

Decompiling CAD using FP + Synthesis

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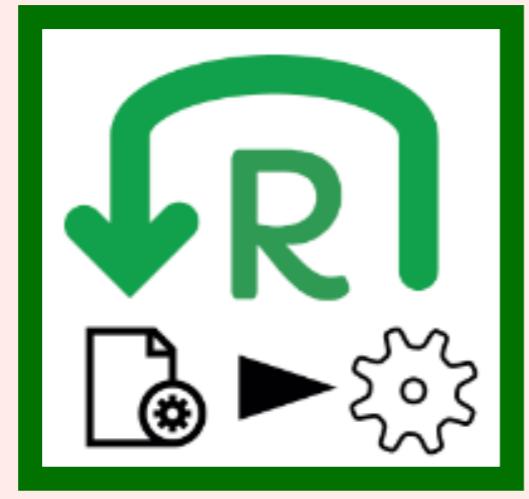
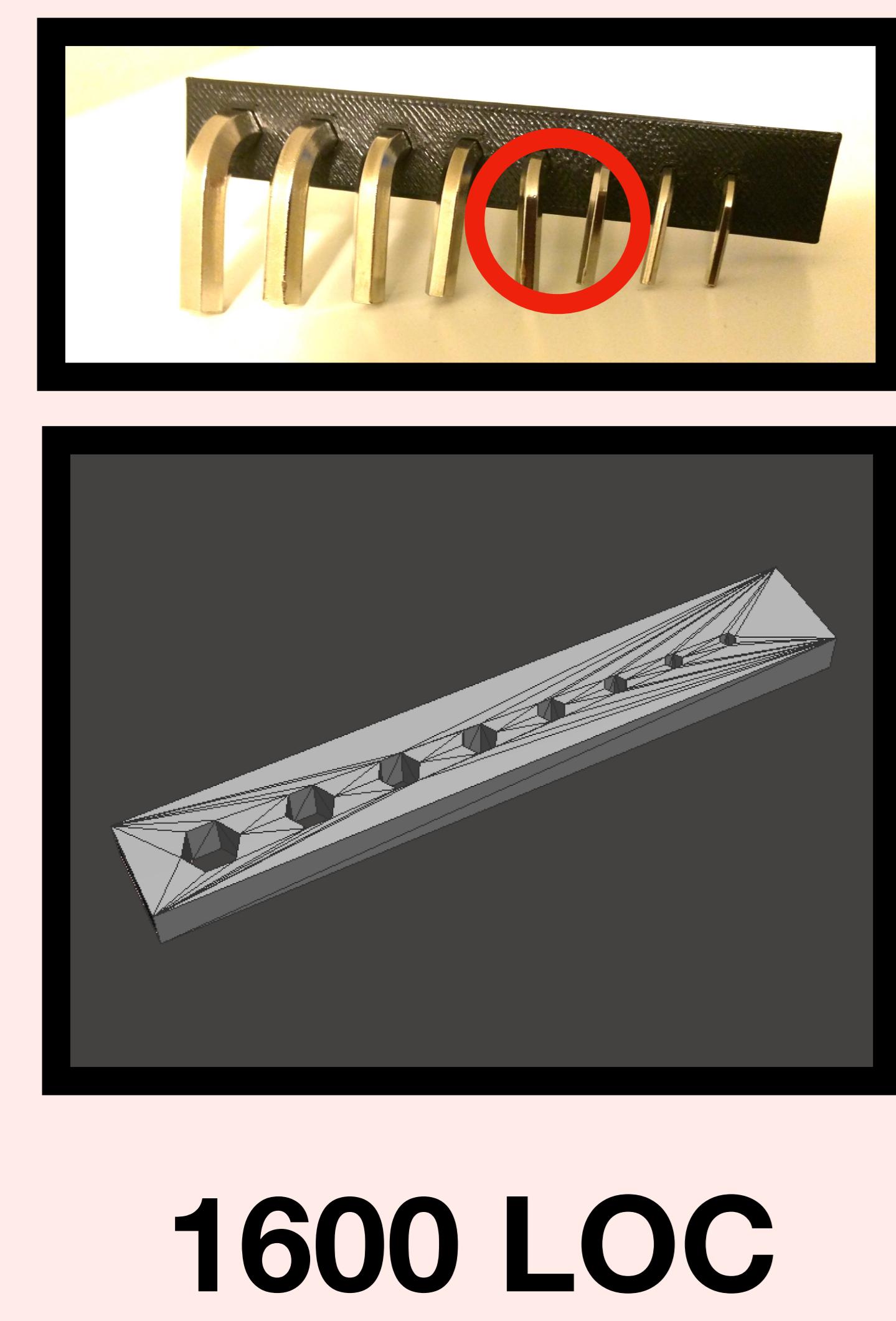
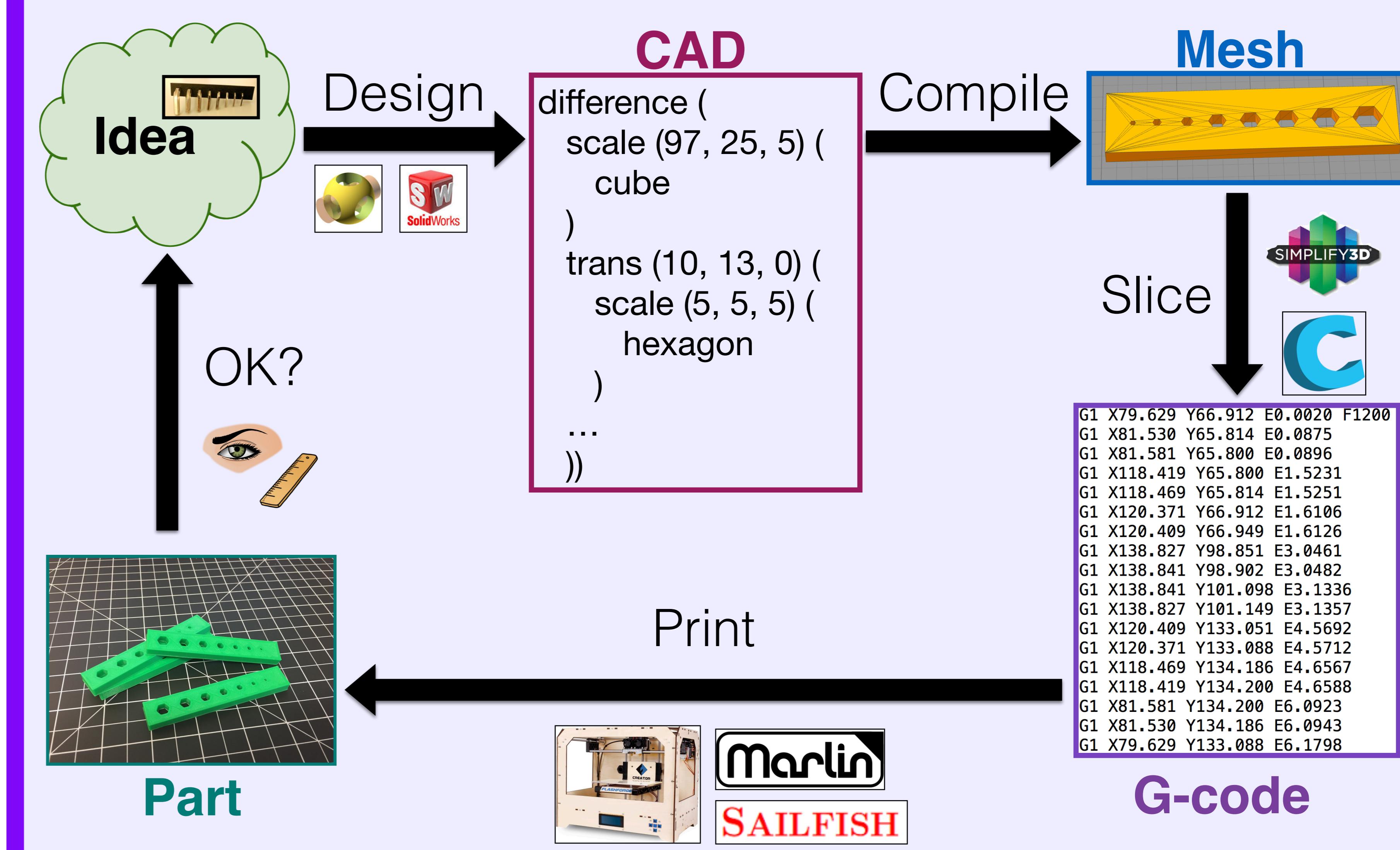
Designing CAD models is *hard*

Online design repositories like Thingiverse are popular alternatives

- + Shared as meshes
- + CAD package agnostic
- + Cheap
- + Easy

- Immutable
- Incomplete

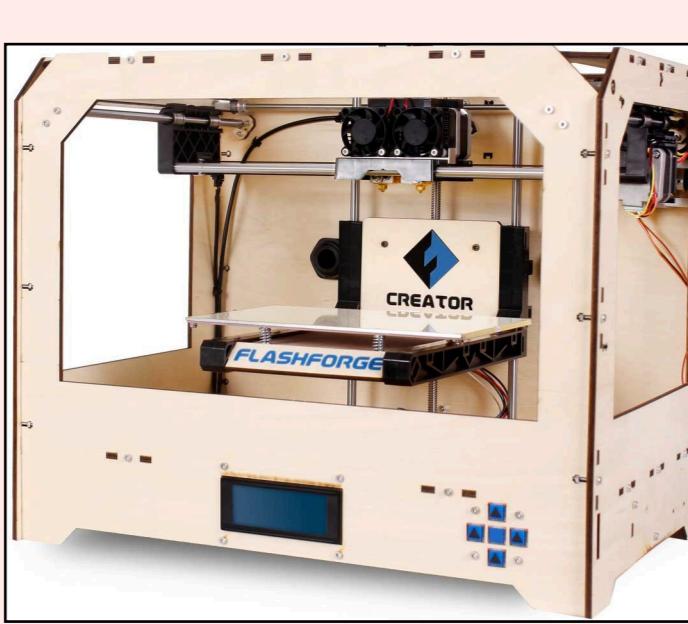
3D Printing Pipeline = Compiler



1600 LOC

difference (
scale (97.0, 25.0, 5.0) cube

trans (49.0, 13.0, 2.5) (
scale (7.0, 6.06, 5.0) (
cylinder 6))
...)



success!

print

edit

difference (
scale (97.0, 25.0, 5.0) cube

trans (49.0, 13.0, 2.5) (
scale (7.0, 6.06, 5.0) (
rotateZ (35.0) (
cylinder 6)))
...)

PL Fab Foundations

Synthesis = search + oracles

- subtractive
- additive
- primitive matching

Need PL foundations:

- DSLs for CAD and Mesh
- denotational semantics
- evaluation contexts
- compiler correctness proof

Implementation in ~ 25,000 LOC of OCaml

[github.com/uwplse/
reincarnate-aec](https://github.com/uwplse/reincarnate-aec)

Thingiverse
models
synthesized

