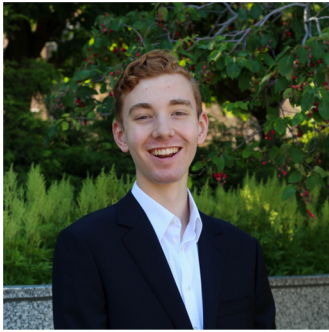


Direct Manipulation for Computational Making



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What is *Computational Making*?

Making

+

Computational
Thinking

=

- FlatCAD
- BlocksCAD
- Madeup
- OpenSCAD

Aesthetics

Construction

Creativity

What is *Direct Manipulation*?

- Interacting with a computer
 - Actions are:
 1. Rapidly executed
 2. Immediately observable
 3. Easily reversed
 4. Direct, *visual* results
- } Modern Software Paradigm

[2] Schneiderman. (1993)

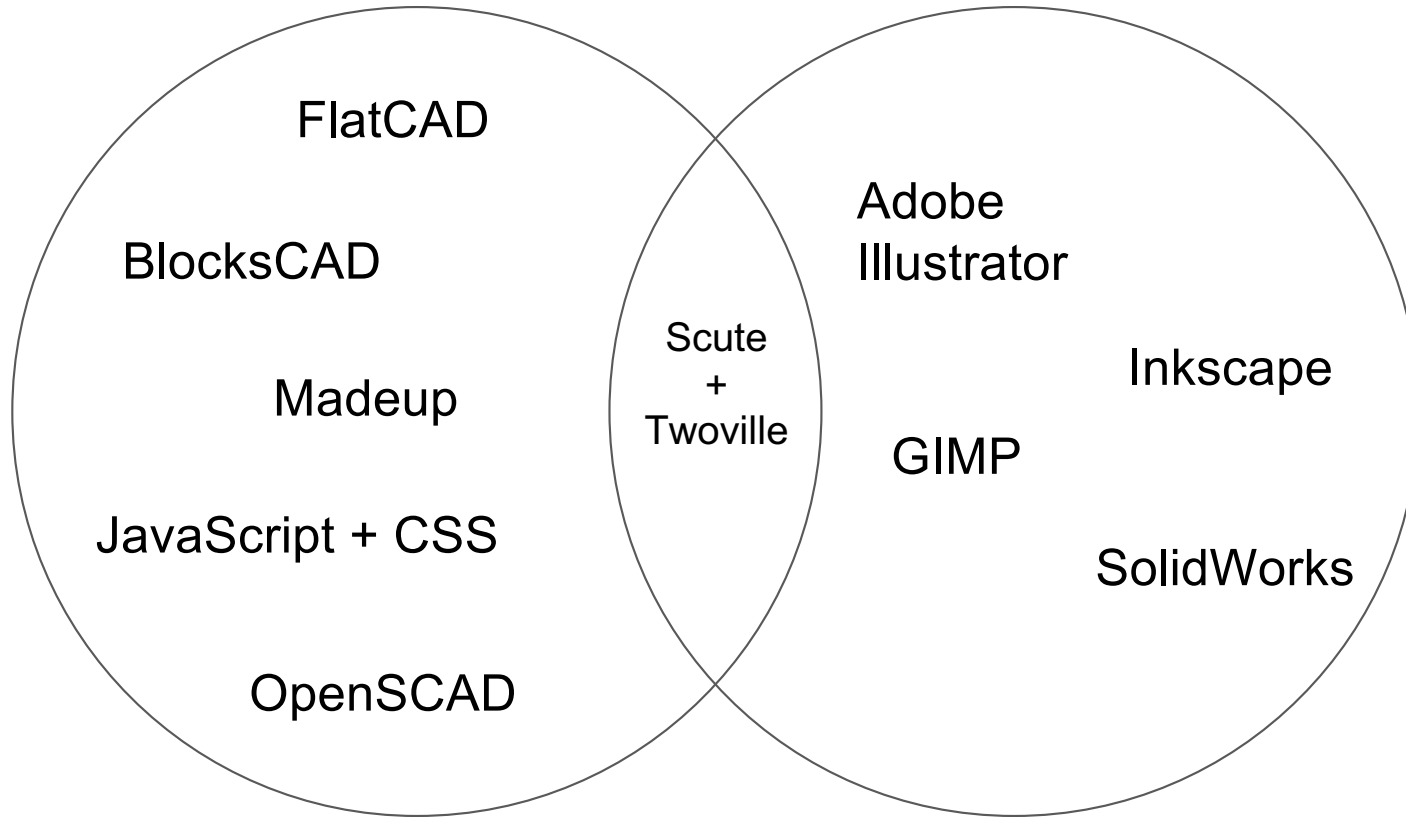
- Improvements when used with programming?
 - Tasks solved quicker
 - Solutions more efficient
- How can this inform computational making?

[3] Adam et al. (2019)

[4] Handhausen et al. (2009)

Computational Making

Direct Manipulation



FlatCAD

BlocksCAD

Madeup

JavaScript + CSS

OpenSCAD

Scute
+
Twoville

Adobe
Illustrator

GIMP

Inkscape

SolidWorks

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- [2] Ben Shneiderman. 1993. Direct Manipulation: a Step Beyond Programming Languages. Sparks of innovation in human-computer interaction, 17 (1993), 1993.
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