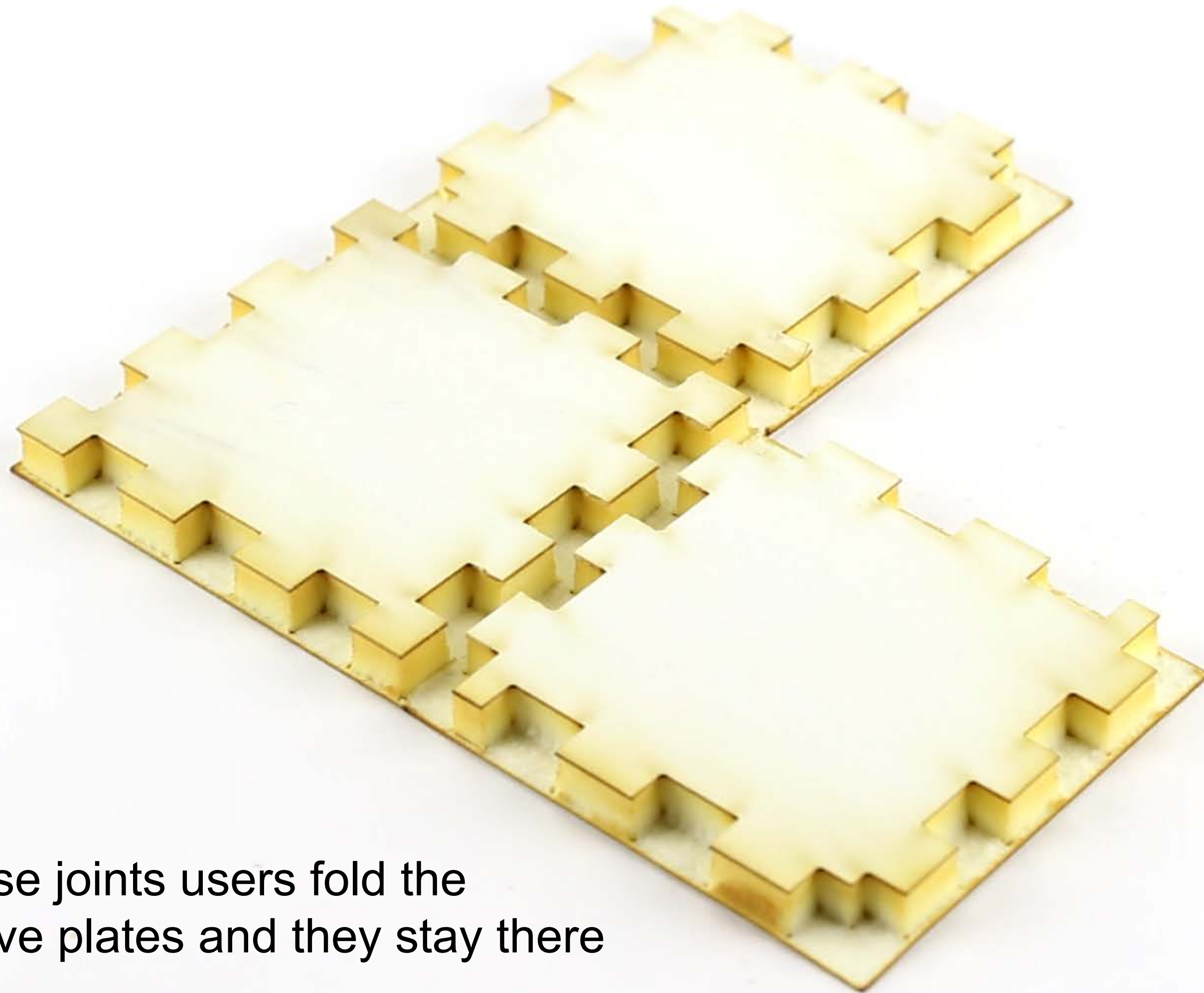


connected paper layer



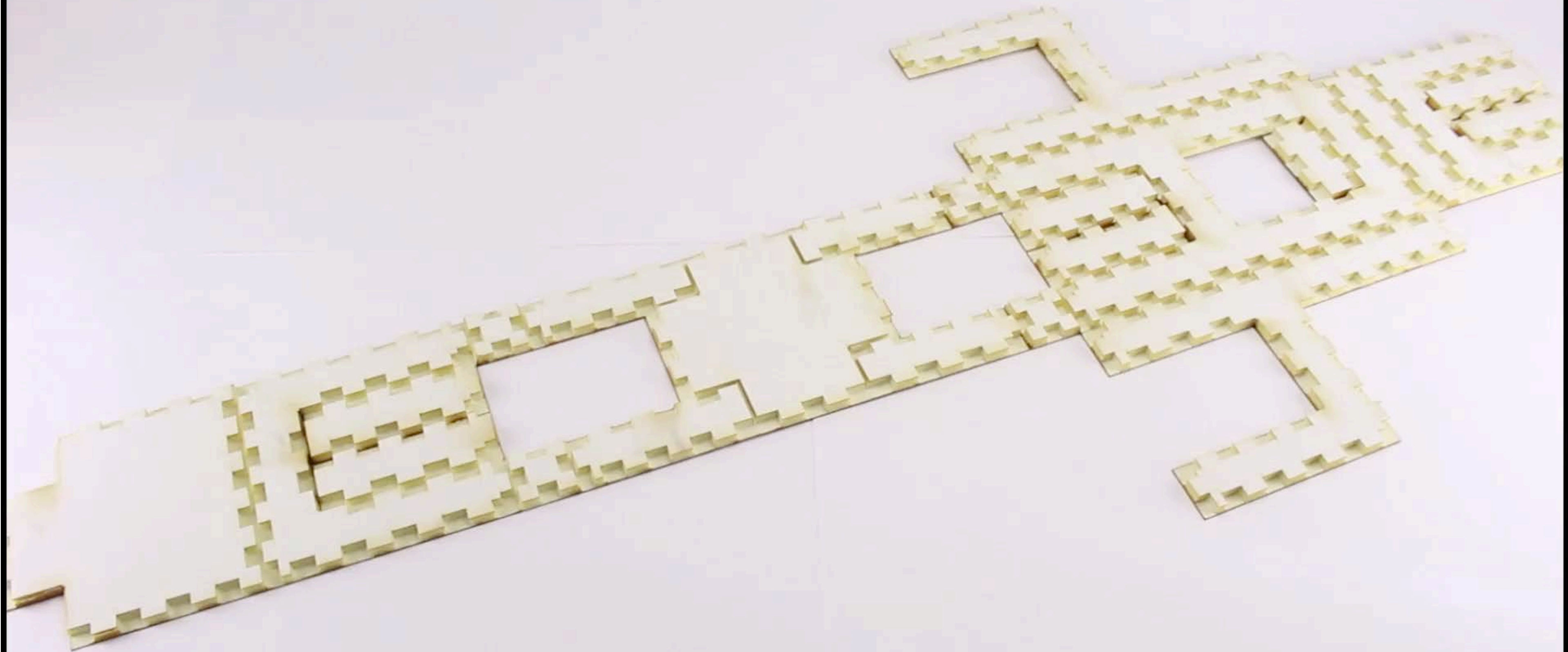
press fit finger joints

plates are connected by
the outer paper layer



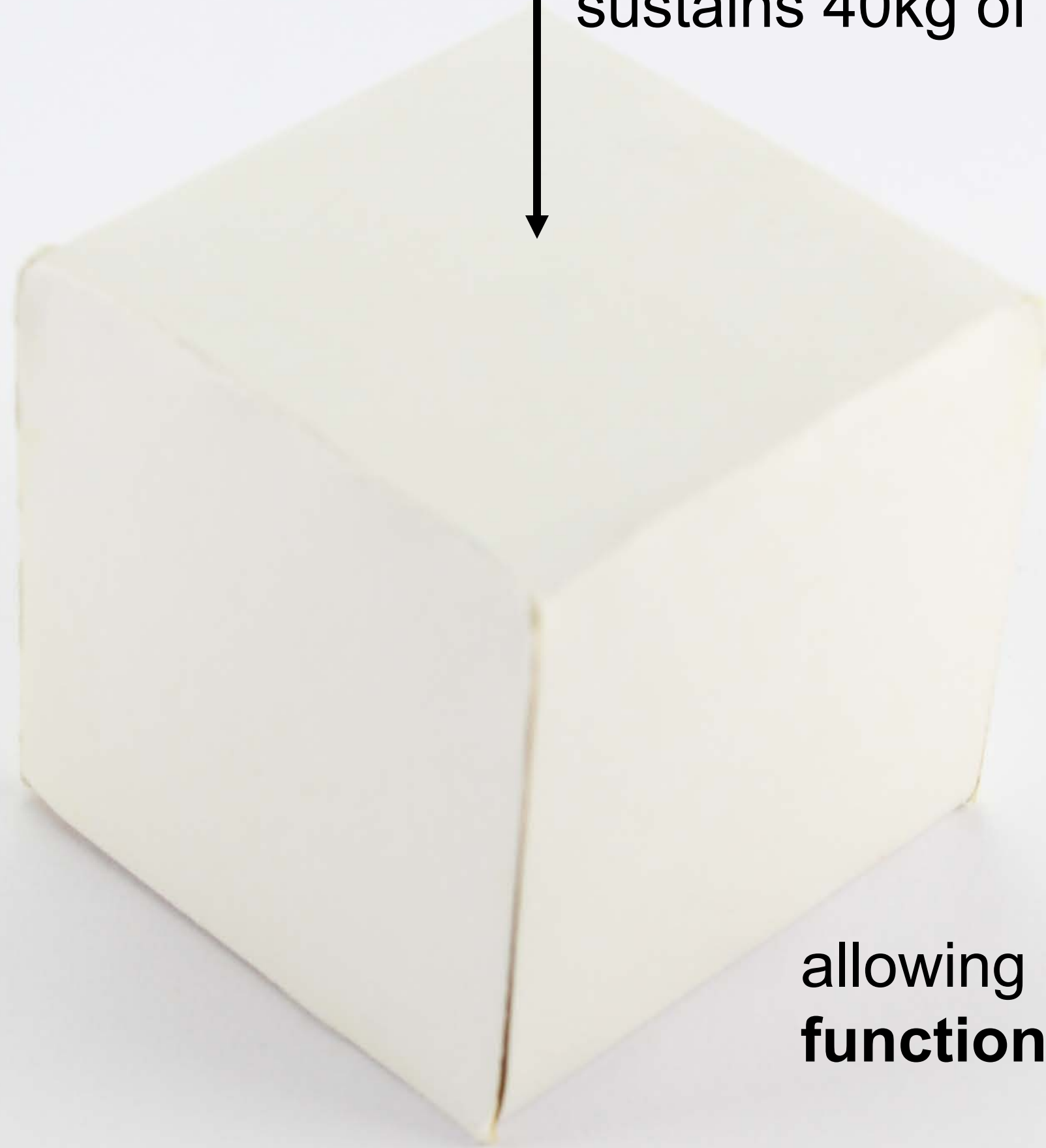
with these joints users fold the
respective plates and they stay there

4x

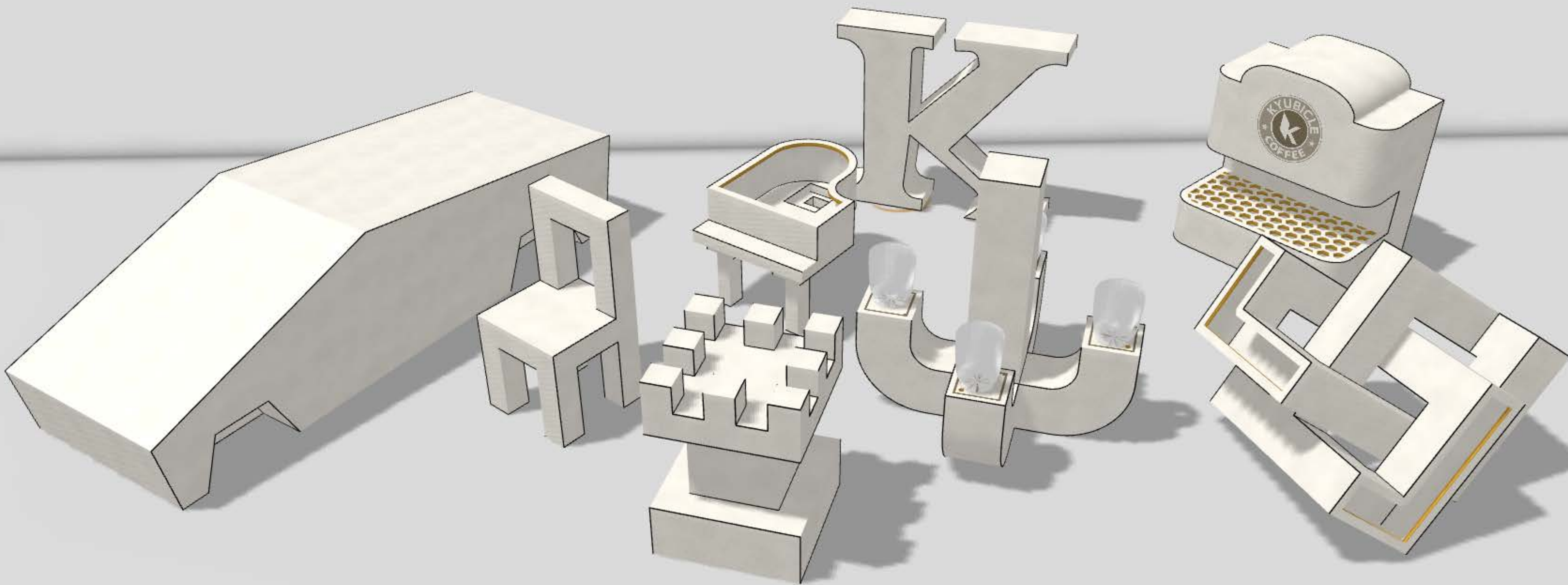




sustains 40kg of compression



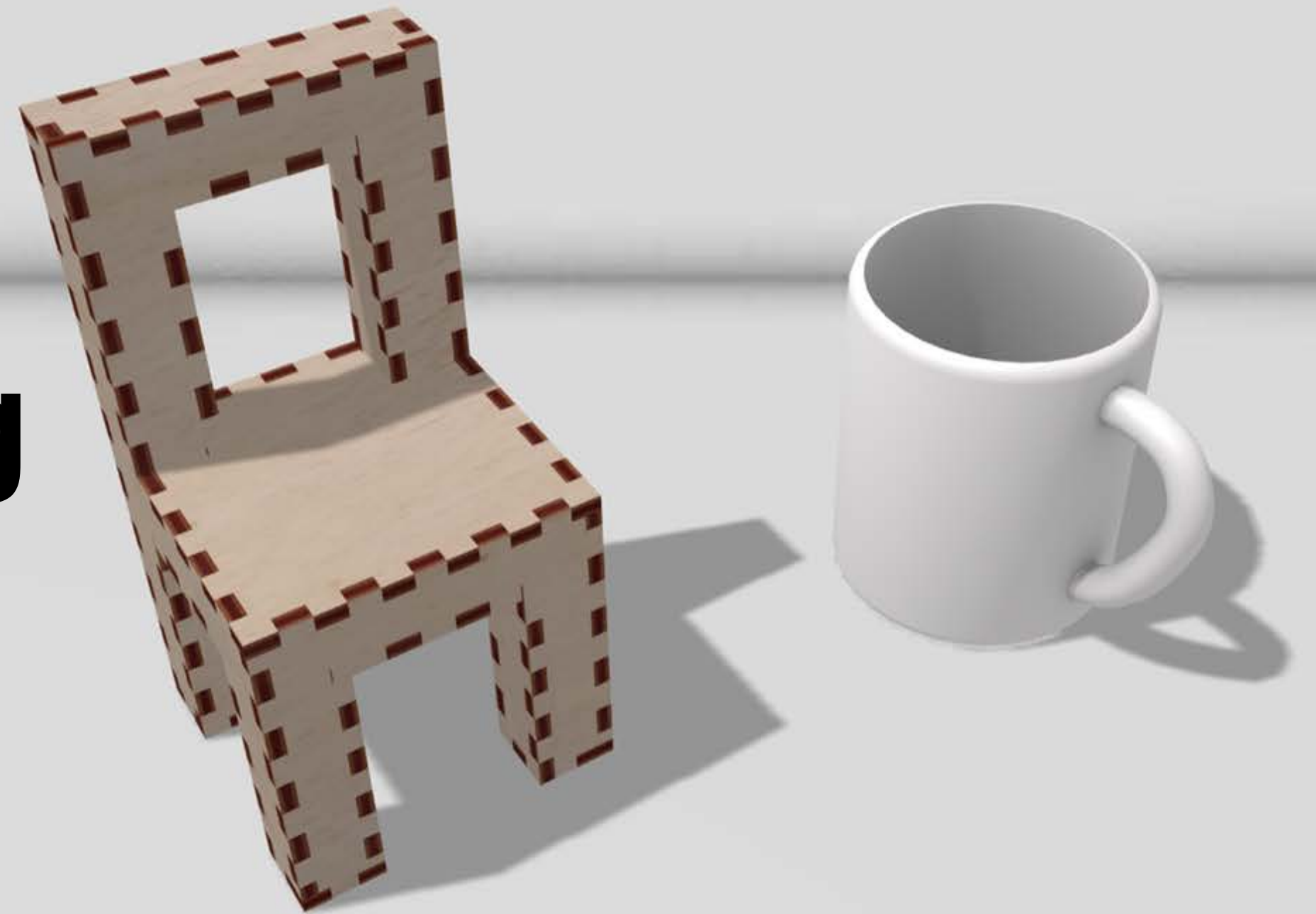
allowing users to make
functional prototypes



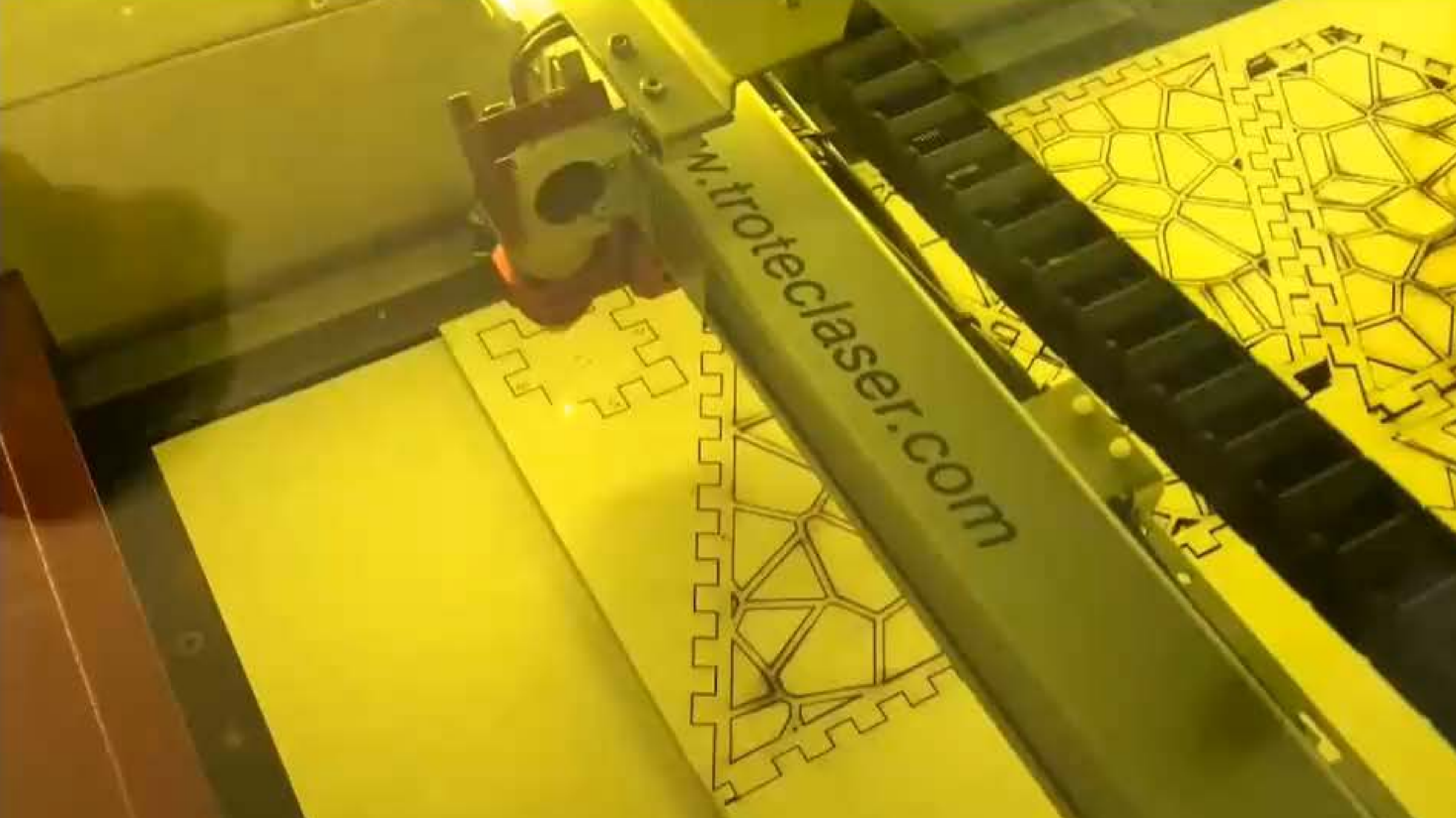
motivation

rapid prototyping

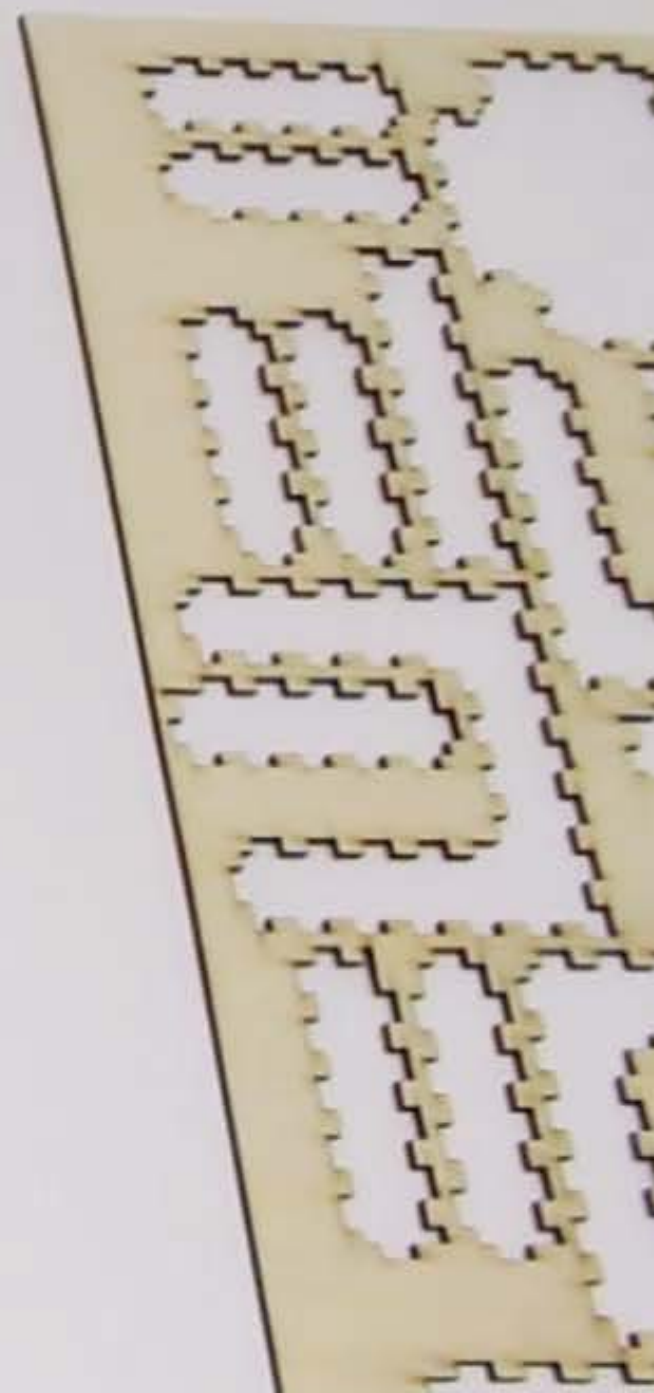
fast fabrication of a physical part, model or assembly using 3D computer aided design.

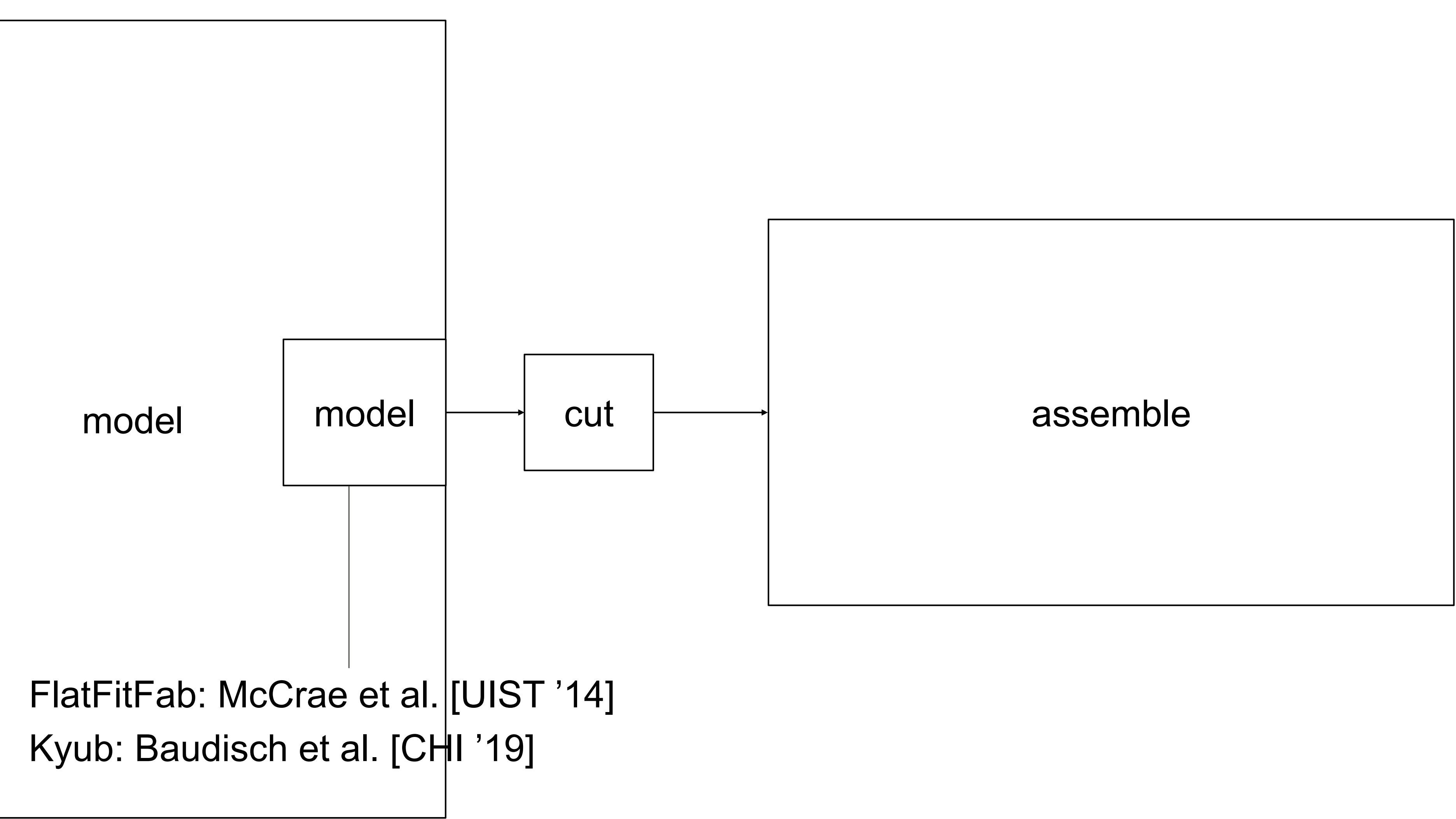


www.troteclaser.com

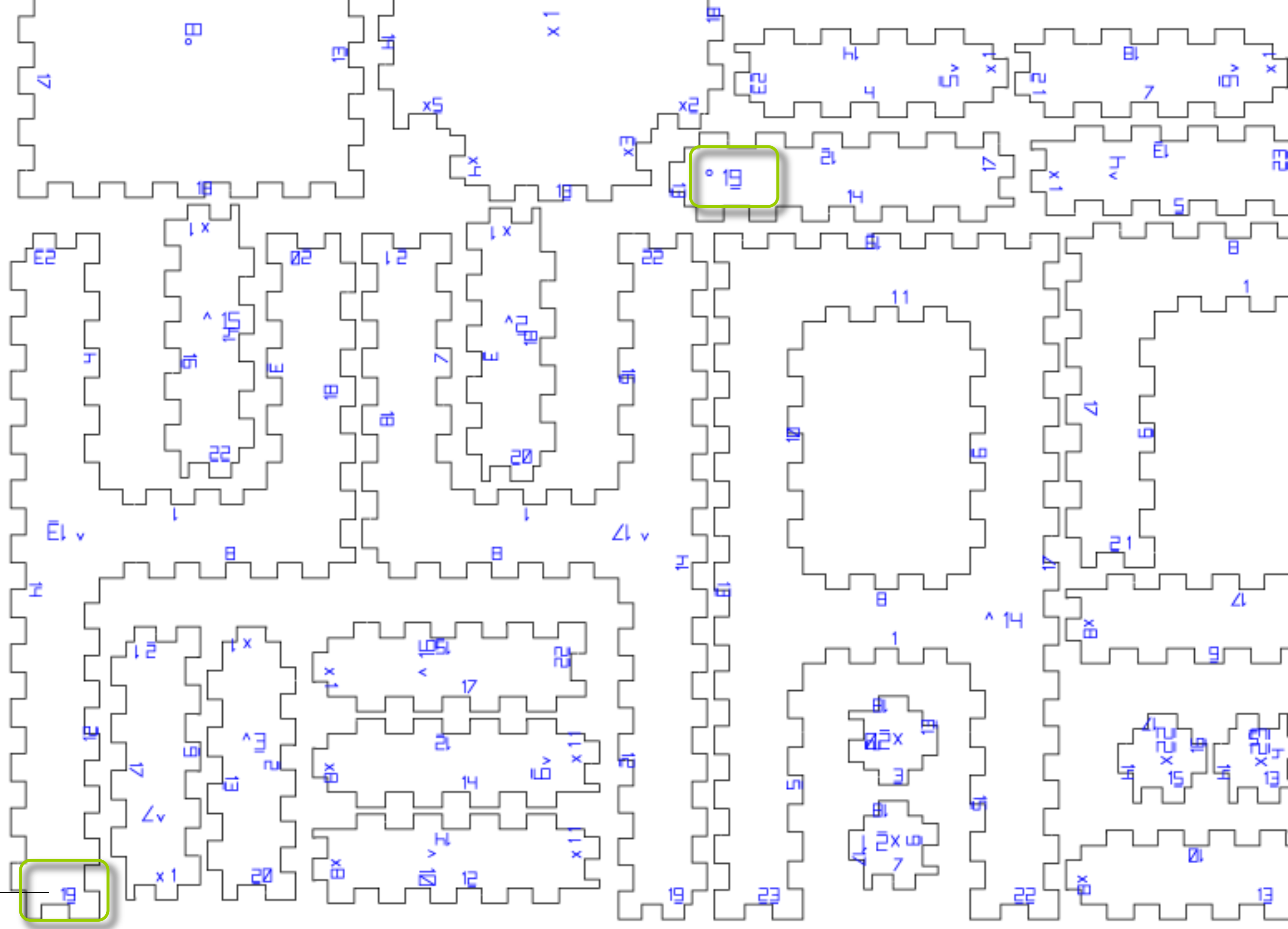


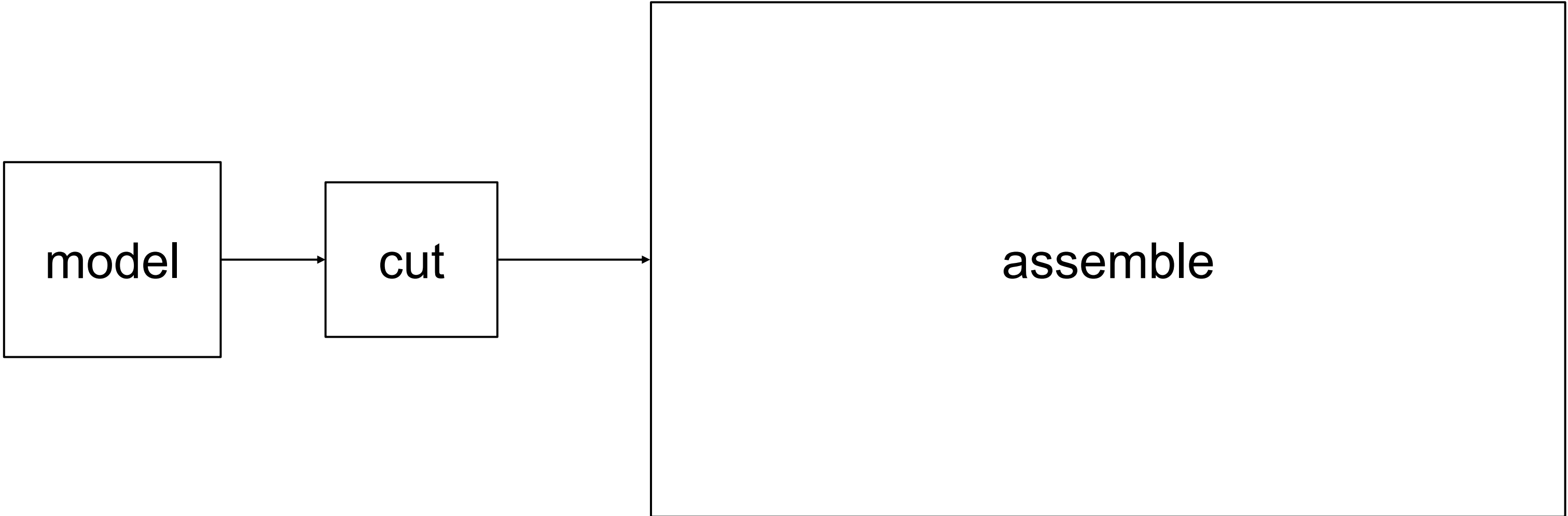
8x

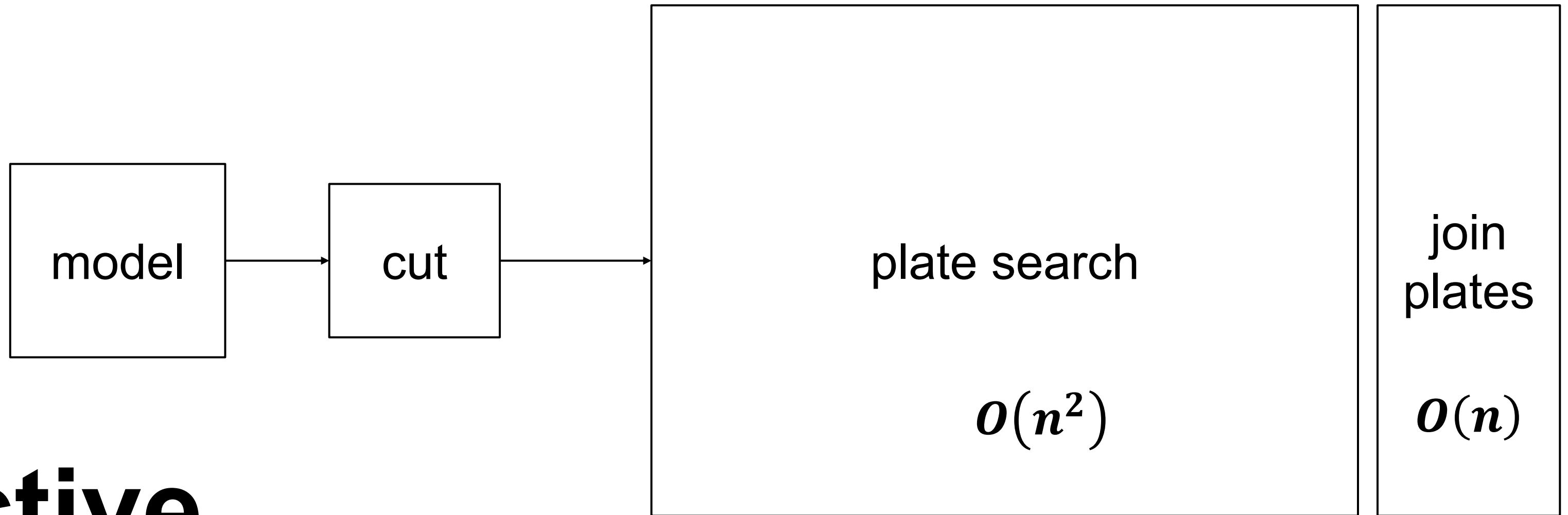




lookup numbers
on plates/edges







objective

reduce complexity of **plate search** from $O(n^2) \rightarrow O(n)$



objective

reduce complexity of **plate search** from $O(n^2)$ \rightarrow $O(n)$

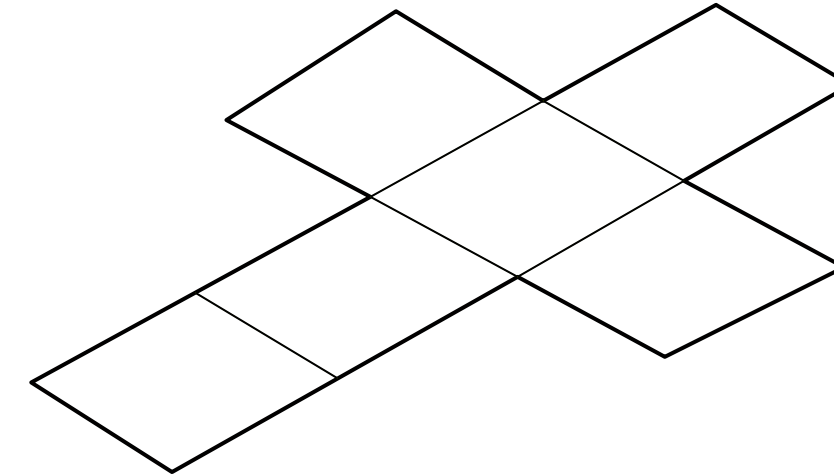
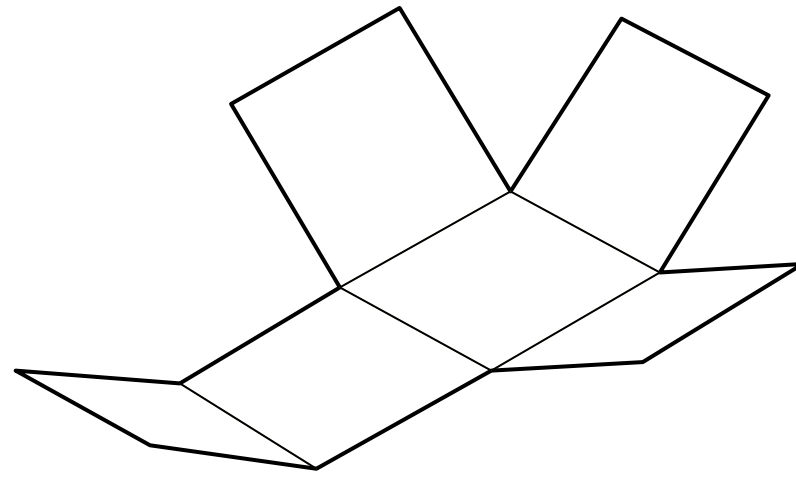
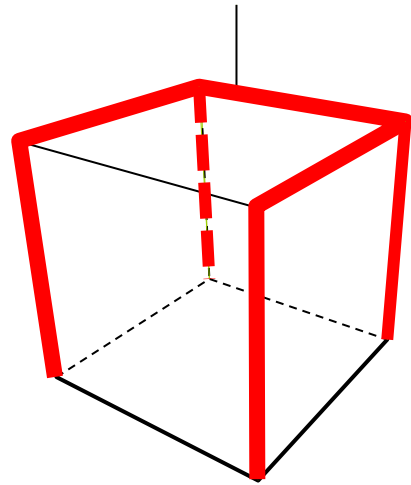
how to solve this?

key idea:::

if two things are supposed to be joined: place them next to each other













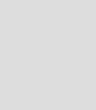
this is where unfolding can help...

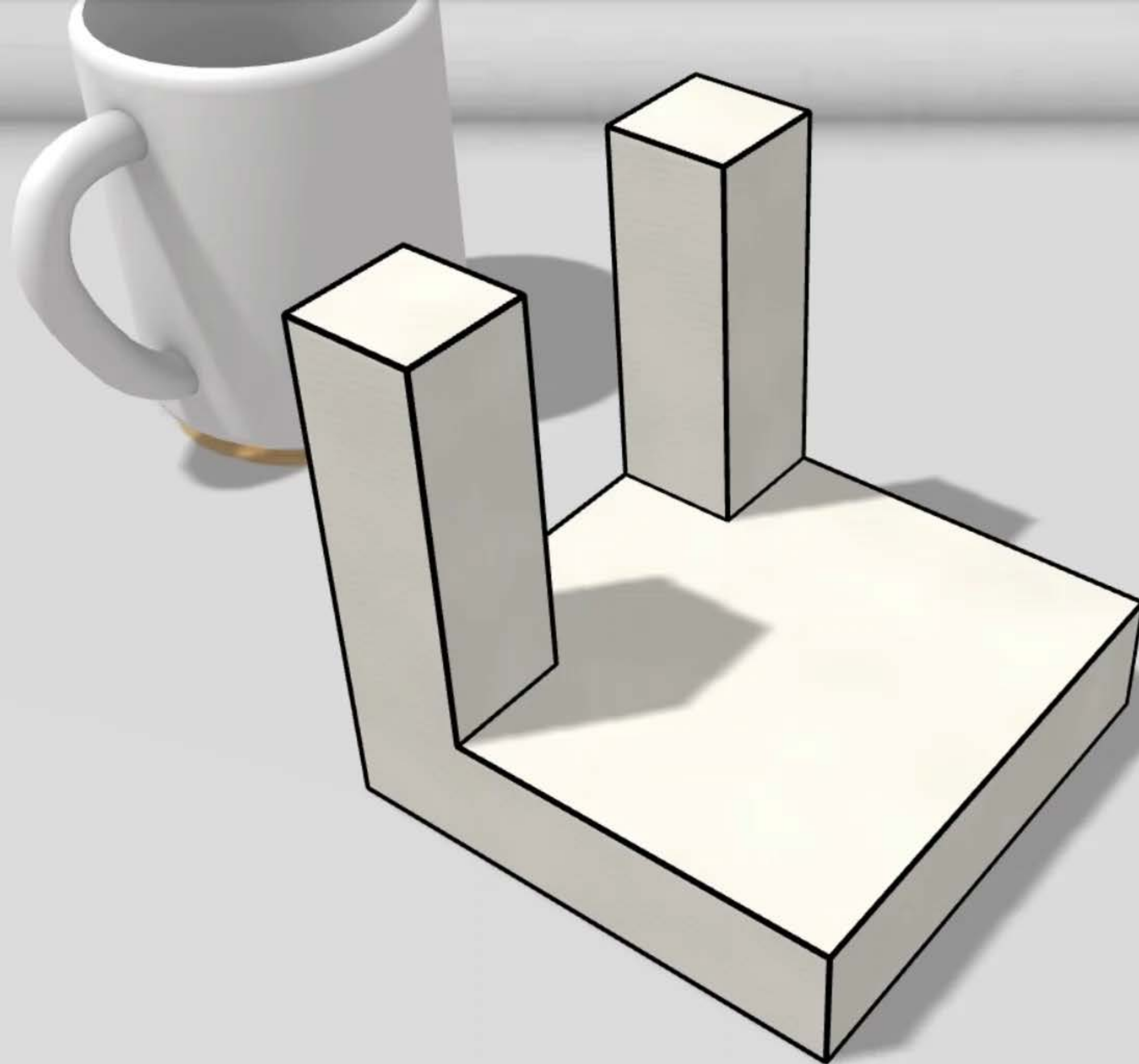
**cut along
these edges**

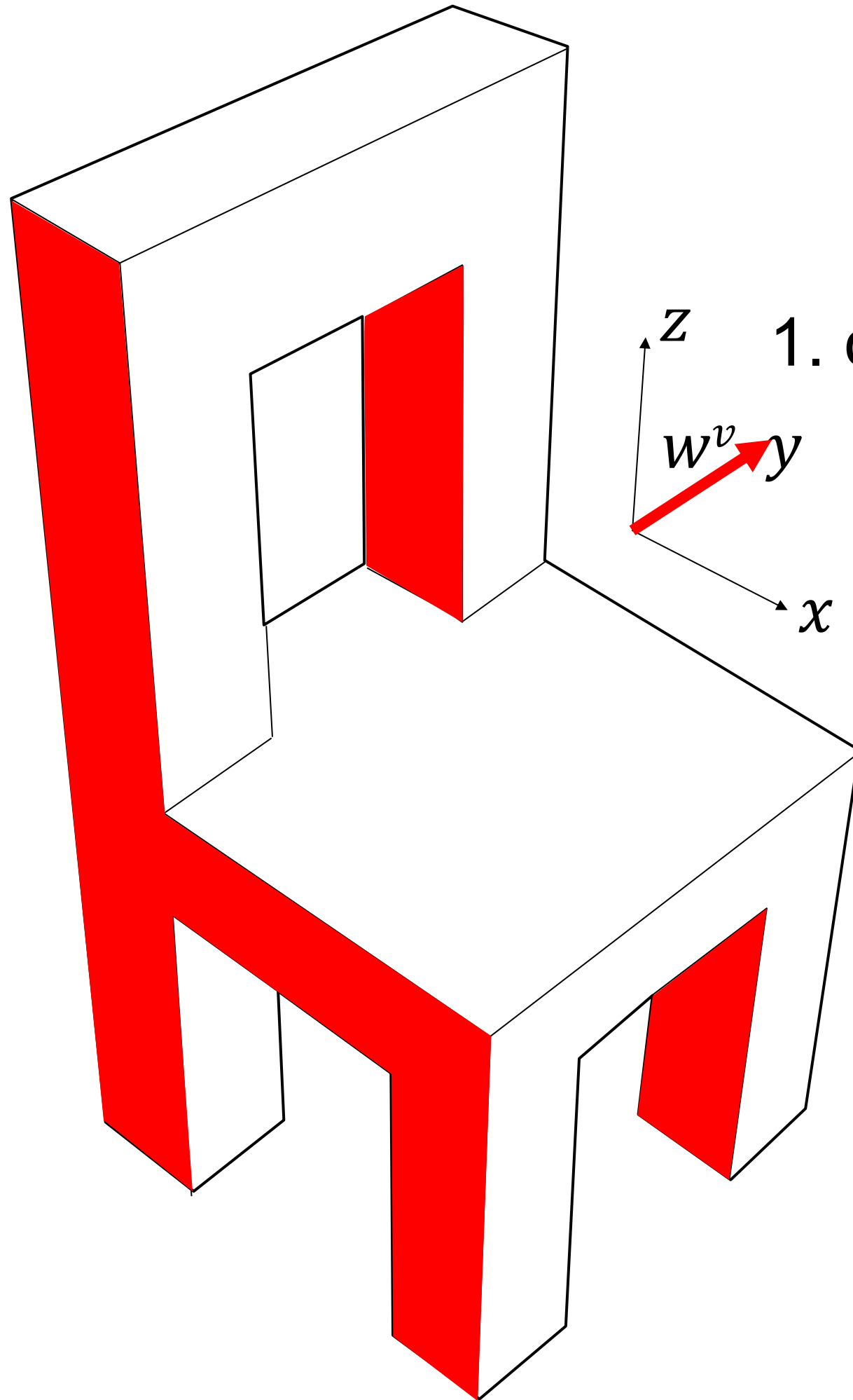


edge unfolding::

cut a polyhedron along its **edges** and unfold flat to a single, non-overlapping, simple polygon

-  undo
-  drag
-  this side down
-  rotate assembly
-  edit anything
-  import model
-  boxels
-  plate
-  cutouts
-  textures
-  material & look
-  unlock additional tools
-  save & fabricate (saving...)



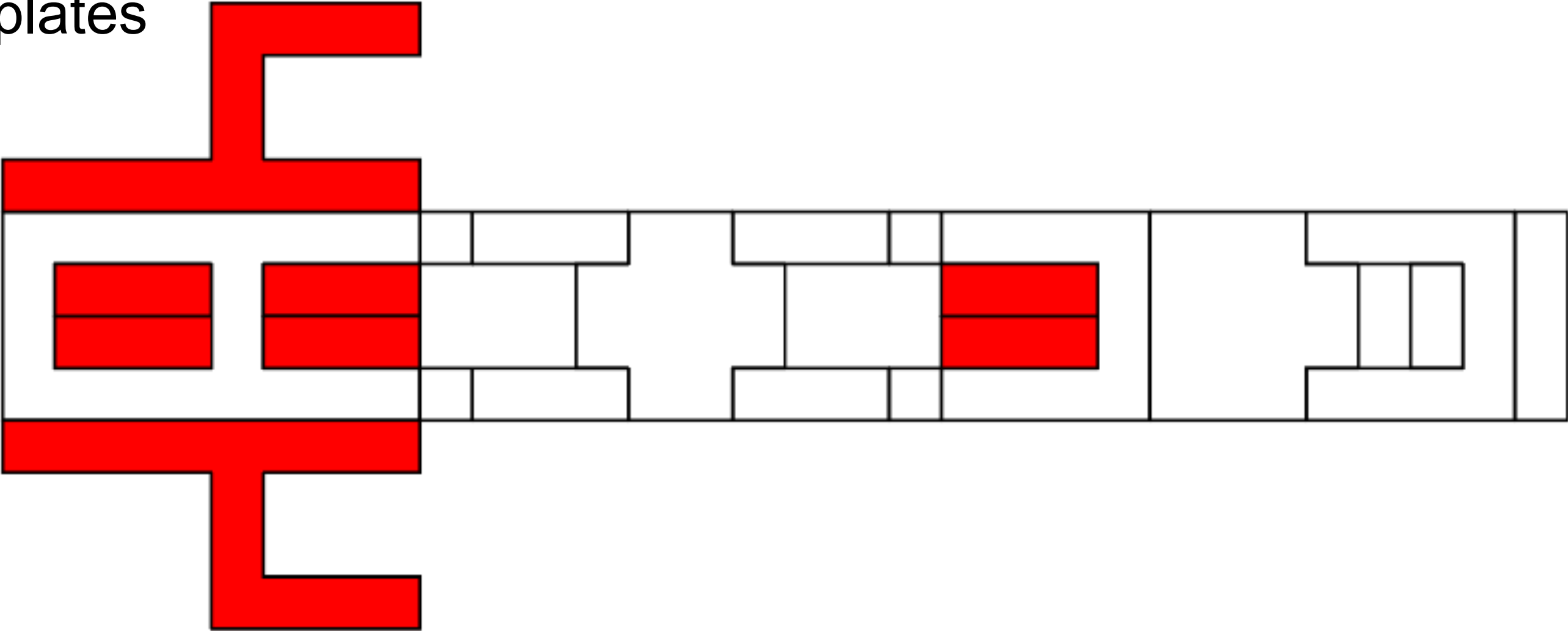


1. choose a “wing” dimension

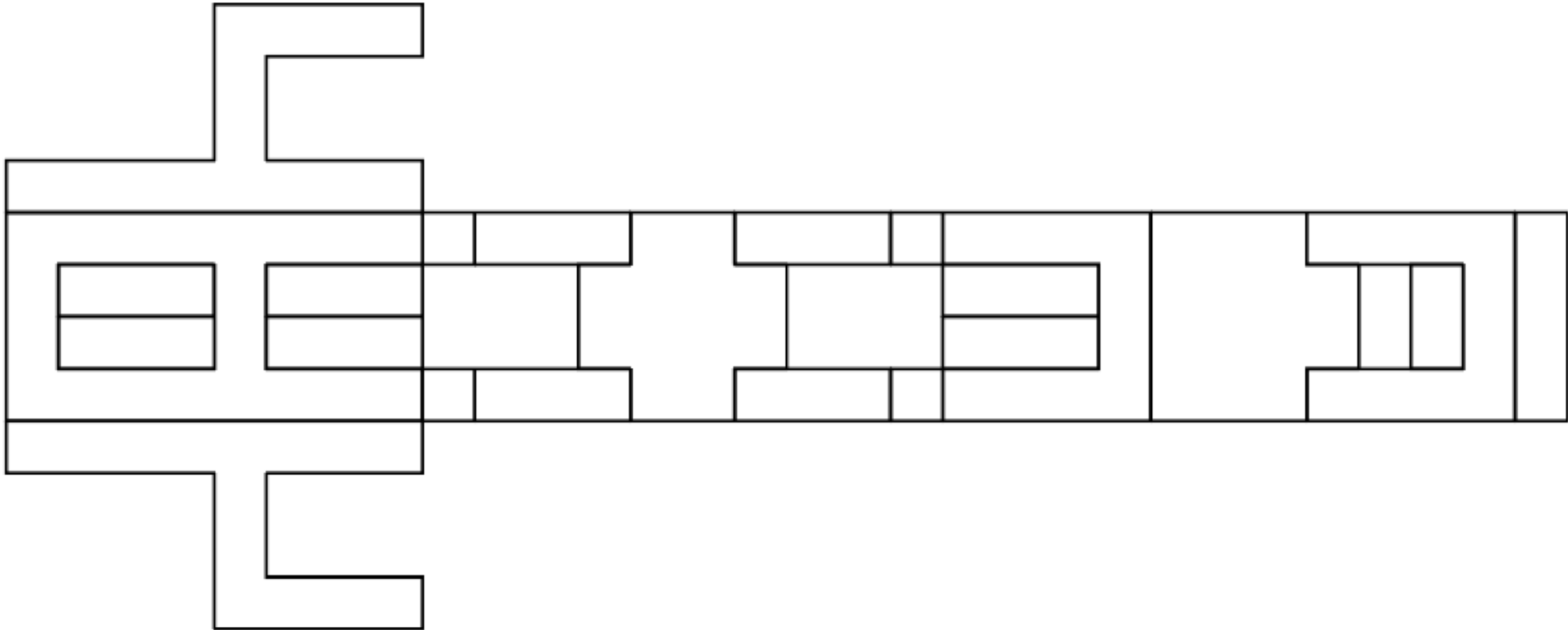
2. all plates with normal parallel to w^v are now “wing” plates

3. All remaining plates are “strip” plates

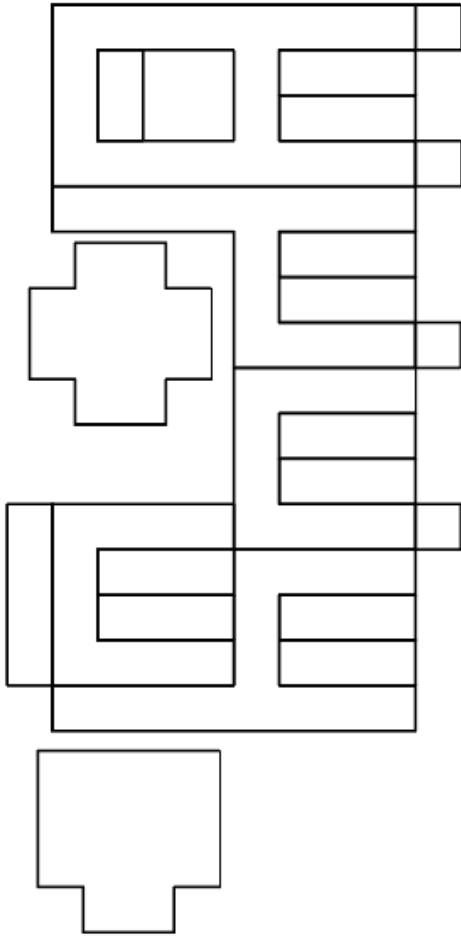
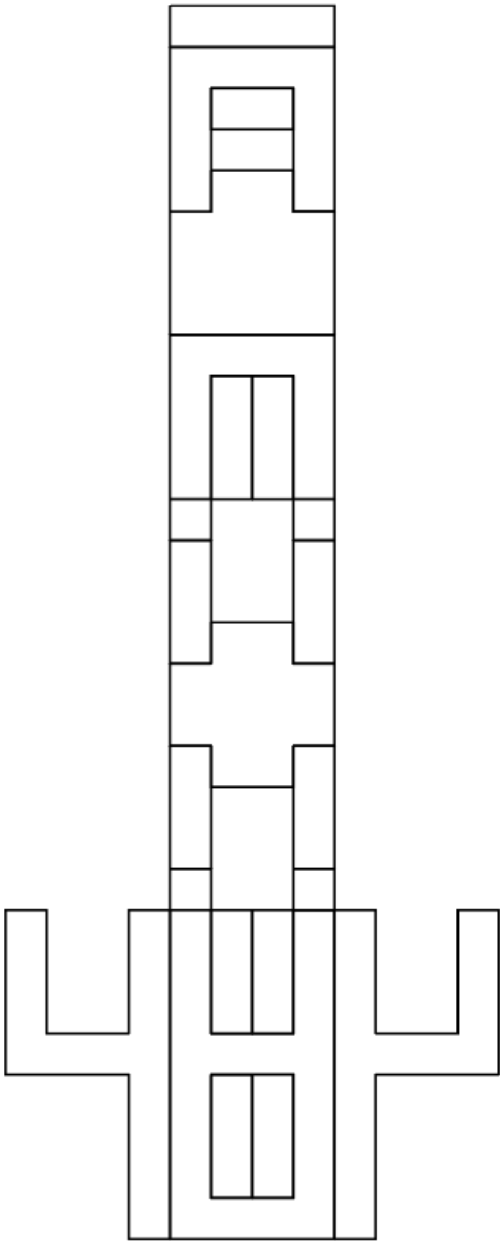
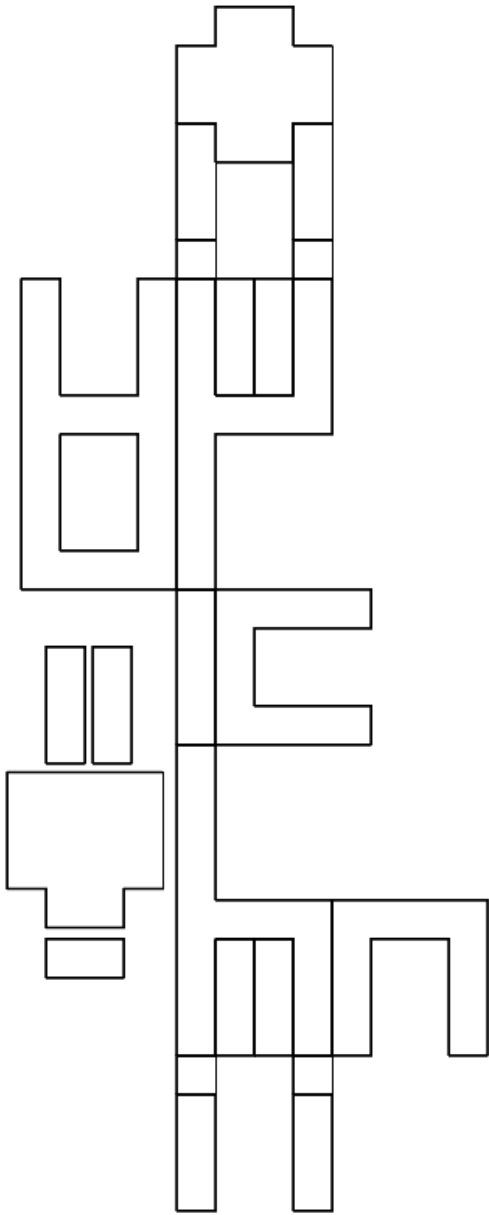
4. unfold all strip plates



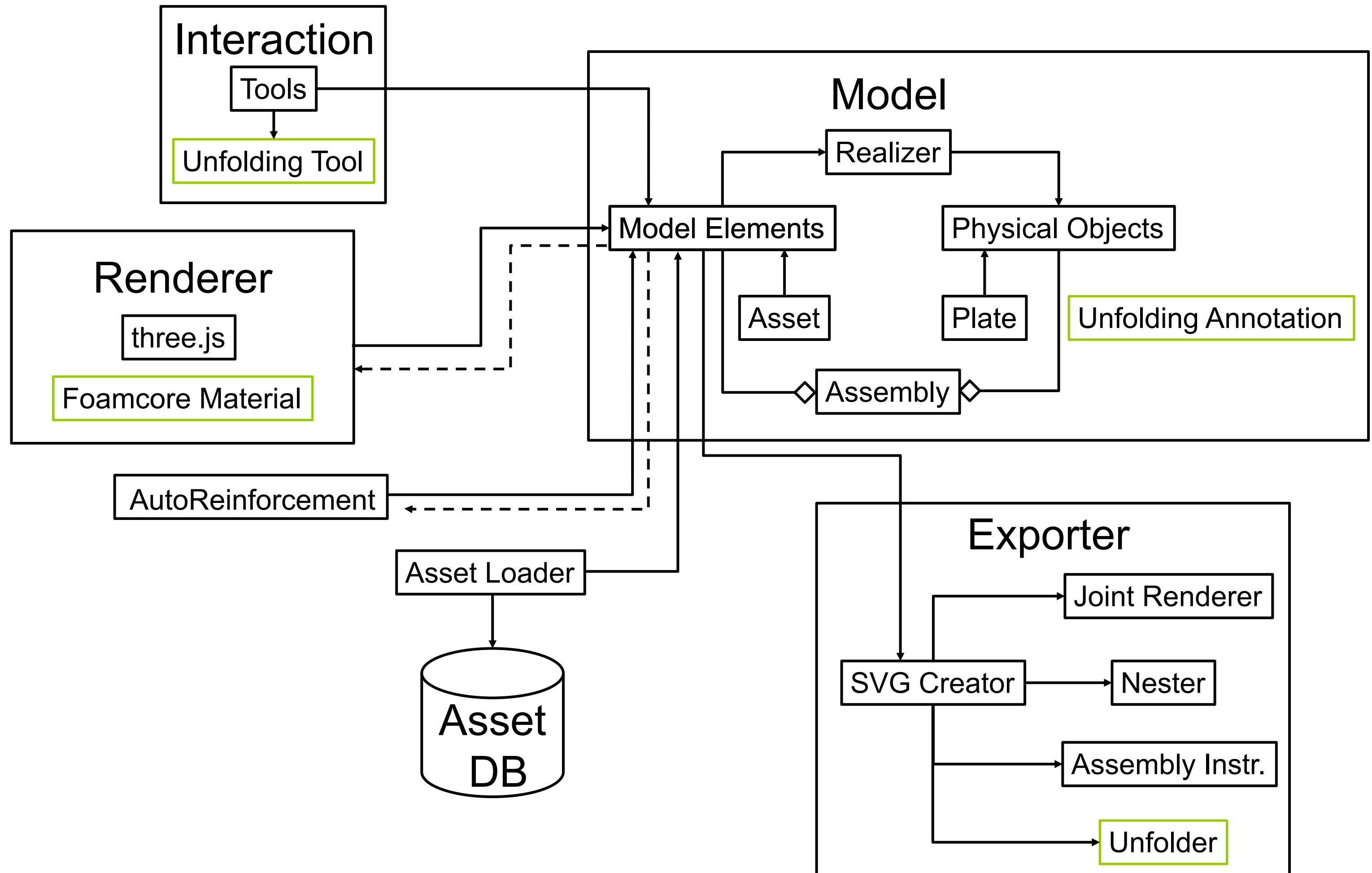
5. add wing plates, switch joint if overlap occurs



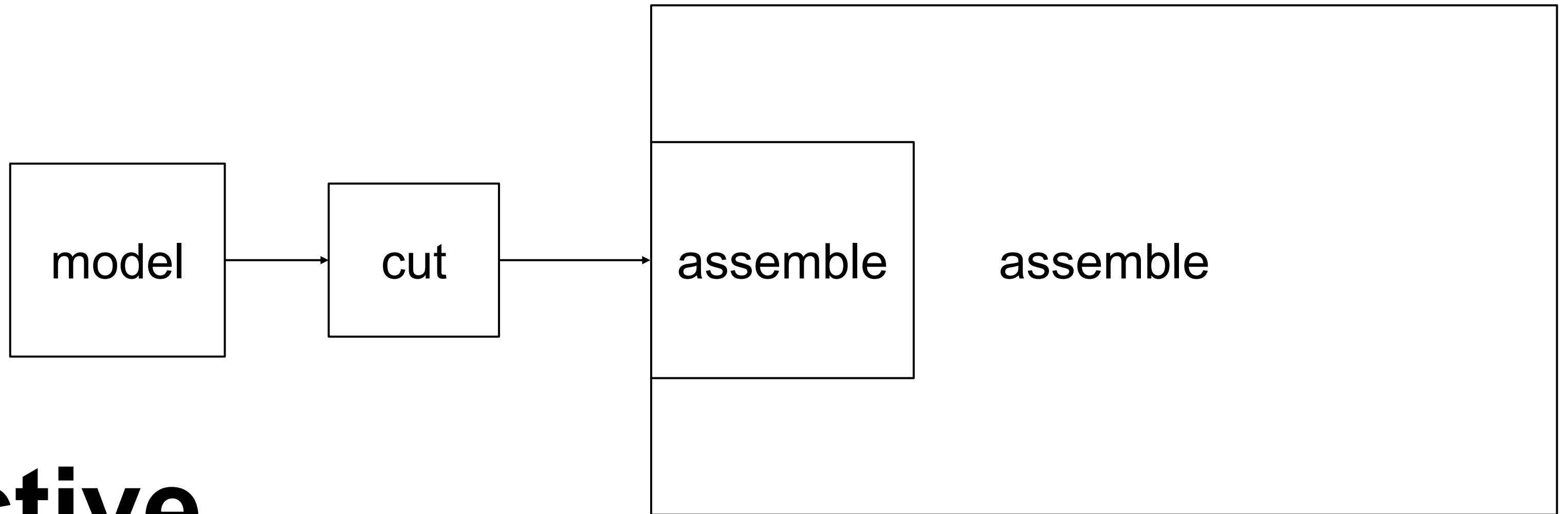
choosing different wing dimensions
results in different unfoldings



integration into 3D
editor

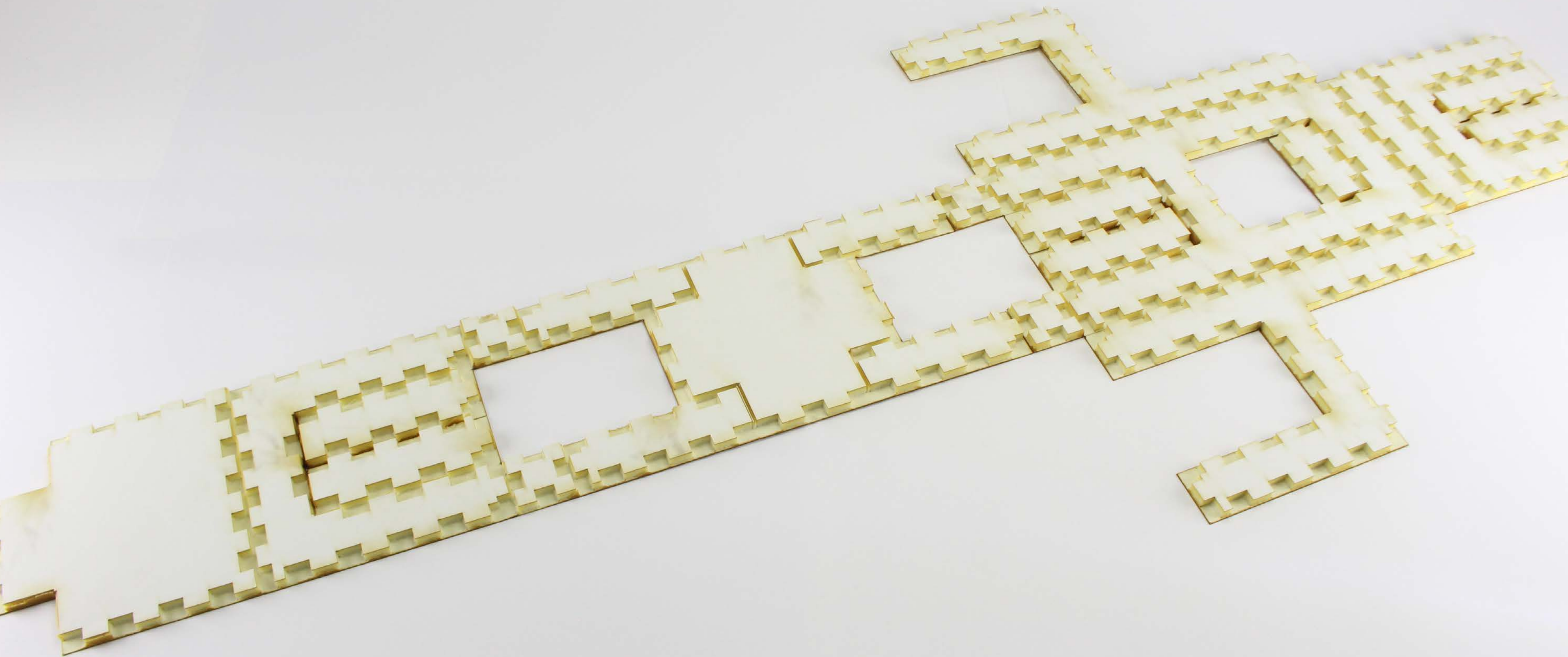


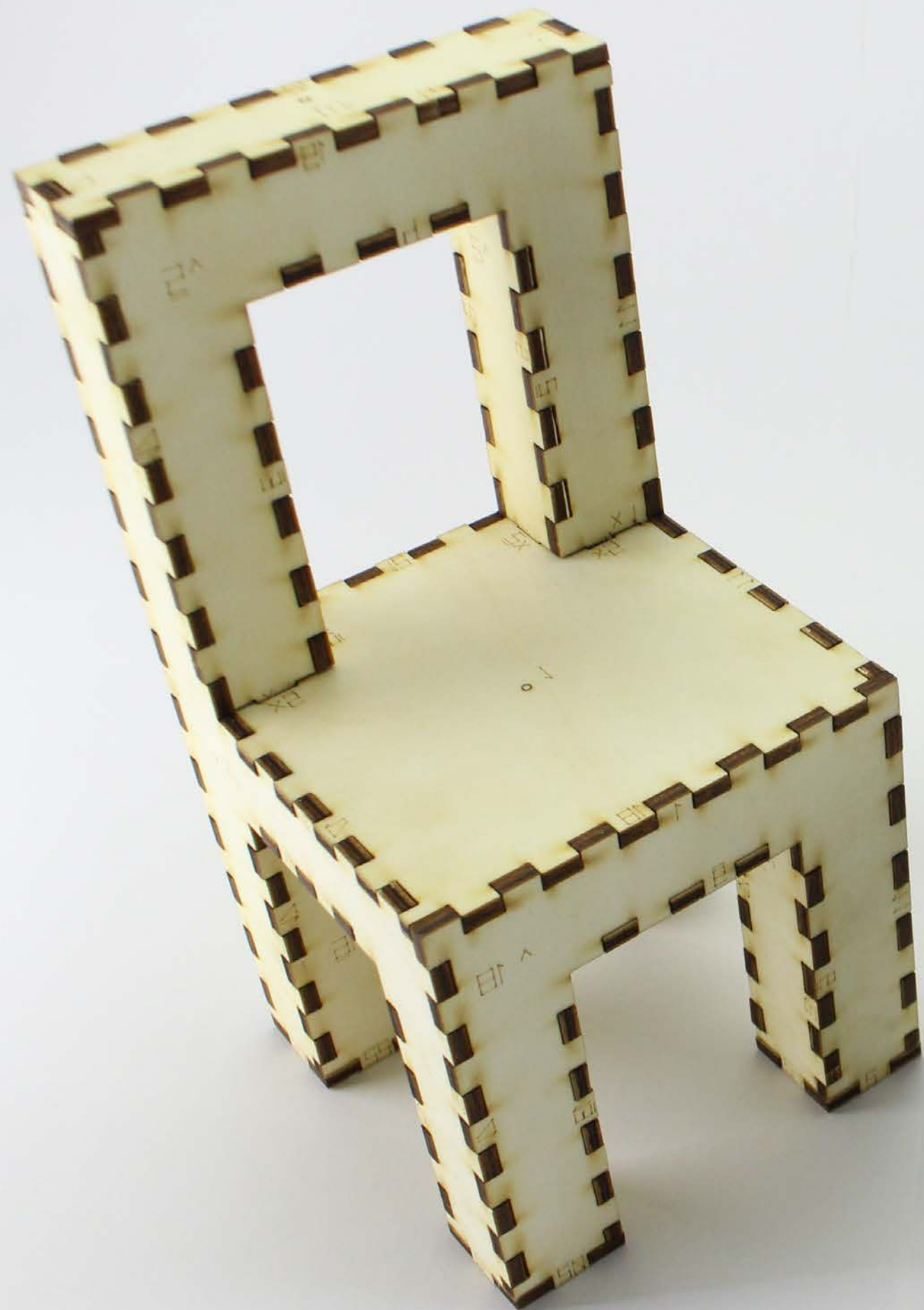
conclusion



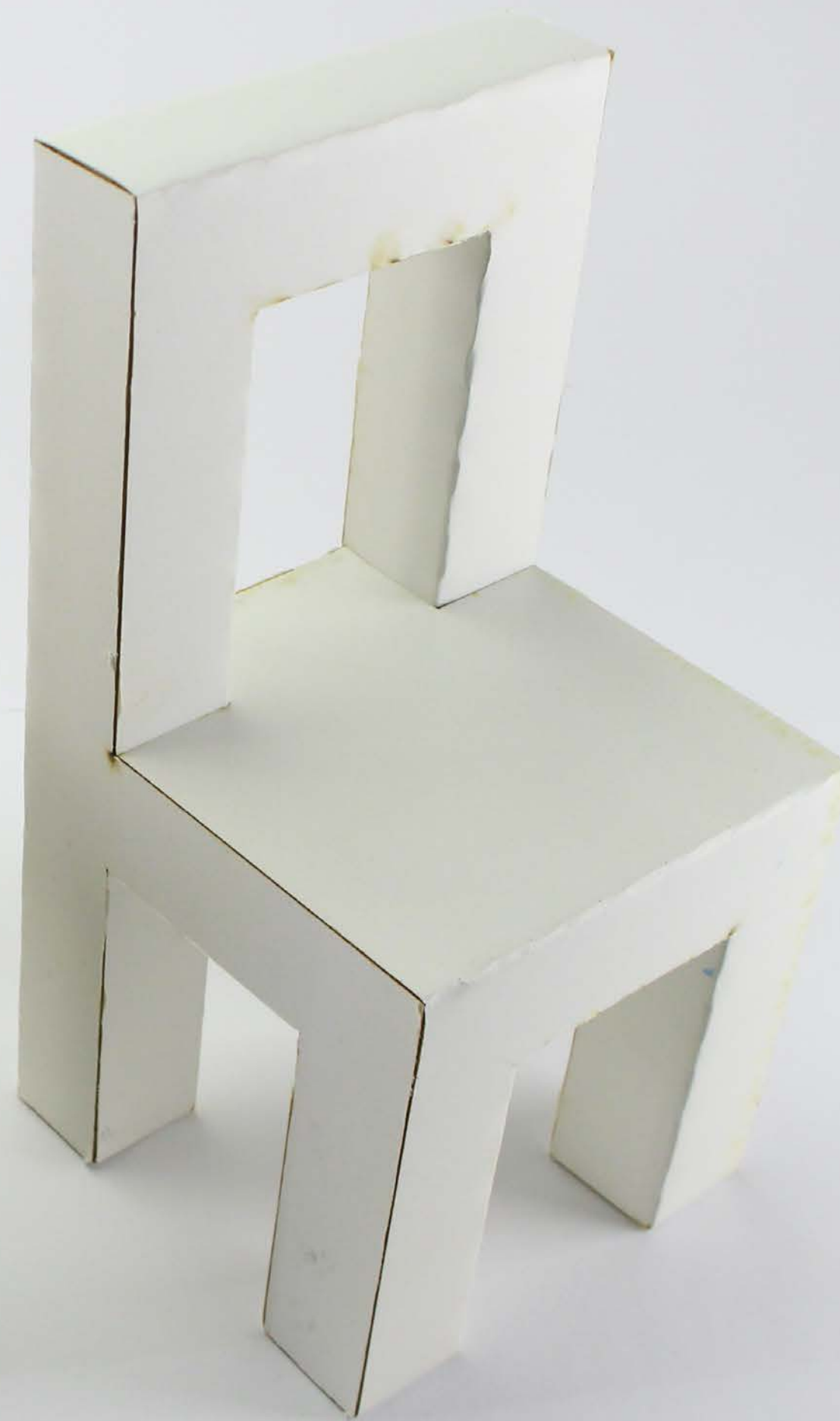
objective

reduce complexity of **plate search** from $O(n^2) \rightarrow O(n)$





plywood: 21 minutes



foamcore: 4 minutes

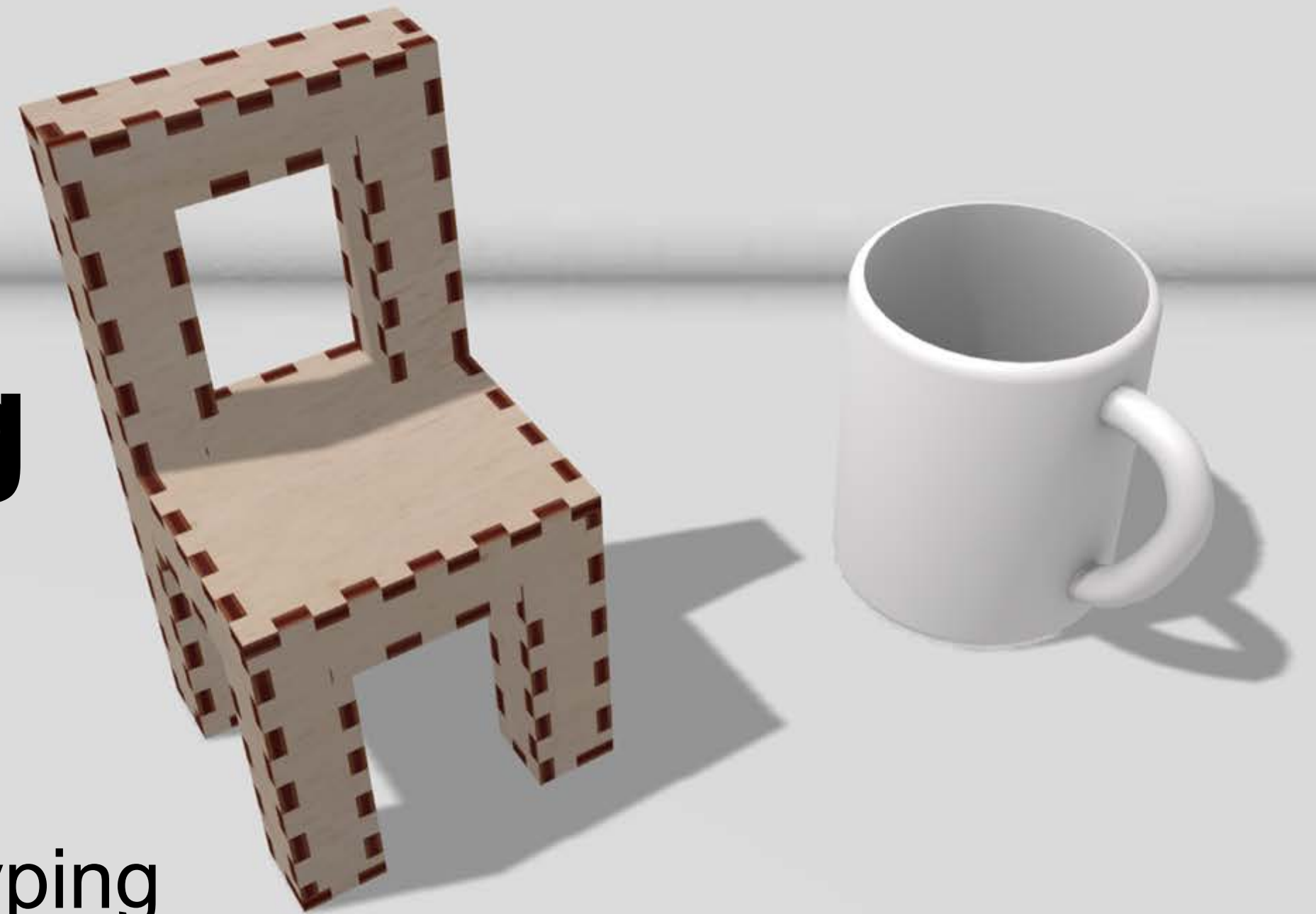
rapid prototyping

carpenter: next week prototyping

3D printing: next day prototyping

lascutting: next meeting prototyping

foamcore: within meeting prototyping



A 3D model of a complex, multi-layered structure made from a yellow foam core. The structure is composed of several interconnected rectangular and square frames, each with a grid-like pattern of small, raised rectangular blocks. The overall shape is elongated and somewhat irregular, resembling a stylized letter or a specific architectural component. The model is shown from a perspective that highlights its depth and the intricate details of the laser-cut foam core.

Fast Fabrication of 3D Models by Folding Laser-Cut Foam Core

Oliver Adameck, Lukas Fritzsche & Jonas Noack
Supervisors: Prof. Patrick Baudisch & Muhammad Abdullah