

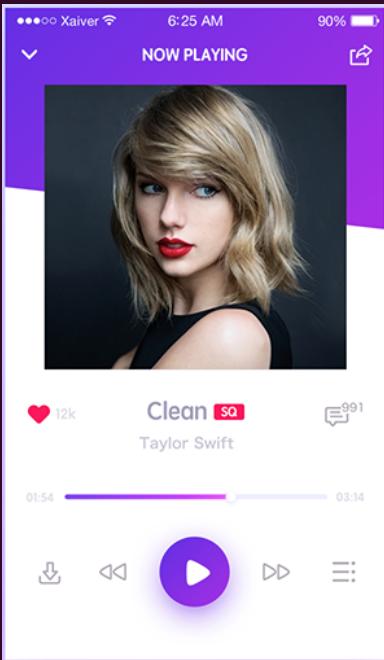
Scout: Rapid Exploration of Interface Layout Alternatives through High-Level Design Constraints

Amanda Swearngin, Chenglong Wang, Alannah Oleson, Amy Ko, James Fogarty
amaswea.github.io

DUB Shorts
April 15th, 2020



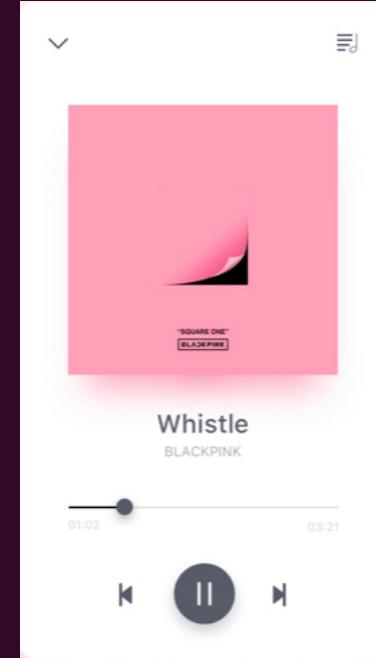
Alternative 1



Alternative 2

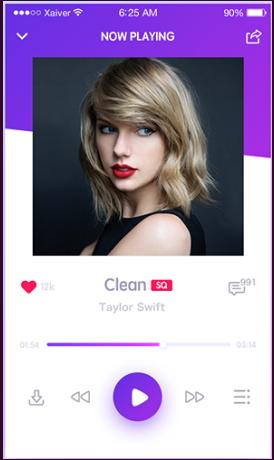


Alternative 3



Benefits of Creating Alternatives

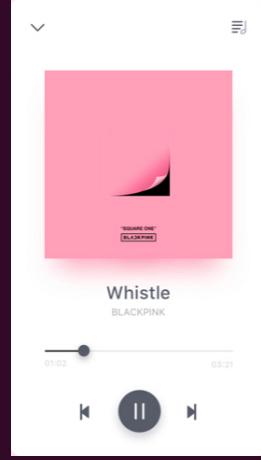
Alternative 1



Alternative 2



Alternative 3



Better designs¹

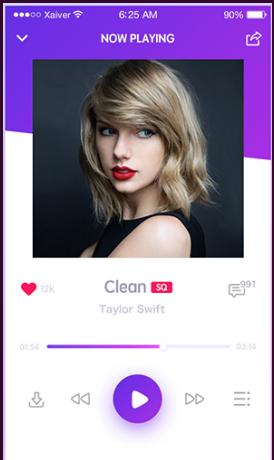
Stronger critiques²

More diverse designs³

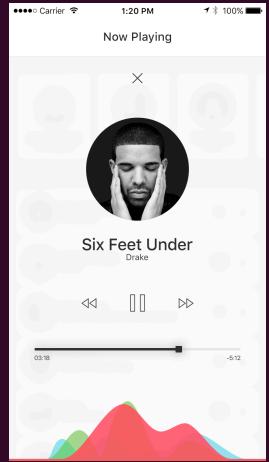
1. Dow, et. al., "Parallel Prototyping Leads to Better Design Results, More Divergence, and Increased Self-efficacy, Design Thinking Research", 2012
2. Tohidi, et. al., "Getting the Right Design and the Design Right", CHI 2006
3. Bill Buxton, "Sketching User Experiences: Getting the Design Right and the Right Design", 2007

Challenges of Creating Alternatives

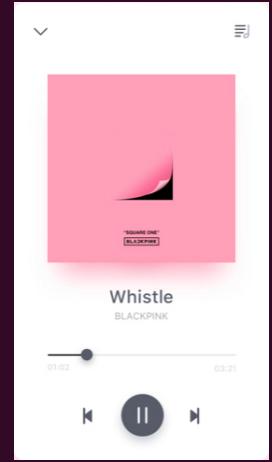
Alternative 1



Alternative 2



Alternative 3

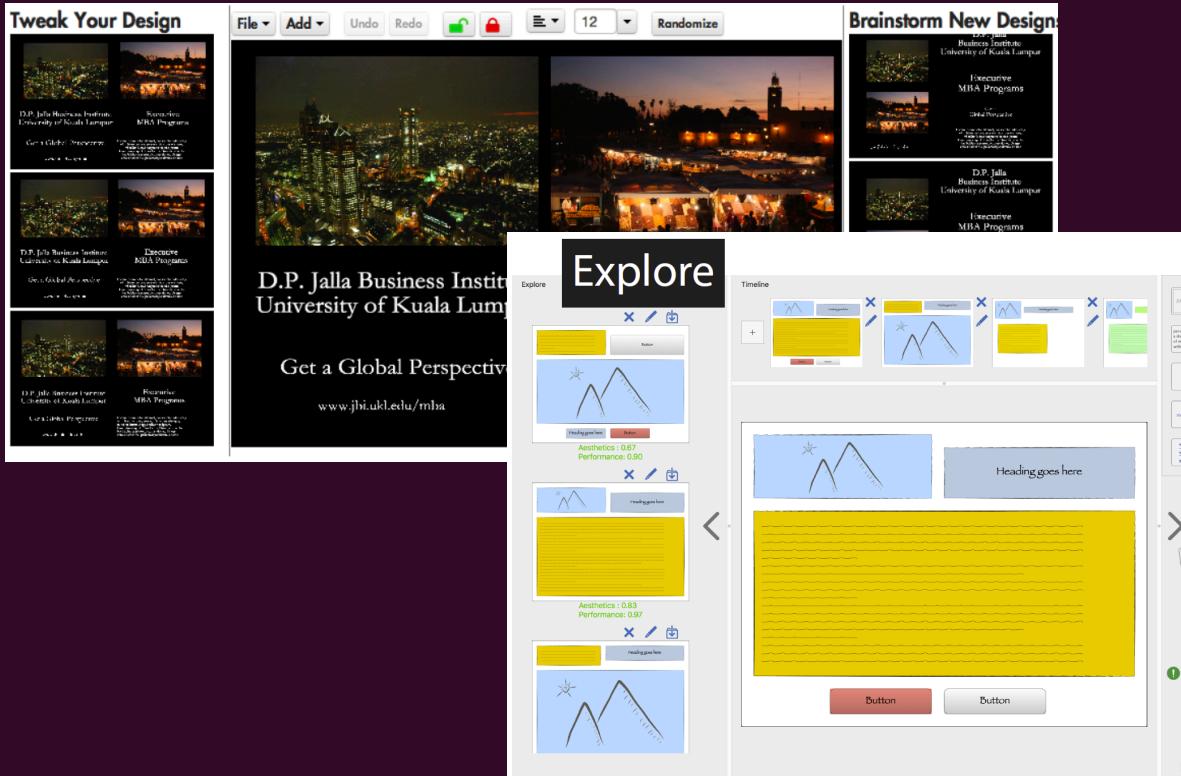


Designer Fixation¹



Tools for Automatic Exploration of Alternatives

DesignScape¹



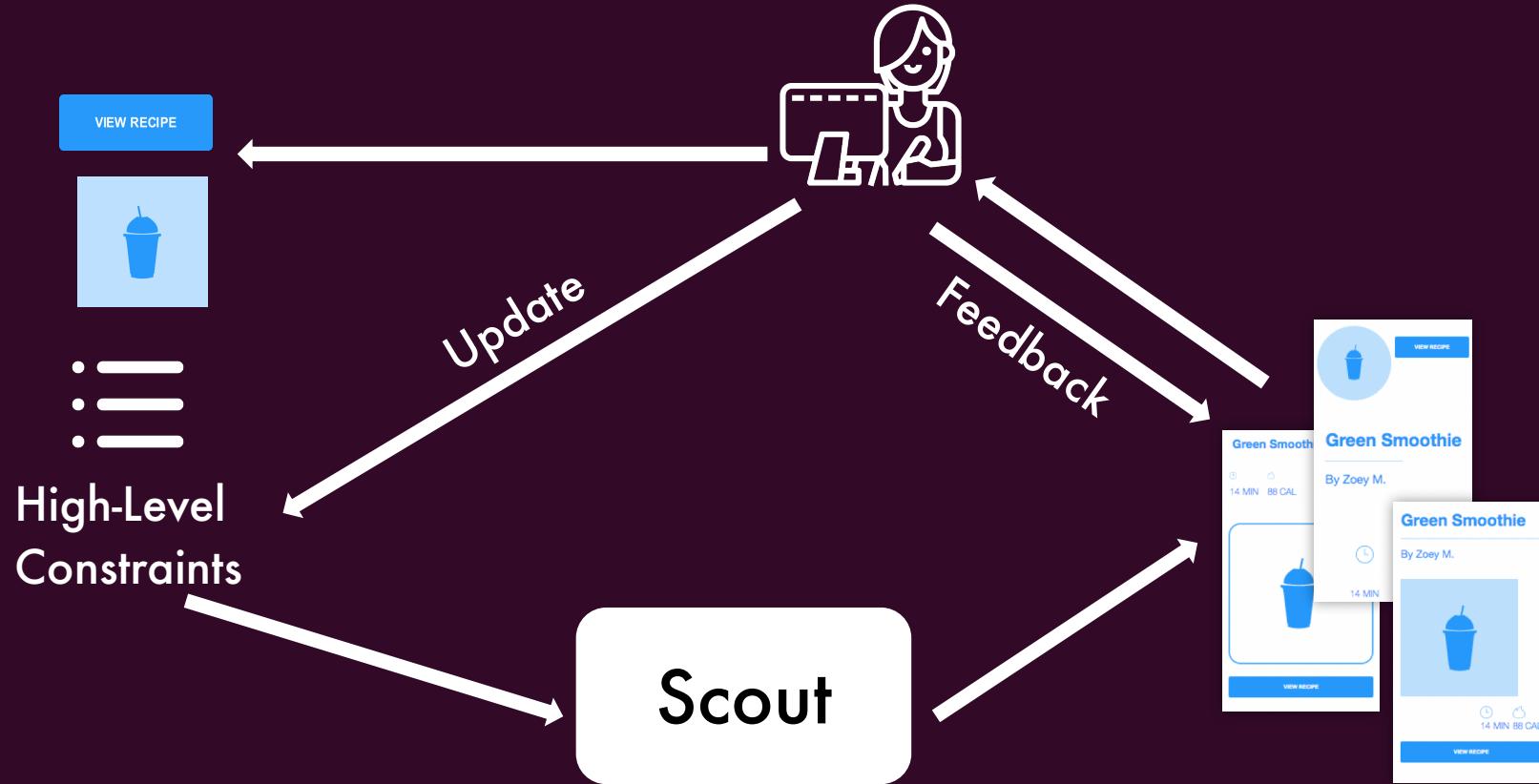
Sketchplore²

No feedback

Designer unable to control generation or define constraints on interface semantics

1. Peter O'Donovan, Aseem Agarwala, Aaron Hertzmann. "DesignScape: Design with Interactive Layout Suggestions", CHI '15
2. Kashyap Todi, Daryl Weir, and Antti Oulasvirta. "Sketchplore: Sketch and Explore with a Layout Optimizer", DIS '16

Scout: Rapid Exploration of Interface Layout Alternatives using High-Level Design Constraints¹



1. Amanda Sweenyngin, Chenglong Wang, Alannah Oleson, James Fogarty, Amy Ko, "Scout: Rapid Exploration of Interface Layout Alternatives through High-Level Design Constraints", CHI 2020

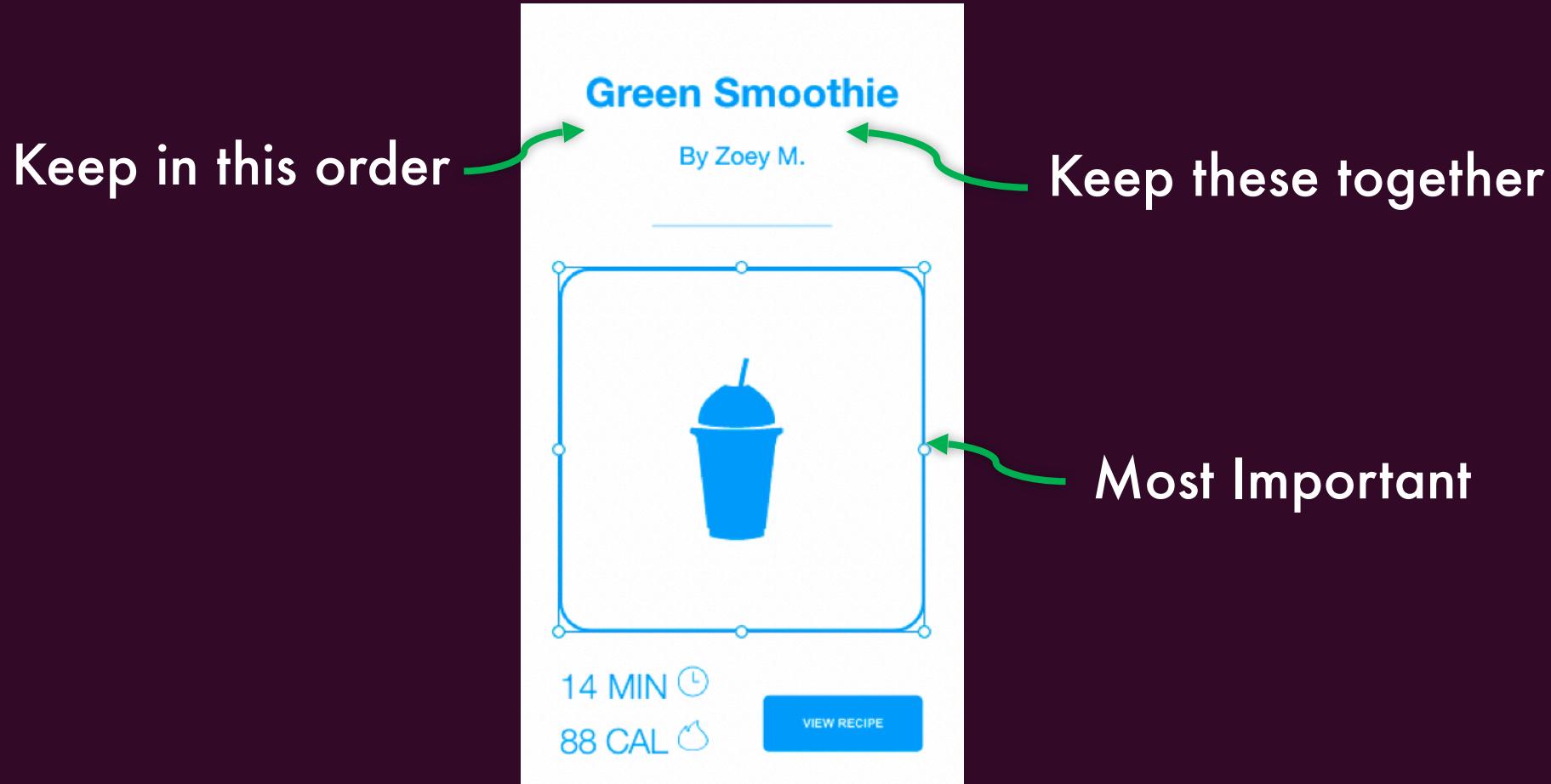
Research Questions

How can we give designers more control over alternative generation, by letting them define constraints on high-level interface semantics?

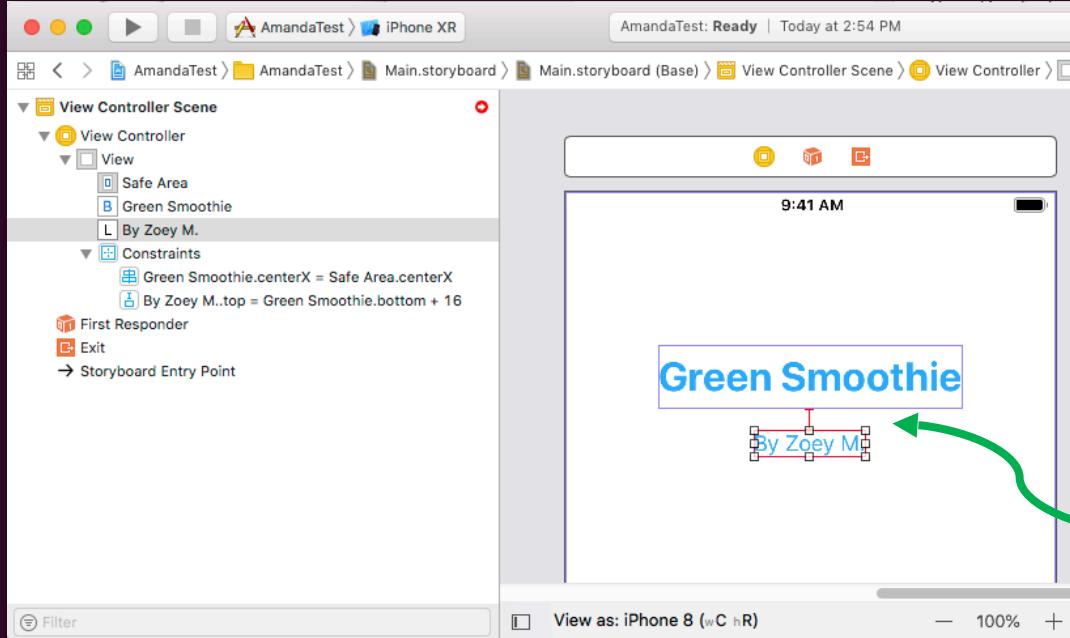
Research Questions

How can we give designers more control over alternative generation, by letting them define constraints on high-level interface semantics?

High-Level Constraints



Low-Level Spatial Constraints



Constraint

```
subtext.y == header.y +  
header.height + 20
```

Apple AutoLayout

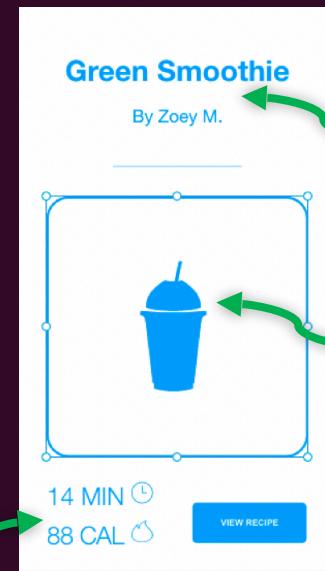
Research Questions

How can we give designers more control over alternative generation, by letting them define constraints on high-level interface semantics?

~~Low-level Spatial Constraint~~

```
subtext.y == header.y +  
header.height + 20
```

High-Level Constraints



Keep these
together

Most
Important

Keep in this order

Research Questions

How can we use these constraints to help designers rapidly ideate and visualize alternate layouts?

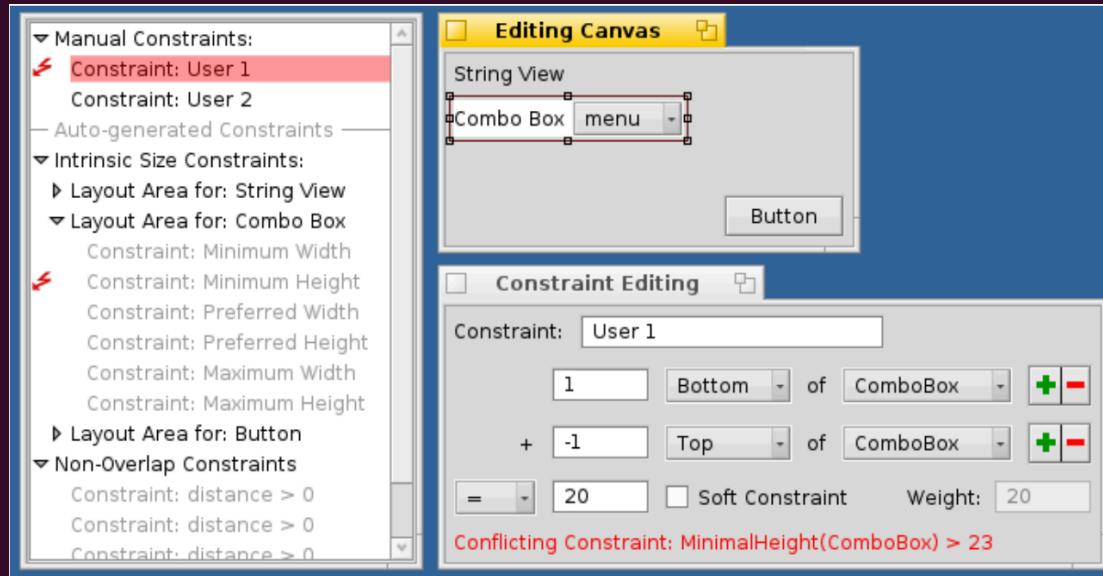
Leveraging Past Work on Constraints

Research Systems

Rockit²

Peridot³

SUPPLE⁴



Constraint
Solver

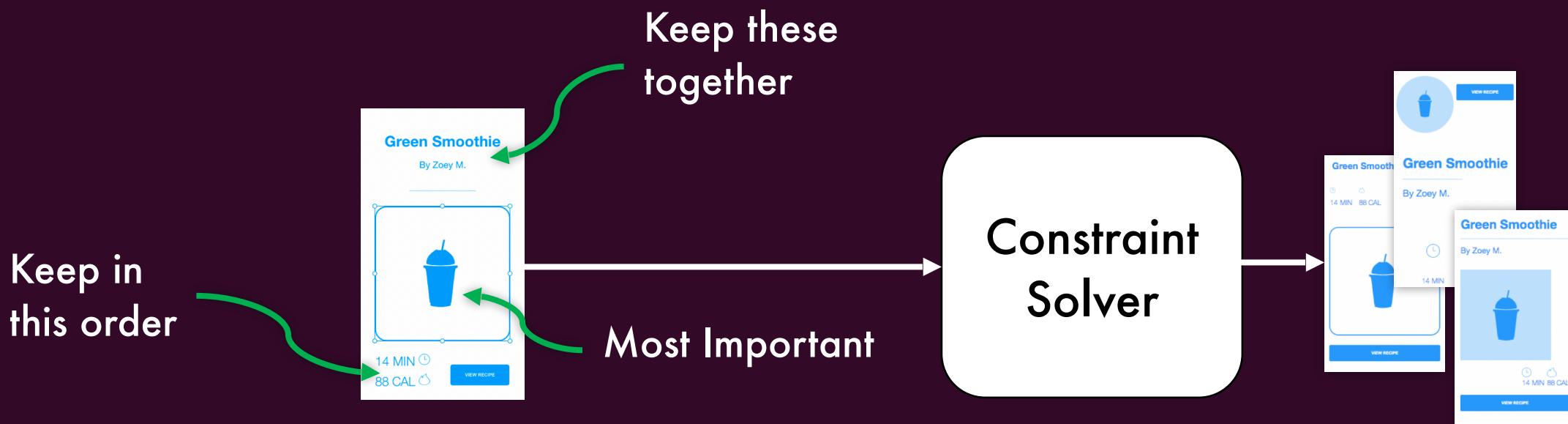
The screenshot shows a configuration panel for a classroom setup. It includes dropdown menus for Light Bank (Left, Center, Right), Light Level (7), Power Input (Computer 1, Computer 2, Video, Screen), and Vent (Off, Low, Med, High). A message box indicates a conflict:

Classroom
Light Bank Left
Center
Right
Light Level 7
Power Input Computer 1
Vent Off
Conflicting Constraint: MinimalHeight(ComboBox) > 23

1. Sutherland, "Sketchpad: A Man-machine Graphical Communication System", SHARE, '64
2. Karsenty et al., "Inferring Graphical Constraints with Rockit", CHI '93
3. Myers et al., "Creating Highly Interactive and Graphical User Interfaces by Demonstration", SIGGRAPH '86
4. Gajos et al., "Automatically Generating User Interfaces Adapted to Users' Motor and Vision Capabilities", UIST '07
5. Zeidler et al., "The Auckland Layout Editor: An Improved GUI Layout Specification Process", UIST '13

Research Questions

How can we use these constraints to help designers rapidly ideate and visualize alternate layouts?



Scout Not Secure | 10.158.54.128:8082/scout/# Error

Outline See more layout ideas

Feedback

Layout Ideas 44 Under Consideration 0 Saved 23 Discarded

Discard Invalid Ideas Export Saved Ideas

Canvas
Order Unimportant
Remove all feedback

Alternate
Order Unimportant High Emphasis

Group
Order Important

Green Smoothie
By Zoey M.

Repeat
Order Important Low Emphasis

Item
Order Unimportant

14 MIN

Item
Order Unimportant

88 CAL

[VIEW RECIPE](#)

Select an element in the Outline Panel or in a layout idea canvas to the right to see feedback options.

Layout Ideas

Green Smoothie By Zoey M.
14 MN 88 CAL
[VIEW RECIPE](#)

Green Smoothie By Zoey M.
14 MN 88 CAL
[VIEW RECIPE](#)

New
Green Smoothie By Zoey M.
14 MIN 88 CAL
[VIEW RECIPE](#)

Green Smoothie By Zoey M.
14 MIN 88 CAL
[VIEW RECIPE](#)

Green Smoothie By Zoey M.
14 MIN 88 CAL
[VIEW RECIPE](#)

Green Smoothie By Zoey M.
14 MIN 88 CAL
[VIEW RECIPE](#)

Green Smoothie By Zoey M.
14 MIN 88 CAL
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Green Smoothie By Zoey M.
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14 MIN 88 CAL
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Green Smoothie By Zoey M.
14 MIN 88 CAL
[VIEW RECIPE](#)

Green Smoothie By Zoey M.
14 MIN 88 CAL
[VIEW RECIPE](#)

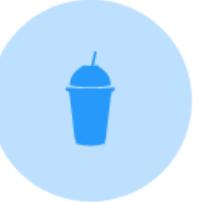
Scout – Redesigning a Layout



Green Smoothie

By Zoey M.

[VIEW RECIPE](#)



🕒 14 MIN 🍃 88 CAL



Widgets

Clear Widgets



Outline

See more layout ideas

Feedback

Layout Ideas

0 Under Consideration

0 Saved



Drag and drop your SVG interface elements here.

Canvas

Order

Ren



TeaserComponents_SmoothieRecipe



Search

iCloud Drive

Desktop

AirDrop

Downloads

Google Drive

Recents

Genie

GitHub

Applications

Rewire2

Rewire

Dropbox

layout

Creative Cloud Files

Scout

Videos

iCloud

Documents

Desktop

iCloud Drive

Name	Date Modified	Size	Kind
0_Separator.svg	Jun 15, 2019 at 5:57 PM	171 bytes	MyDoc...
1_CirclePlaceholder.svg	Jun 15, 2019 at 2:43 PM	2 KB	MyDoc...
1_RoundedCornerIcon.svg	Jun 15, 2019 at 5:04 PM	2 KB	MyDoc...
1_SquareIcon.svg	Jun 15, 2019 at 2:43 PM	2 KB	MyDoc...
2_Title.svg	Jun 15, 2019 at 6:23 PM	317 bytes	MyDoc...
3_Subtext.svg	Jun 15, 2019 at 6:23 PM	293 bytes	MyDoc...
5_clock_icon.svg	Jun 15, 2019 at 5:52 PM	799 bytes	MyDoc...
6_12minutes.svg	Jun 15, 2019 at 6:09 PM	327 bytes	MyDoc...
7_calories_icon.svg	Jun 15, 2019 at 5:52 PM	1 KB	MyDoc...
8_ingredients.svg	Jun 15, 2019 at 6:09 PM	401 bytes	MyDoc...
10_Button2.svg	Jun 15, 2019 at 3:13 PM	506 bytes	MyDoc...

Scout Not Secure | 10.158.54.128:8082/scout/#

Scout Exploring alternative layout ideas for wireframes.

Widgets Clear Widgets < **Outline** See more layout ideas

(Separator)

Canvas

Order important

Remove all feedback

Select an element in the Outline Panel or in a layout idea canvas to the right to see feedback options.

Feedback

Layout Ideas 0 Under Consideration 0 Saved

You currently have no layout ideas under consideration.

Green Smoothie

By Zoey M.

14 MIN

1

Scout

Not Secure | 10.158.54.128:8082/scout/#

Scout Exploring alternative layout ideas for wireframes

Outline See more layout ideas

Canvas

Order important

Remove all feedback

Alternate

Order Unimportant

Group

Order Unimportant

Green Smoothie

By Zoey M.

14 MIN

88 CAL

VIEW RECIPE

Feedback

Emphasis Normal

Grid Layout & Placement

Left Column Vary Keep Prevent

Right Column Vary Keep Prevent

Y Vary Keep Prevent

Canvas Alignment Vary Keep Prevent

Layout Ideas 0 Under Consideration 0 Saved 11 Discarded

Discard Invalid Ideas

You currently have no layout ideas under consideration

Green Smoothie

By Zoey M.

14 MIN 88 CAL

VIEW RECIPE

Green Smoothie

By Zoey M.

14 MIN 88 CAL

VIEW RECIPE

Green Smoothie

By Zoey M.

14 MIN 88 CAL

VIEW RECIPE

Alternate Group

Use one placeholder per layout

High-Level Constraints

19

Scout

Not Secure | 10.158.54.128:8082/scout/#

Scout Exploring alternative layout ideas for wireframes

Outline See more layout ideas

Canvas

Order Important

Remove all feedback

- Alternate

High Emphasis

- Group

Order Unimportant

Green Smoothie

By Zoey M.

- Repeat

Order important

Item

Order Unimportant

14 MIN

Item

Order Unimportant

Feedback

Layout Ideas 0 Under Consideration 0 Saved 11 Discarded

Discard Invalid Ideas

Emphasis - High

You currently have no layout ideas under consideration. Click **See More Layout Ideas** in the outline to see more.

Principle: Interfaces should have a main focal point.¹

1. Alex White, *The Elements of Graphic Design*, 2011

20

Scout

Not Secure | 10.158.54.128:8082/scout/# Error

Scout

Exploring alternative layout ideas for wireframes.

Outline See more layout ideas

Canvas

Order Important

Remove all feedback

Alternate

Order Unimportant



Group

Order Unimportant

Green Smoothie

By Zoey M.

Repeat

Order important

Item

Order Unimportant



14 MIN

Item

Order Unimportant



88 CAL

Feedback

Order Important **ON**

Emphasis Normal ▾

Grid Layout & Placement

Left Column **Vary** Keep Prevent

Right Column **Vary** Keep Prevent

Y **Vary** Keep Prevent

Canvas Alignment **Vary** Keep Prevent

Arrangement

Arrangement **Vary** Keep Prevent

Alignment **Vary** Keep Prevent

Padding **Vary** Keep Prevent

Group Alignment **Vary** Keep Prevent

Layout Ideas 0 Under Consideration 0 Saved 11 Discarded

Discard Invalid Ideas Export Saved Ideas

You currently have no layout ideas under consideration. Click **See More Layout Ideas** in the outline to see more.

Scout Exploring alternative layout ideas for wireframes.

Widgets Clear Widgets < +

Outline See more layout ideas

Feedback

Layout Ideas 14 Under Consideration 0 Saved 6 Discarded

Discard Invalid Ideas Export Saved Ideas

Canvas

Order Unimportant Remove all feedback

Alternate

Order Unimportant High Emphasis

Select an element in the Outline Panel or in a layout idea canvas to the right to see feedback options.

Green Smoothie By Zoey M. 14 MIN 88 CAL

Group

Order Important

Green Smoothie

Repeat

Order Important Low Emphasis

Keep arrangement horizontal. -

Item

Order Unimportant

88 CAL

Drag and drop your SVG interface elements here.

Arrangement Horizontal ▾ Keep Prevent

★ 🔍

Green Smoothie By Zoey M. 14 MIN 88 CAL

★ 🔍

Green Smoothie By Zoey M. 14 MIN 88 CAL

★ 🔍 New

Green Smoothie By Zoey M. 14 MIN 88 CAL

★ 🔍 New

Green Smoothie By Zoey M. 14 MIN 88 CAL

22

Feedback

Layout Ideas

44 Under Consideration

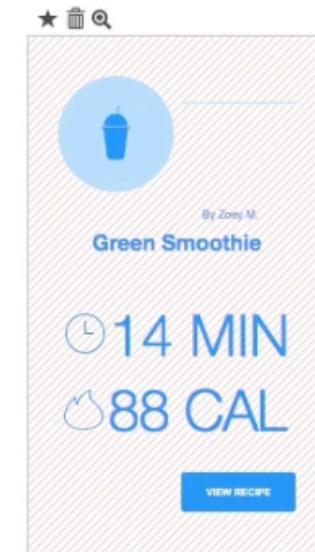
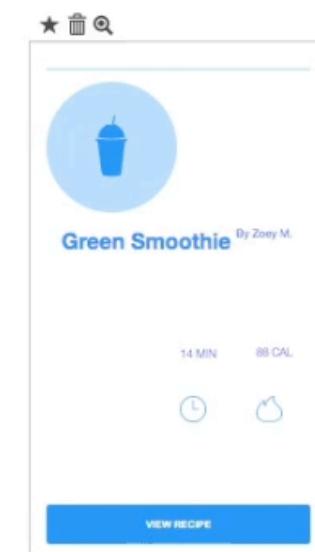
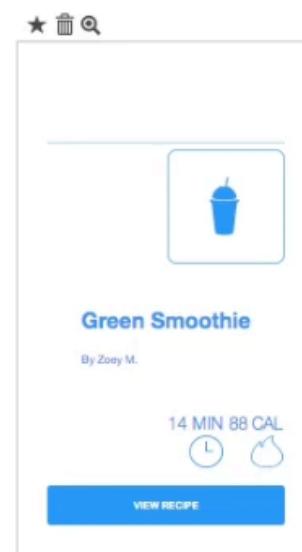
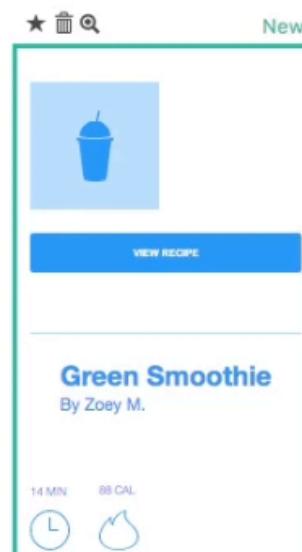
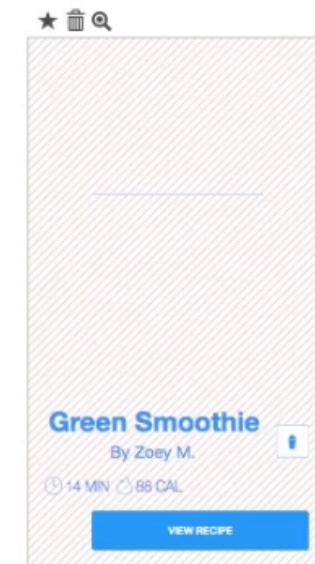
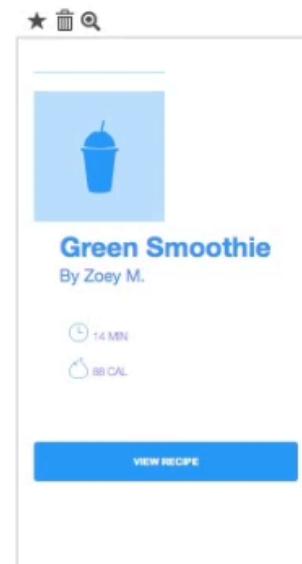
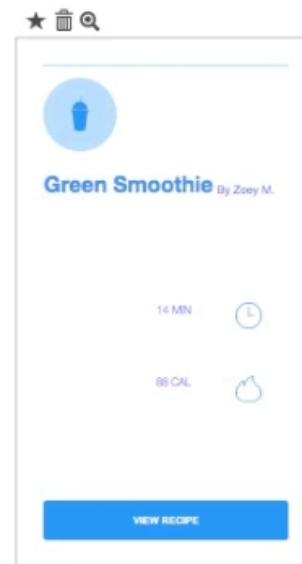
0 Saved

23 Discarded

Discard Invalid Ideas

Export Saved Ideas

Select an element in the Outline Panel or in a layout idea canvas to the right to see feedback options.



Secure | 10.158.54.128:8082/scout/#

Feedback Layout Ideas 35 Under Consideration 3 Saved 29 Discarded Discard Invalid Ideas Export Saved Ideas

Select an element in the Outline Panel or in a layout idea canvas to see feedback options.

Alternate Unimportant High Emphasis

Design Prototype

All items < ANDROID MOBILE - 1 design-canvas-... Group 64 Group 53 Group 48 Group 46 Mask Group 1 Rectangle 6 10.Button2 T VIEW RECIPE Rectangle 1090

Smoothie * Smoothie * Smoothie *

Android Mobile - 1 Android Mobile - 2 Android Mobile - 3

Green Smoothie By Zoey M. Green Smoothie By Zoey M. Green Smoothie By Zoey M.

14 MIN 88 CAL 14 MIN 88 CAL 14 MIN 88 CAL

VIEW RECIPE VIEW RECIPE VIEW RECIPE

Green Smoothie By Zoey M. Green Smoothie By Zoey M. Green Smoothie By Zoey M.

14 MIN 88 CAL 14 MIN 88 CAL 14 MIN 88 CAL

VIEW RECIPE VIEW RECIPE VIEW RECIPE

106.5% Share Repeat Grid

W 332.17 x 14 H 50.51 y 217.62

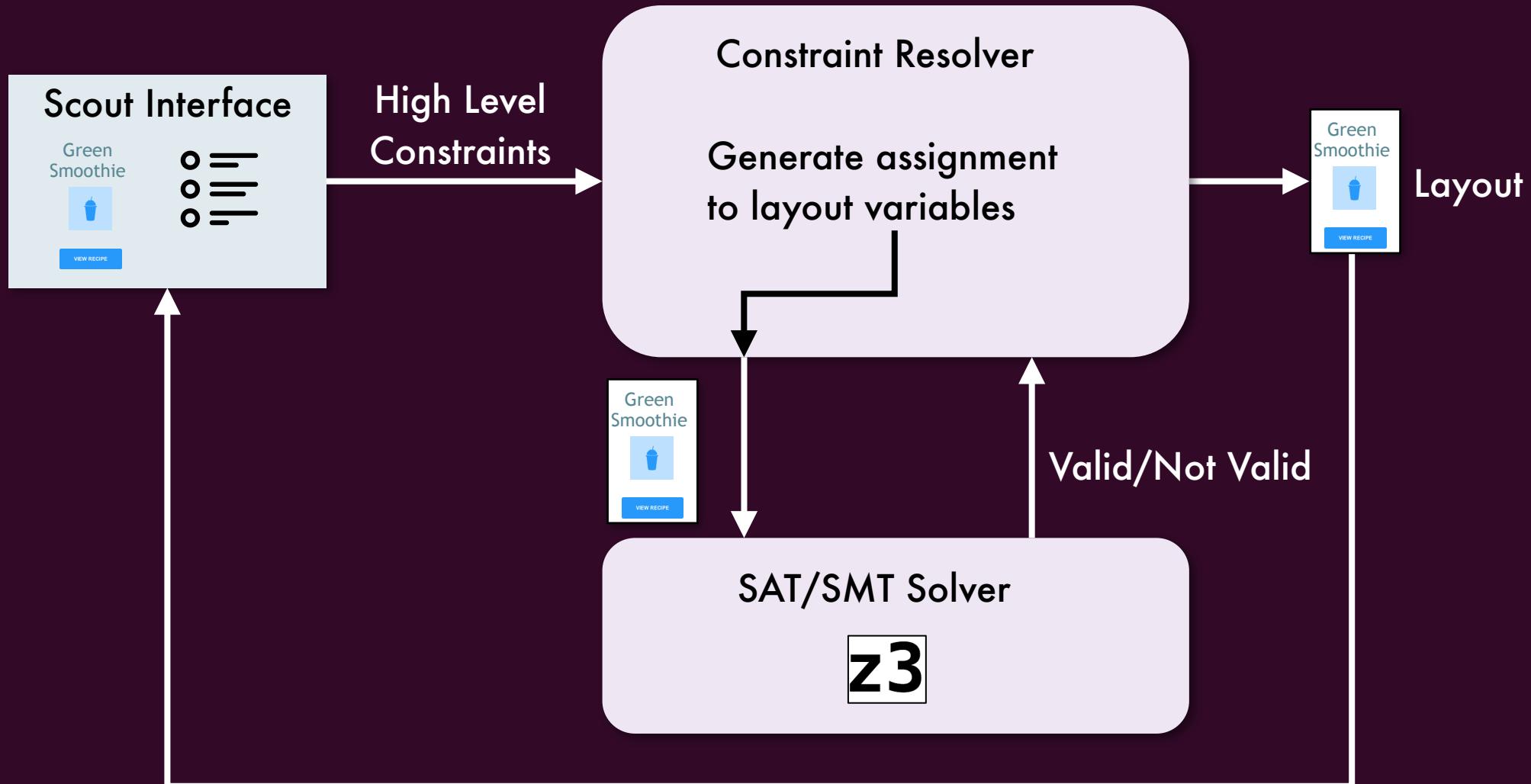
RESPONSIVE RESIZE Auto Manual

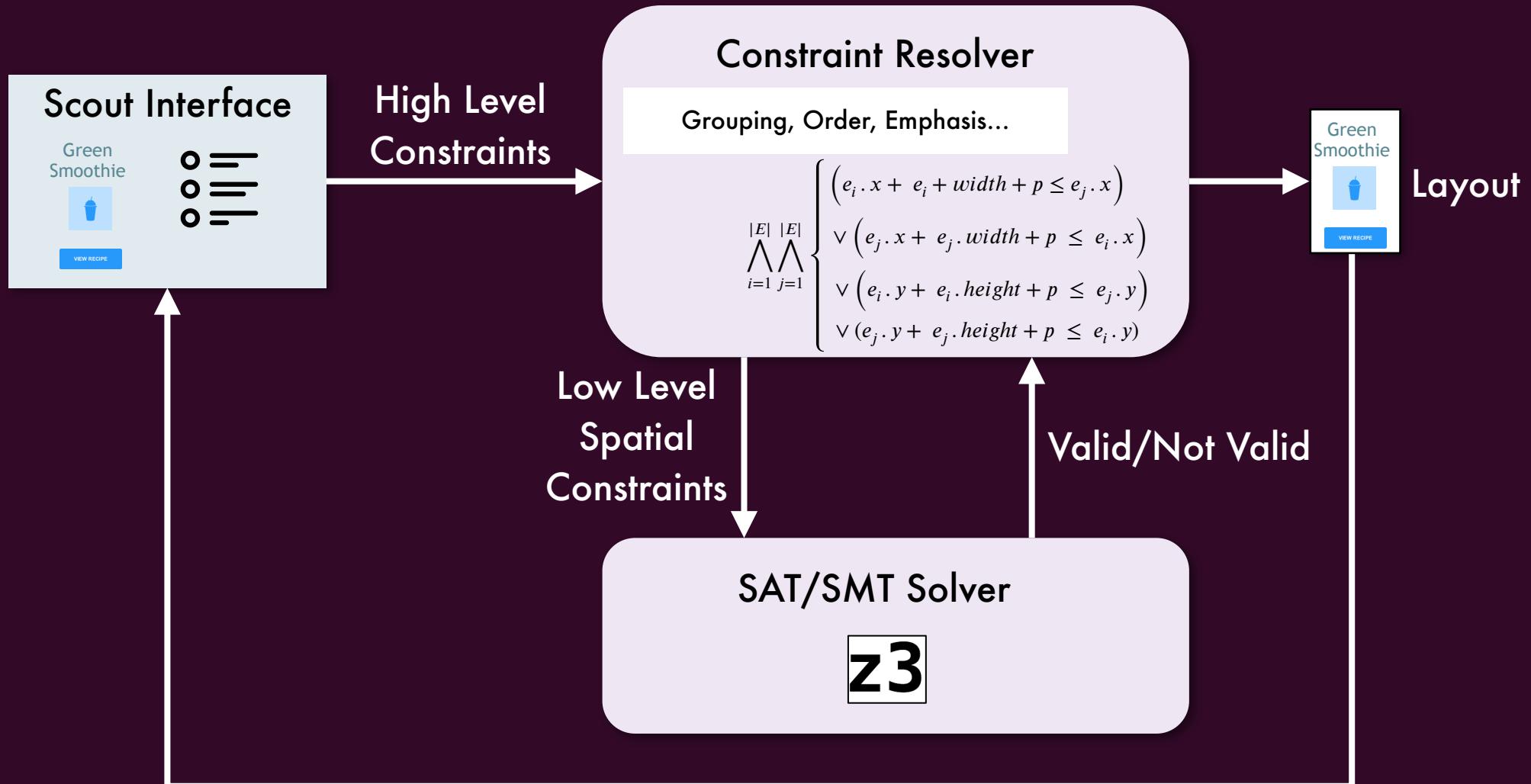
APPEARANCE 100% 5 Fill Border Shadow Background Blur Mark for Export

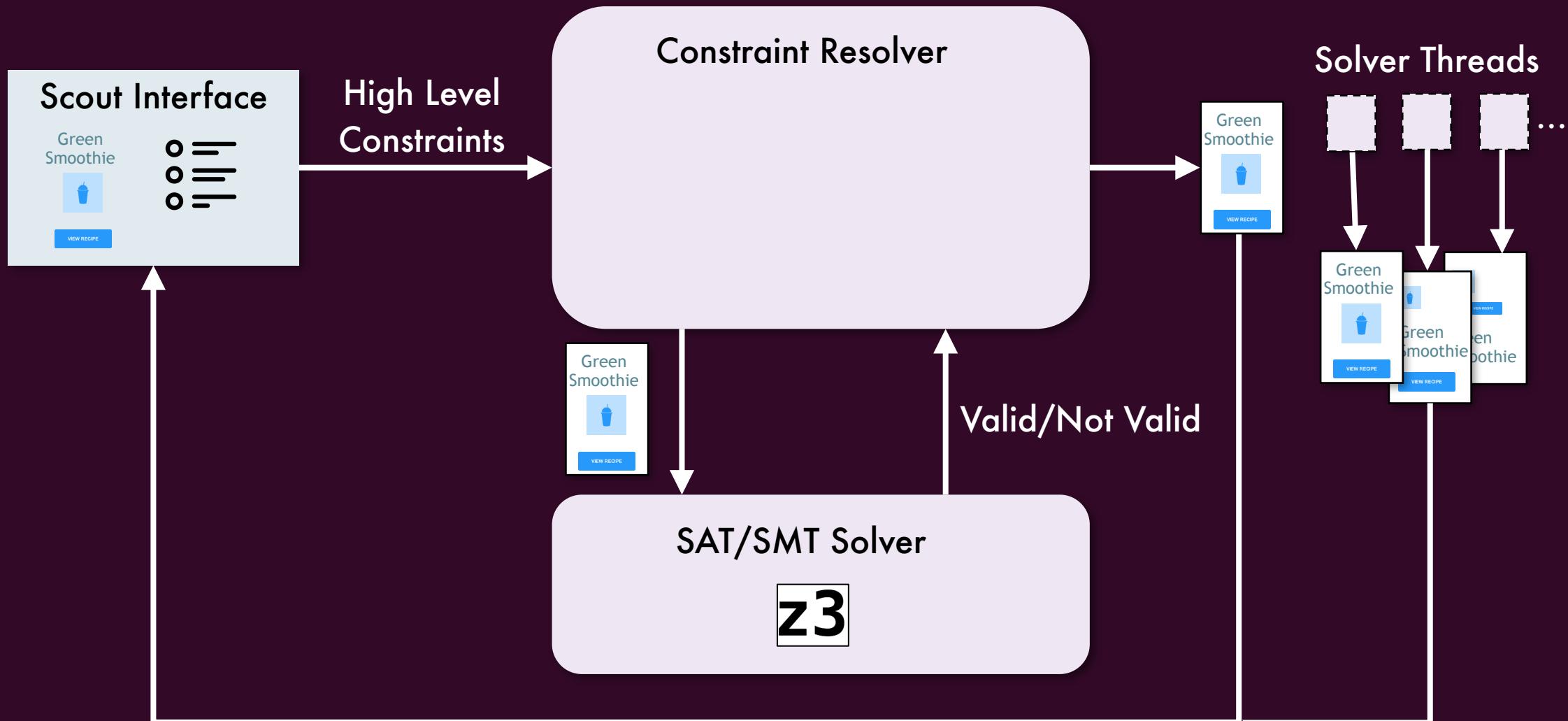
1 of your plugins has an update available. Open Plugin Manager

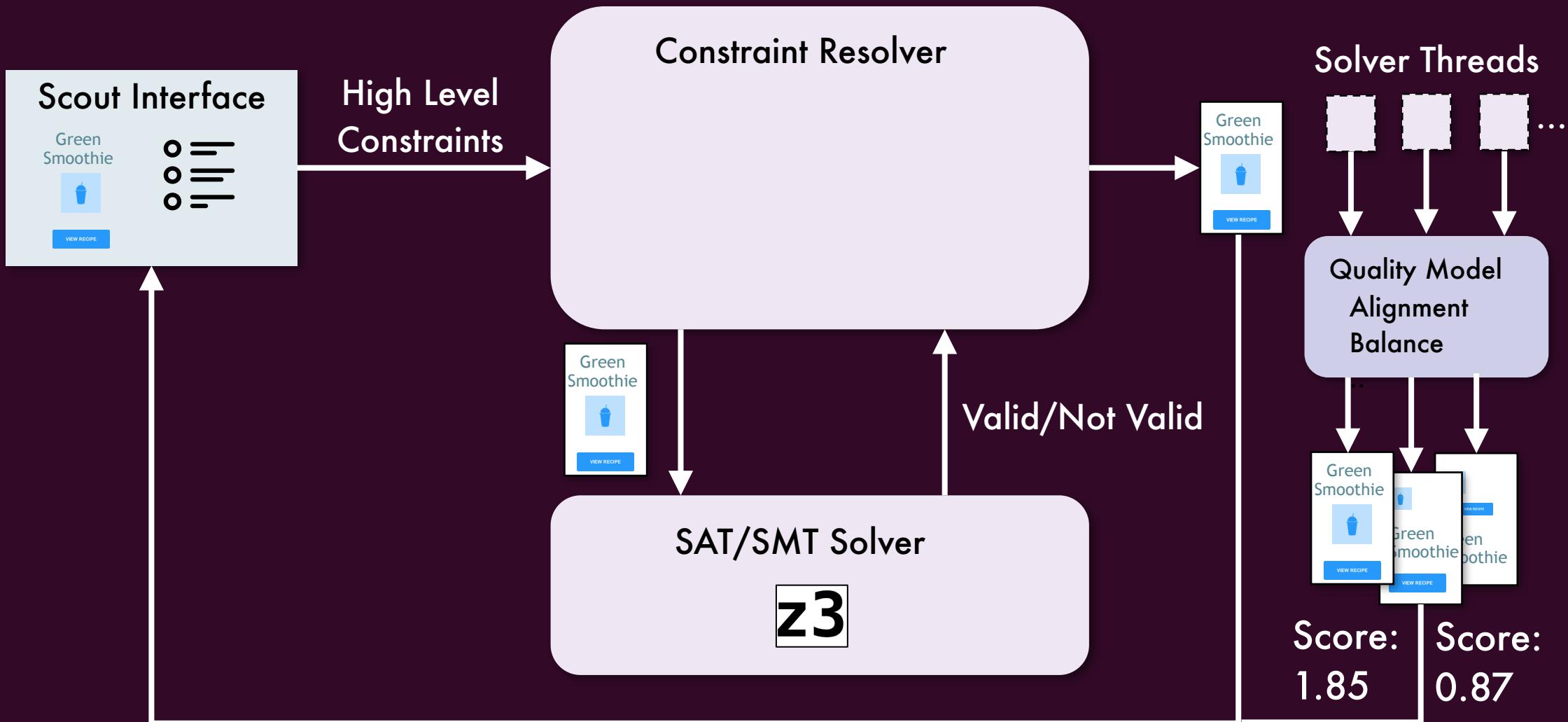
24

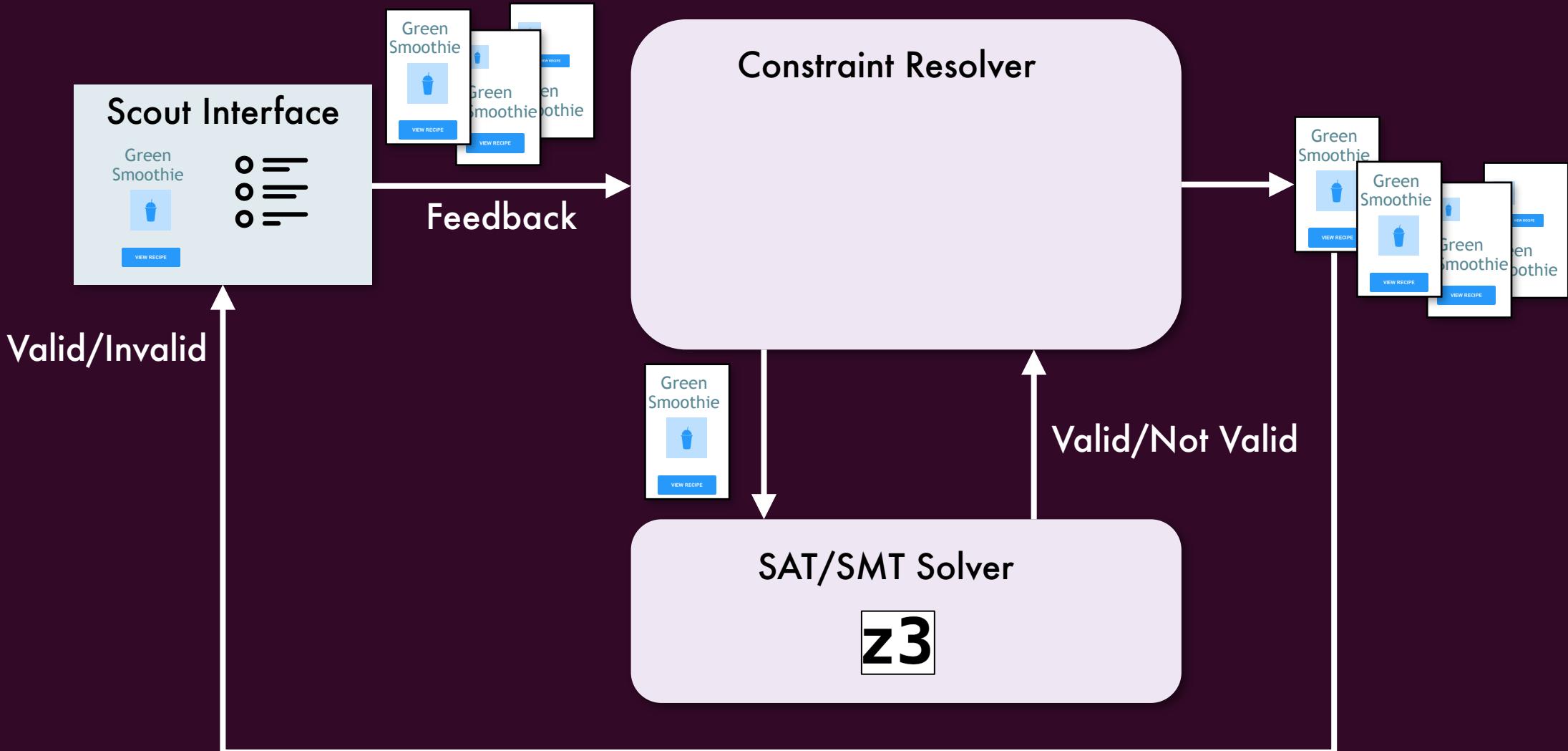
Architecture











Evaluation



18 Interface Designers

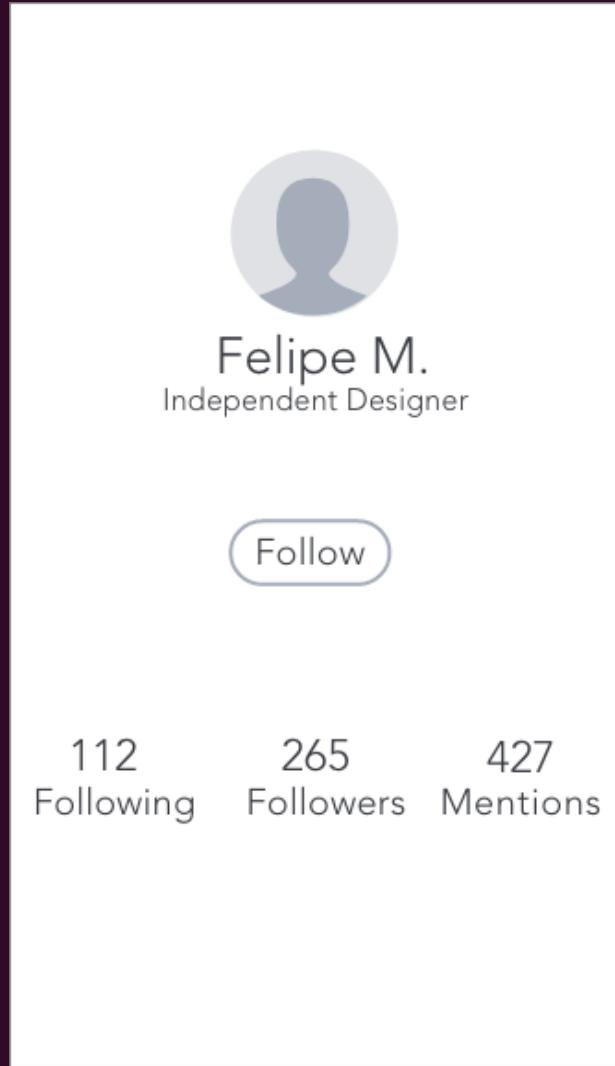
Evaluation Research Questions

RQ1: Does Scout help designers generate more diverse interface layouts?

RQ2: Does Scout help designers generate higher quality interface layouts?

RQ3: How does Scout affect designer processes of exploring potential interface layouts?

Scout Evaluation - Designers' Task



Redesign the layout of a mobile app design wireframe.

Task: Create 3 diverse alternative layouts

Desirability Study¹ Keywords
“dull” “familiar”

Goal Keywords
“clean” “compelling”

Scout Evaluation - 2 Scenarios

Social Media



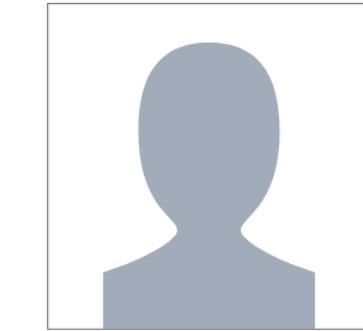
Felipe M.
Independent Designer

Follow

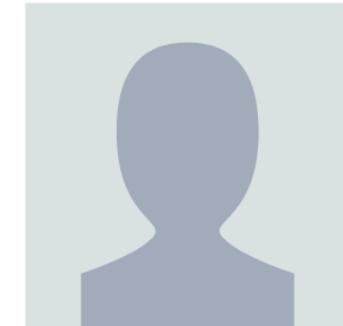
112
Following

265
Followers

427
Mentions



Profile Picture
Alternate 1



Profile Picture
Alternate 2

Weather

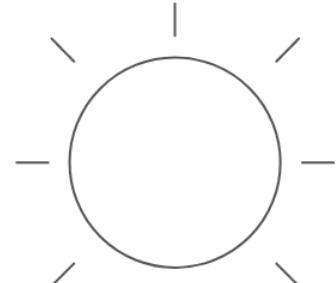
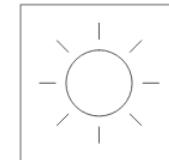
Seattle

Monday, March 11th

44°

Sunny

Winds, S 14mph



Sunny Icon
Alternate 1



Tues

Wed

Thur

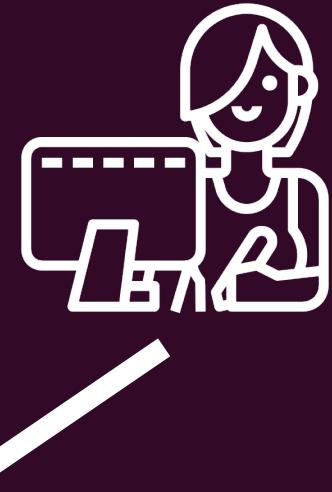


Sunny Icon
Alternate 2

Scout Evaluation - 2 Conditions

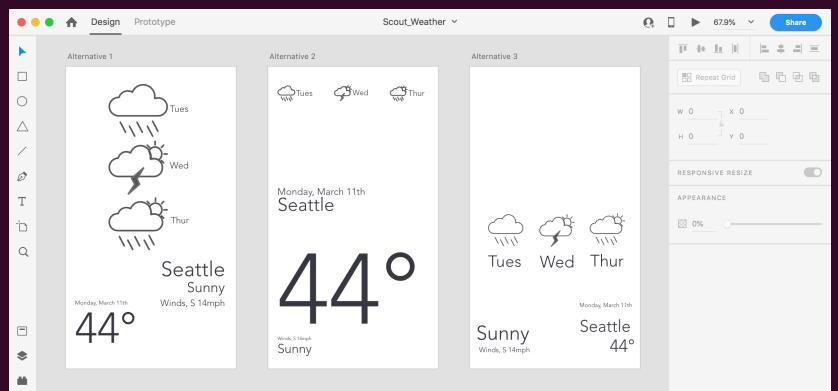
Scout Task

- Use Scout and save 3 designs (20 minutes)
- Export to Adobe XD for refinement (10 minutes)

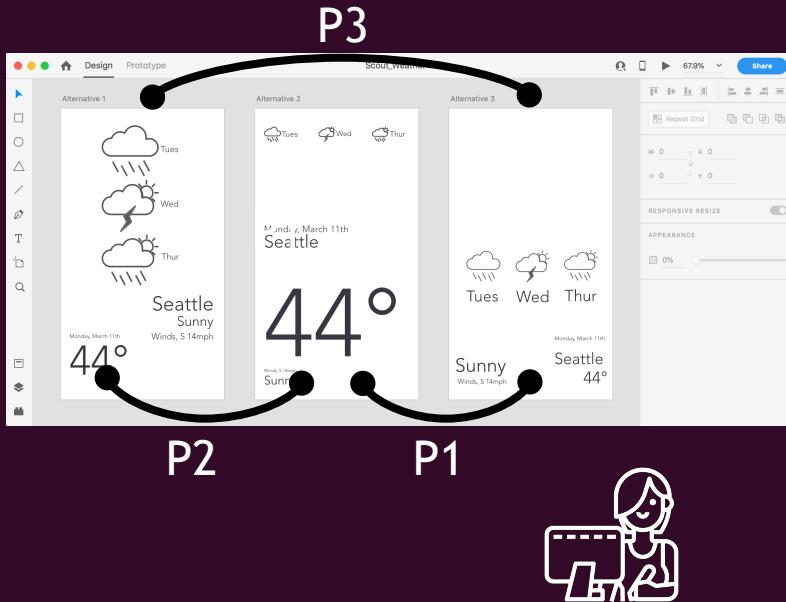


Baseline Task

- Scratch paper
- Create 3 alternatives in Adobe XD

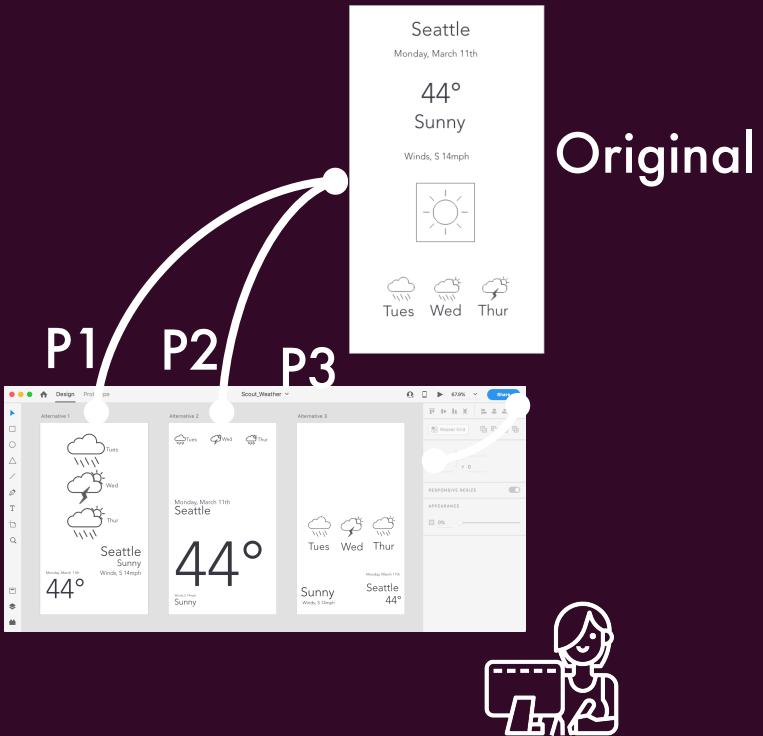


RQ1: Does Scout help designers generate more diverse interface layouts than with a baseline tool?



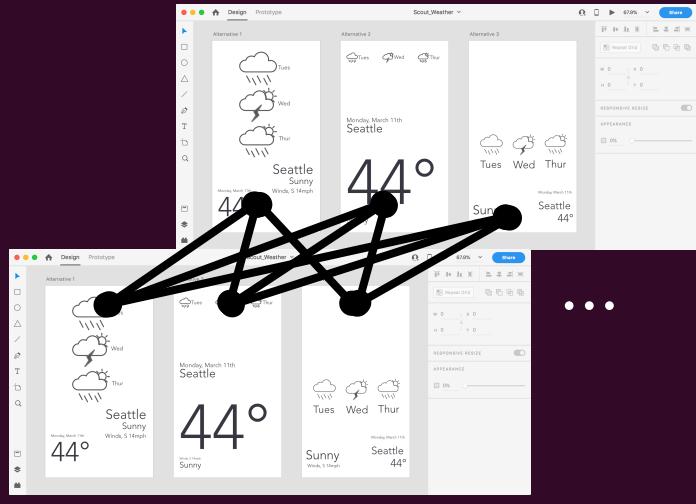
Scout layouts were 12% more spatially diverse from than the Baseline pairs ($n=54$, $p < 0.027$)

RQ1: Does Scout help designers generate more diverse interface layouts than with a baseline tool?



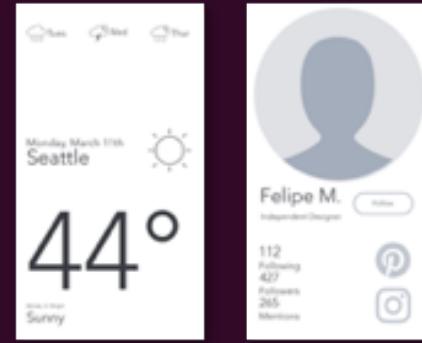
Scout layouts were 15% more spatially diverse from the Original layout than the Baseline pairs ($n=54$, $p < 0.023$)

RQ1: Does Scout help designers generate more diverse interface layouts than with a baseline tool?

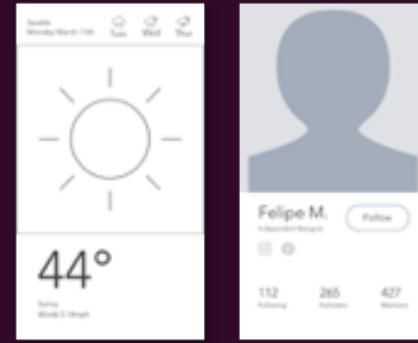


Scout increased the overall mean spatial diversity by 25% for Social Media and 10% for Weather. ($n = 351$, $p < 0.0001$)

RQ2: Does Scout help designers generate higher quality interface layouts?



Scout Designs



Baseline Designs

No significant differences in quality.

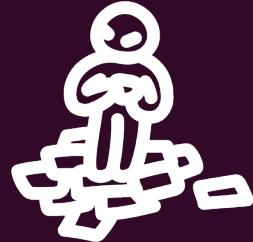
RQ3: How does Scout affect designer processes of exploring potential interface layouts?



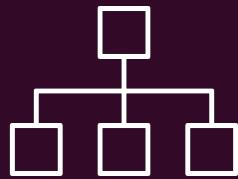
Scout helped designers think of new ideas.

P18: *"I thought, wow it's square and I don't like it, but because it said diverse and I had the option to easily look at different ideas with different shapes, I was more open to it. If I had done this on my own, I probably would have used the circle and nothing else."*

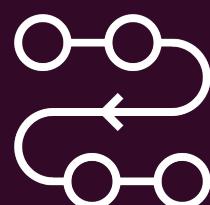
RQ3: How does Scout affect designer processes of exploring potential interface layouts?



Designers would use Scout to quickly ideate or visualize layouts or to get unstuck.



Designers used more structured, less linear design process with Scout (2) vs Baseline (12).



Reflecting on past approach to creating alternatives:
P21: "*It's something I need to work on. Usually I just end up work on one [idea] and then iterating on that single idea.*"

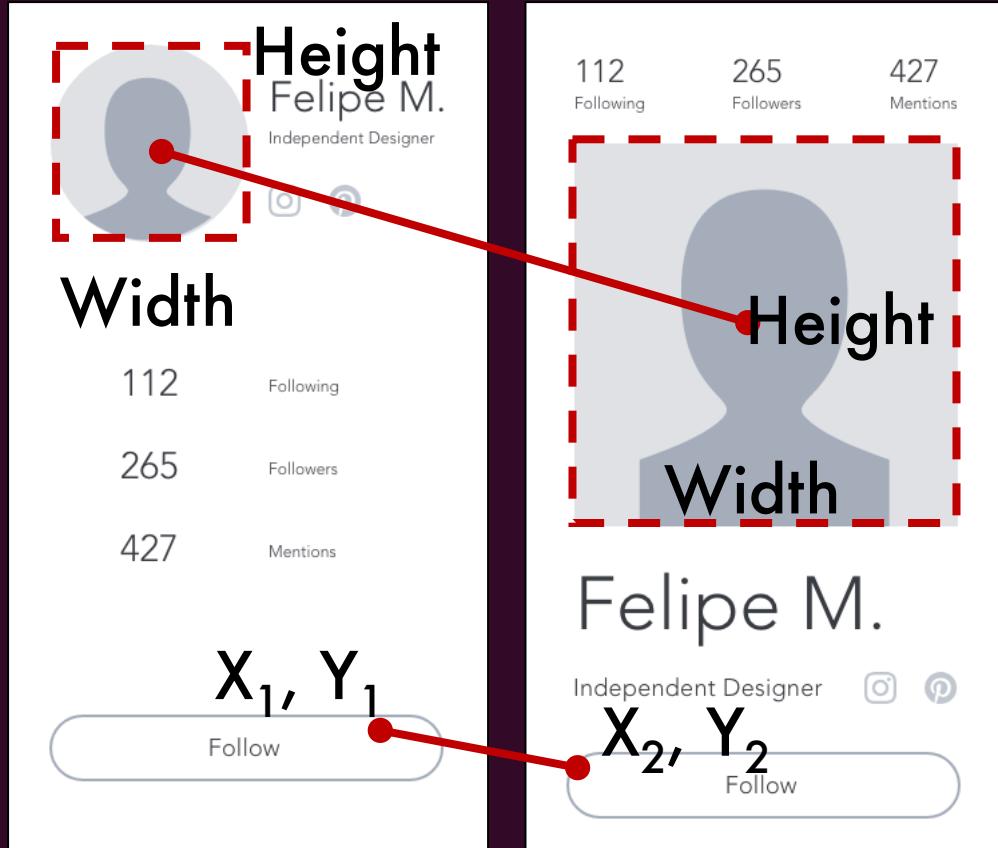
Scout: Rapid Exploration of Interface Layout Alternatives through High-Level Design Constraints

Amanda Swearngin
Chenglong Wang
Alannah Oleson
Amy Ko
James Fogarty

Key Takeaways

- Designers can use high-level constraints to rapidly explore layout alternatives.
- Scout can help designers explore more spatially diverse layout ideas.
- Scout can make the process of exploring alternatives more structured & less linear, and help designers think of new & divergent ideas.

RQ1: Does Scout help designers generate more diverse interface layouts?



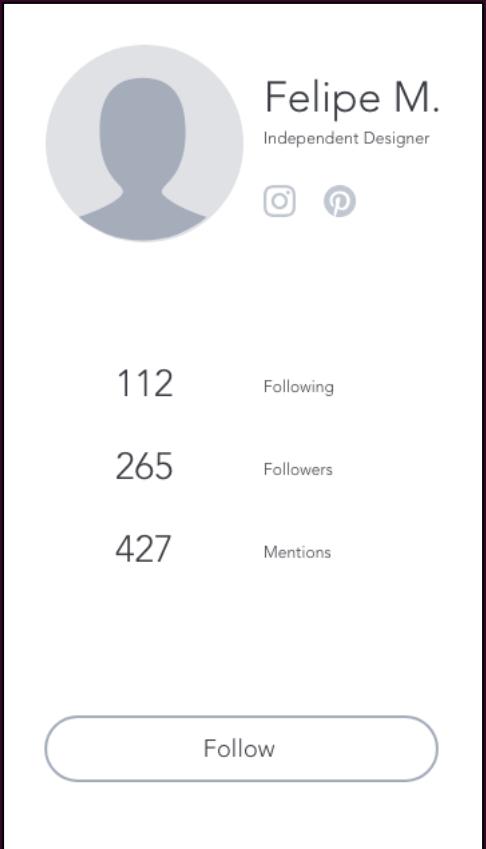
"More diverse" ?

Spatial Diversity Metric

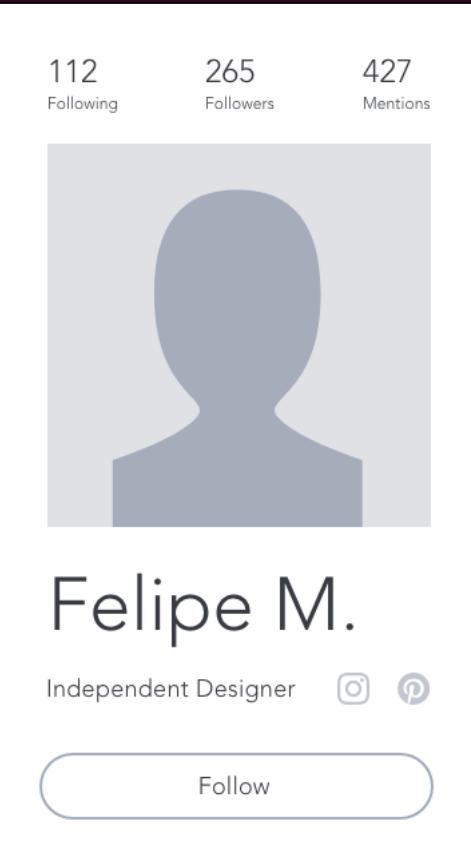
Measure of how much size,
position, relationship to other
elements changed

$$S_{diversity} = w_{dist} * s_{dist} + w_{size} * s_{size} + w_{rel} * s_{rel}$$

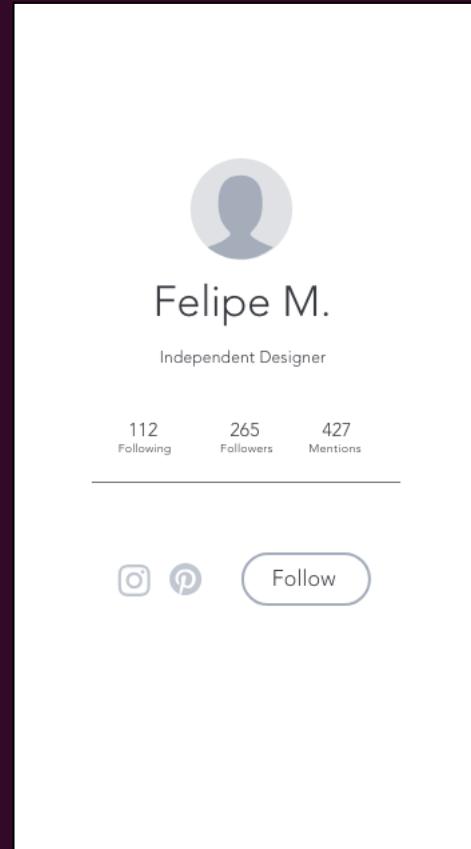
RQ1: Does Scout help designers generate more diverse interface layouts than with a baseline tool?



Spatial Diversity = 1.53



Spatial Diversity = 1.53



Spatial Diversity = 0.194

$$S_{diversity} = w_{dist} * s_{dist} + w_{size} * s_{size} + w_{rel} * s_{rel}$$

RQ1 and RQ2 Summary

Scout helped designers explore a more spatially diverse set of layout ideas, within and across designers, with similar quality to layouts created with a baseline tool.

Scout - Importing Elements

The image displays the Scout interface for importing UI elements, specifically focusing on a smoothie recipe card.

Widgets: A sidebar on the left contains a large smoothie icon and a "VIEW RECIPE" button. Below it is a placeholder area with a "Drag and drop your SVG interface elements here." message.

Canvas: The central workspace shows a smoothie icon with various styling options like "Alternate" and "Group".

Feedback: A detailed panel for styling the smoothie icon includes:

- Order Important:** Set to **ON**.
- Emphasis:** Set to **Normal**.
- Size:** Set to **328x170**.
- Grid Layout & Placement:** Includes settings for Left Column (1), Right Column (3), Y (448), and Canvas Alignment (Right).
- Arrangement:** Includes settings for Arrangement (Vertical), Alignment (Top-Left), Padding (44), and Group Alignment (Center).

Layout Ideas: A grid of 10 cards showing different variations of the smoothie card, each with a "VIEW RECIPE" button and a "New" badge.

Scout - Defining High-Level Constraints



The image shows the Scout interface, a tool for defining high-level constraints for UI elements. It consists of several panels:

- Widgets:** Shows a list of UI elements like a separator, a blue cup icon, and a green smoothie card.
- Canvas:** Displays a visual representation of the layout with elements labeled "Alternate", "Group", and "Repeat".
- Feedback:** A central panel for defining constraints. It includes sections for "Order Important" (set to ON), "Emphasis" (Normal), "Size" (328x170), "Grid Layout & Placement" (Left Column: 1, Right Column: 3, Y: 448, Canvas Alignment: Right), and "Arrangement" (Arrangement: Vertical, Alignment: Top-Left, Padding: 44, Group Alignment: Center).
- Layout Ideas:** A grid of cards showing different layout variations. One card is highlighted with a teal border, indicating it is the current "New" layout.

High-Level Constraints

RQ3: New and Different Ideas

9 designers mentioned Scout helped them come up with a new idea they didn't think they would have had on their own.

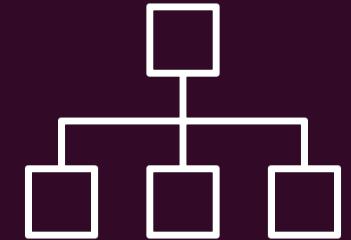


11 designers noted that Scout designs were different than a typical Weather or Social Media app screen

P18: "I thought, wow it's square and I don't like it, but because it said diverse and I had the option to easily look at different ideas with different shapes, I was more open to it. If I had done this on my own, I probably would have used the circle and nothing else."

RQ3: More structured and less linear process

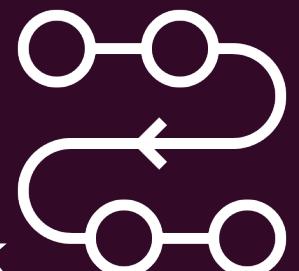
More designers mentioned or considered the interface structure with Scout (i.e., emphasis, grouping, order).



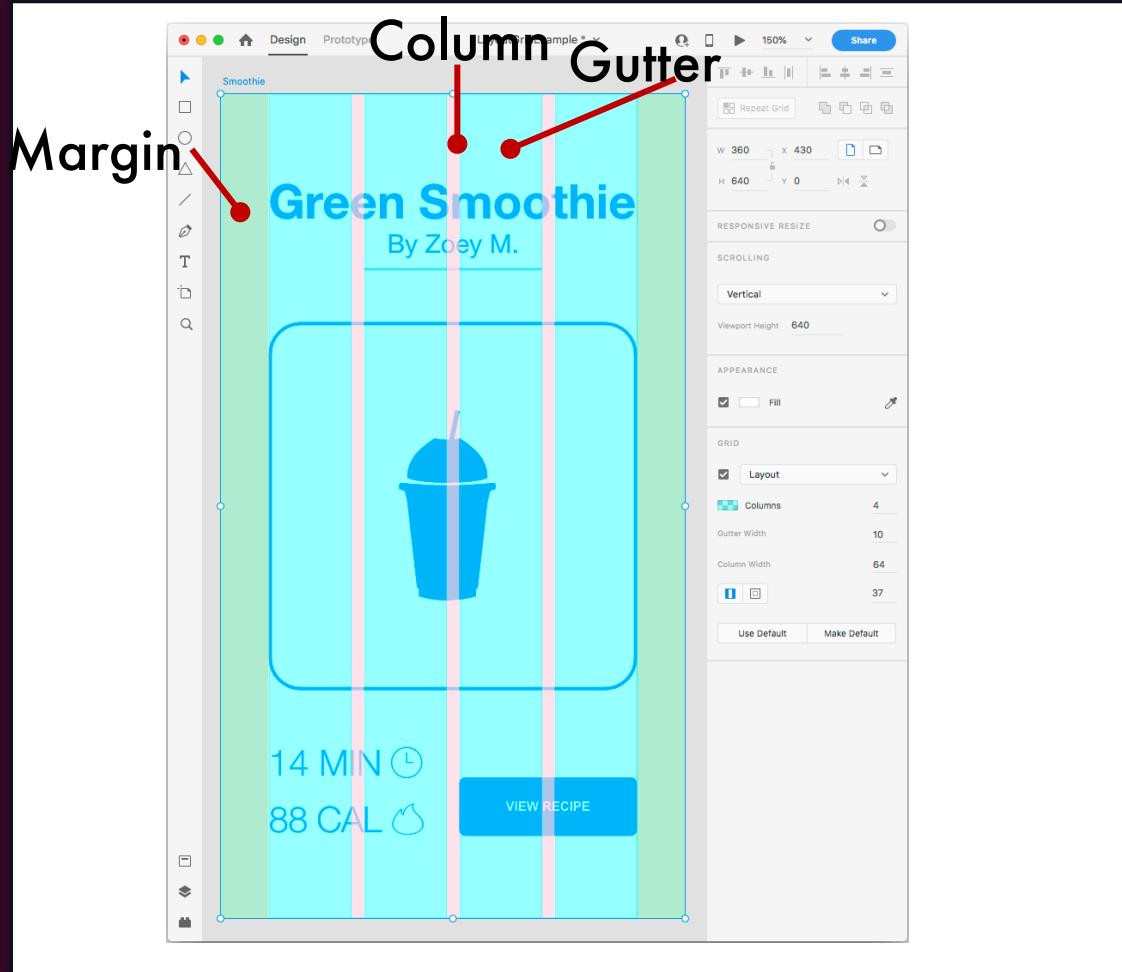
Less designers mentioned a linear design process to create alternatives with Scout (2) vs the Baseline (12).

Reflecting on past approach to creating alternatives:

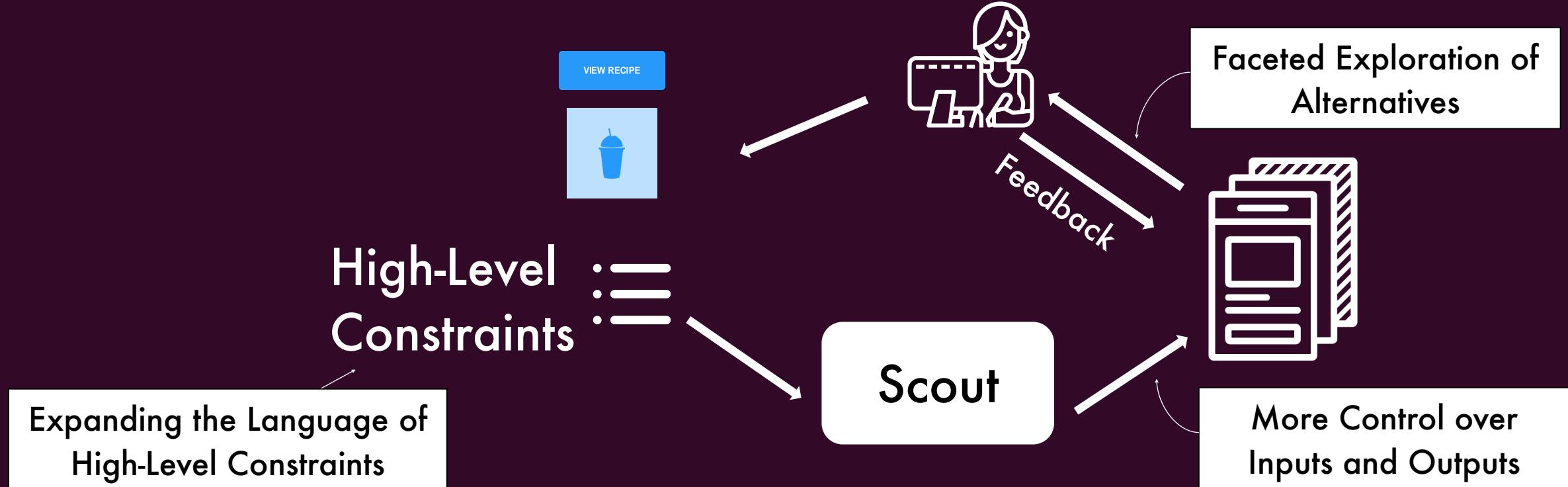
P21: "*It's something I need to work on. Usually I just end up work on one [idea] and then iterating on that single idea.*"



Architectural Insight - Layout Grids



Mixed Initiative Exploration of Alternatives



Inferring High-Level Constraints & Visualizing Combinations

The screenshot shows the Figma interface with the 'Design' tab selected. On the left is the sidebar with icons for selection, artboards, text, shapes, and other tools. The main canvas displays a mobile application design for an Android device. The design includes a header with the title 'Green Smoothie' and author 'By Zoey M.', followed by a large blue placeholder image for the smoothie, and two 'VIEW RECIPE' buttons at the bottom.

Below the main screen, there are four smaller preview windows labeled 'Artboard - 1', 'Artboard - 2', 'Artboard - 3', and 'Artboard - 4'. Each preview shows a different variation of the smoothie card with different layout constraints applied.

The right side of the interface shows the 'Variations' panel with settings for 'Repeat Grid' and various constraint parameters like width (w), height (h), and position (x, y). A 'RESPONSIVE RESIZE' toggle is also present.

Two large text annotations are overlaid on the image:

- A curved arrow points from the text 'Infer High-Level Constraints' to the variations preview area.
- A curved arrow points from the text 'Visualize Combinations' to the variations preview area.

Infer High-Level Constraints

Visualize Combinations

Scout - Constraints

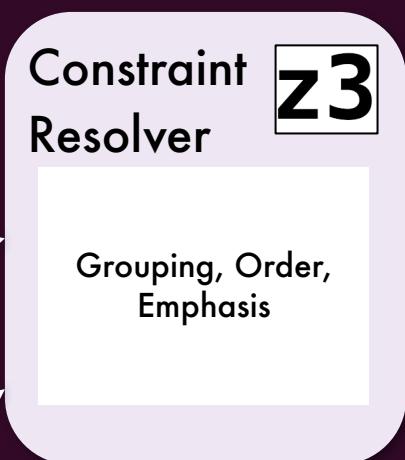
High-Level Constraints

- Emphasis, Repeat/Alternate Group
- Grouping, Order, Arrangement

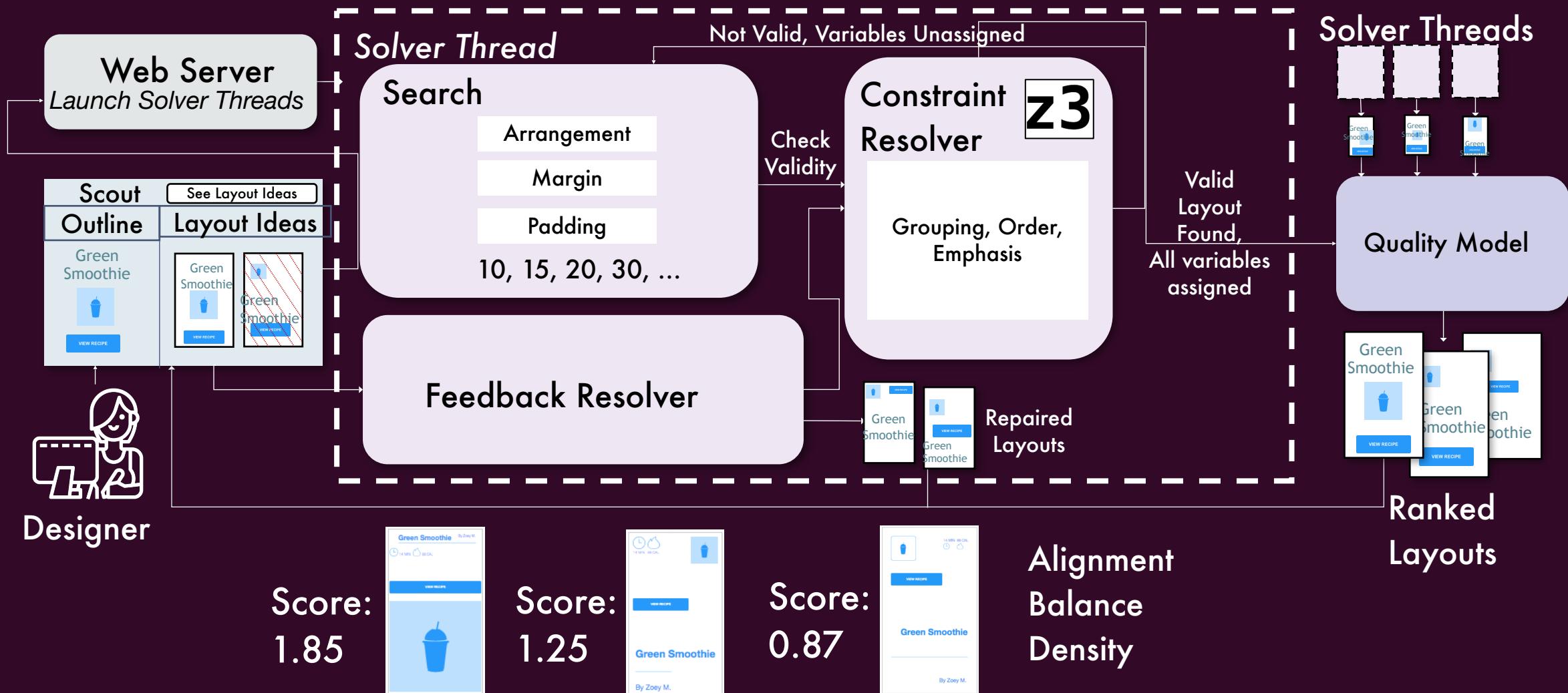
Quality Constraints

- Basic Design Quality
- Layout Grid
- Visual Hierarchy

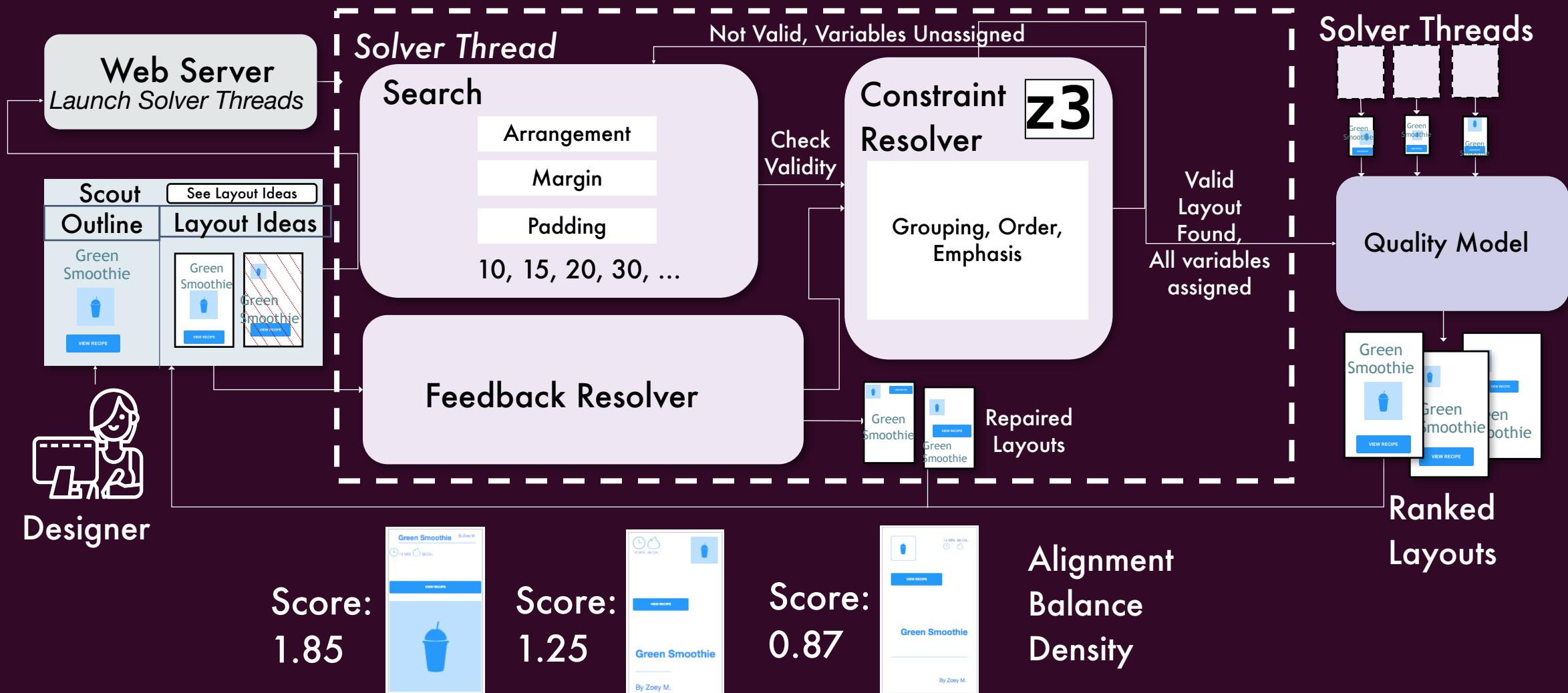
$$\bigwedge_{i=1}^{|E_c|} \left\{ \begin{array}{l} \text{above}\left(E_{c_i}, E_{c_{i+1}}\right) \vee \text{left}\left(E_{c_i}, E_{c_{i+1}}\right) \\ \text{if } c.\text{order} = \text{"important"} \end{array} \right.$$
$$\bigwedge_{i=1}^{|E|} \bigwedge_{j=1}^{|E|} \left\{ \begin{array}{l} \left(e_i.x + e_i.width + p \leq e_j.x \right) \\ \vee \left(e_j.x + e_j.width + p \leq e_i.x \right) \\ \vee \left(e_i.y + e_i.height + p \leq e_j.y \right) \\ \vee \left(e_j.y + e_j.height + p \leq e_i.y \right) \end{array} \right.$$



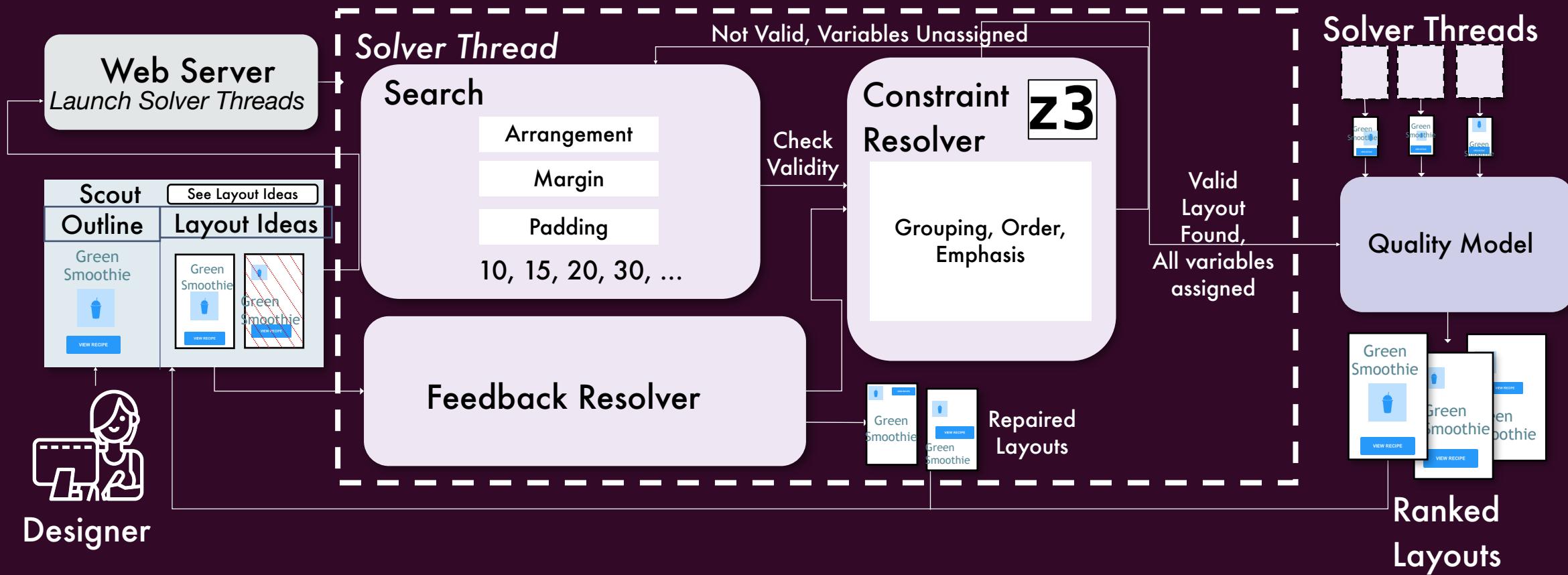
Generating Layouts from High-Level Constraints



Generating Layouts from High-Level Constraints



Generating Layouts from High-Level Constraints



Scout - Defining High-Level Constraints



Widgets Clear Widgets < Canvas Order Unimportant Remove all feedback

Canvas Order Unimportant High Emphasis

Alternate Order Unimportant High Emphasis

Group Order Important

By Zoey M.

Green Smoothie

14 MIN

88 CAL

VIEW RECIPE

Drag and drop your SVG interface elements here.

Outline See more layout ideas

Feedback

Order Important ON

Emphasis Normal ▾

Size 328x170 ▾ Keep Prevent

Grid Layout & Placement

Left Column 1 ▾ Keep Prevent

Right Column 3 ▾ Keep Prevent

Y 448 ▾ Keep Prevent

Canvas Alignment Prevent

Arrangement Vertical ▾ Keep Prevent

Alignment Top-Left ▾ Keep Prevent

Padding

Group Alignment Center ▾ Keep Prevent

Layout Ideas 10 Under Consideration 3 Saved 115

Green Smoothie

Discard Invalid Ideas Export Saved Ideas

By Zoey M.

Green Smoothie

14 MIN

88 CAL

VIEW RECIPE

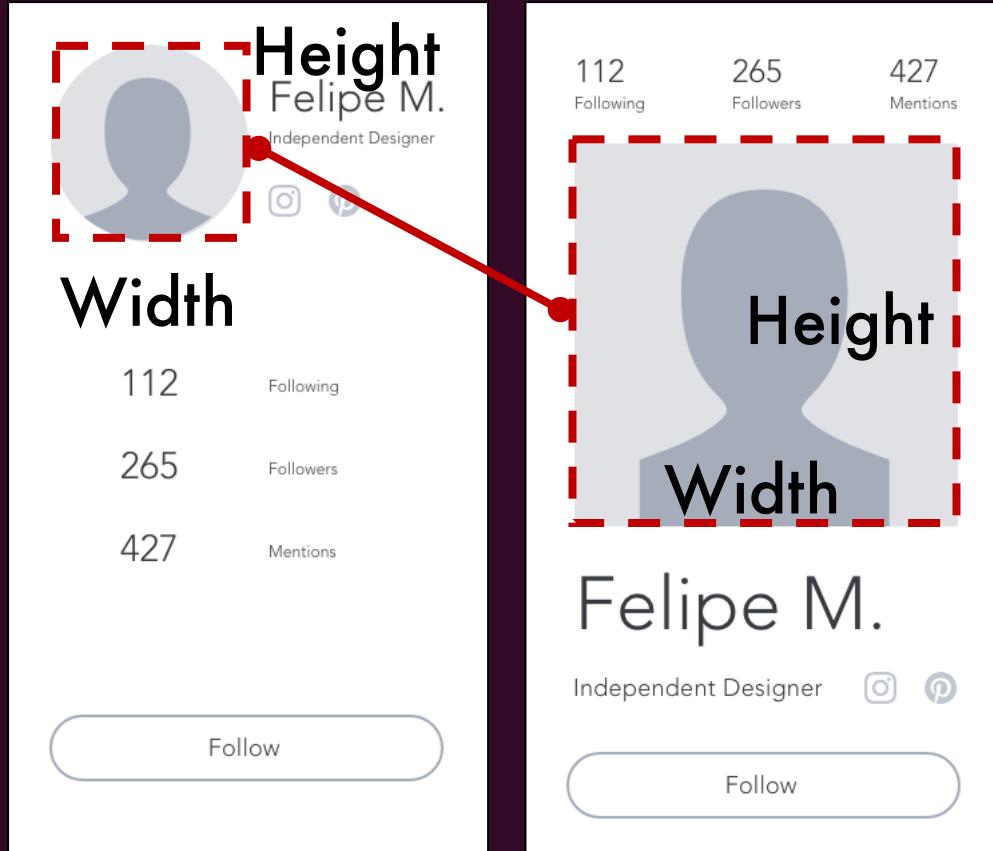
Green Smoothie

Order - Important

Principle: Keep elements in order used for a task¹

1. Nielsen and Molich, "Heuristic Evaluation of User Interfaces", CHI '90

RQ1: Does Scout help designers generate more diverse interface layouts than with a baseline tool?

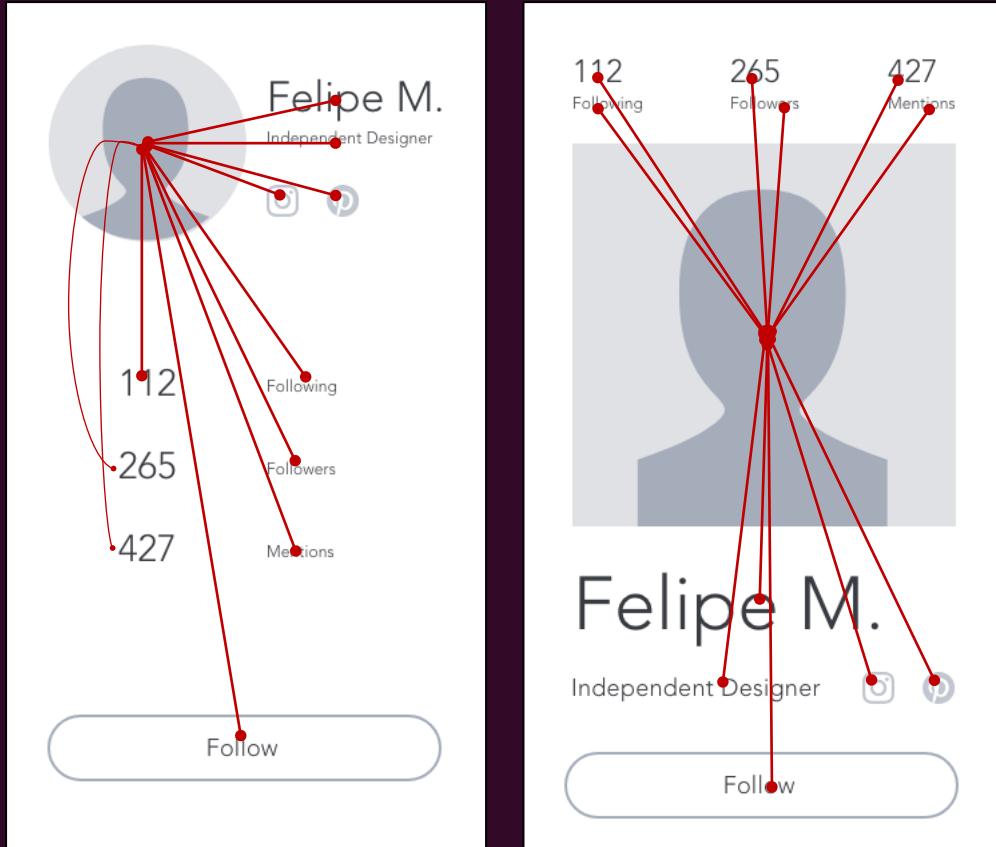


Spatial Diversity Metric

Mean of how much the position of each element changed.

Mean of how much the size of each element changed.

RQ1: Does Scout help designers generate more diverse interface layouts than with a baseline tool?



Spatial Diversity Metric

Mean of how much the position of each element changed.

Mean of how much the size of each element changed.

Mean of how much each element changed in relation to all other elements in the layout.

RQ3: How do designers envision using Scout?

14 designers said they would use Scout to quickly ideate or visualize layouts or to get unstuck.



P5: “I wanted to see a bunch of different things upfront, just to see if different concepts would even work...[P5 describes different ways they moved the elements around the screen.] It would have been nice to quickly see that, like, I didn't want every [element] up there [top of screen], I just wanted profile picture, name and title.”

RQ3: Impact on Diversity and Quality

12 designers thought Scout designs were *more diverse*.



Majority of designers thought Scout designs were *more compelling, but less clean*.

P4: “*It does a good job with the compelling thing...The hierarchy is not dull or boring or and to some extent is not even familiar. ... Like this [Scout design], it breaks [design] cliches, that's for sure. It does a good job of not being boring...*”

RQ2: Does Scout help designers of varying expertise generate higher quality interface layouts than with a baseline tool?

2 expert designers (>3 years professional experience)



Rubric Items

Visual Balance

Typographical Hierarchy

Clear Point of Emphasis

Alignment

Whitespace

Scale

Great - 2

Good - 1

Needs Improvement - 0

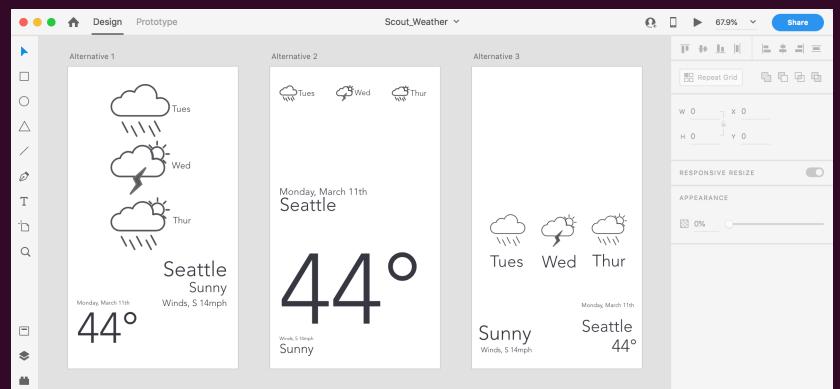
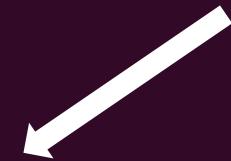
Scout Evaluation – Process

Tutorial & Warmup Task

2 30-Minute Redesign Tasks

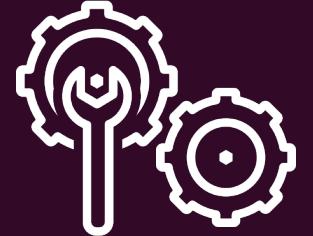
- 1 per scenario, counterbalanced

Interview after each task & at end of study



RQ3: Designers' Suggestions for Improvement

Give designers more control over the inputs and outputs to Scout.



Make it easier to combine sub-parts of different layouts (i.e., mix and match).

Scaffold designers learning of high-level constraints and feedback better (e.g., preview or tooltips for feedback properties).

Emphasis Constraints

$$\phi_{size_increase_or_decrease_only(E, c)} = \bigwedge_{i=1}^{|E|} \bigwedge_{j=1}^{|E|} \begin{cases} e_i.area > e_i.orig - area & \text{if } e_i.emph = "high" \\ e_i.area < e_i.orig - area & \text{if } e_i.emph = "low" \end{cases}$$

$$\phi_{order_before_or_after}$$

...