

Prodirect Manipulation: Bidirectional Programming for the Masses

Ravi Chugh



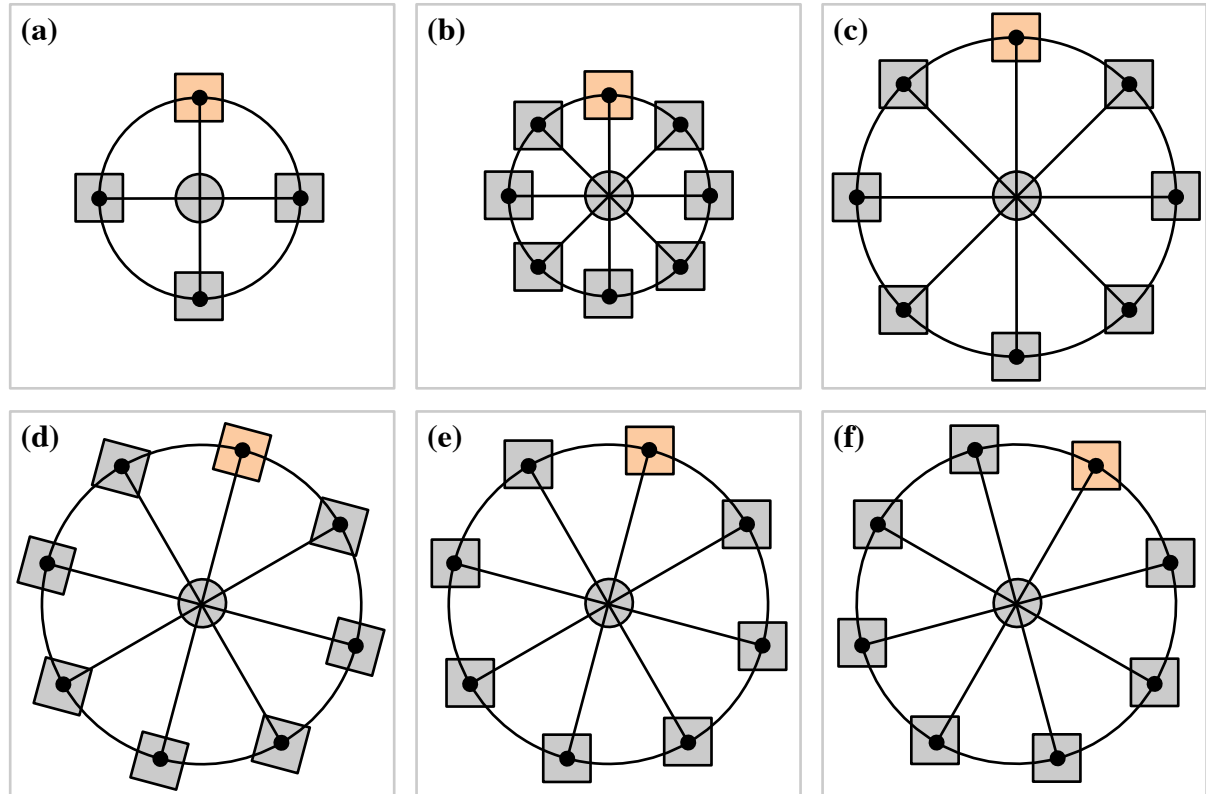
THE UNIVERSITY OF
CHICAGO

Motivating Application



The original Chicago [Ferris Wheel](#), built for the 1893 World's Columbian Exposition [Wikipedia]

Task:

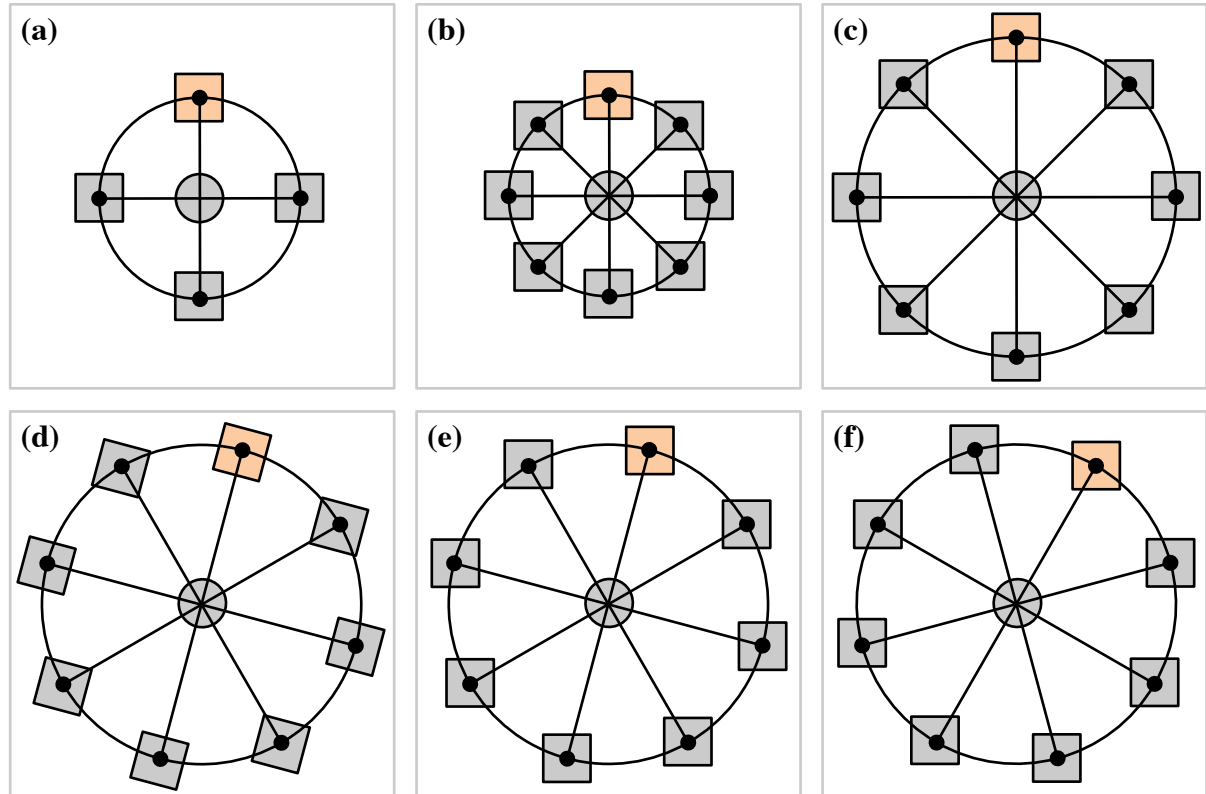


Q: What Would You Choose?

Programming Language
(e.g. JavaScript, Processing)

Direct Manipulation System
(e.g. Illustrator, PowerPoint)










Task:













Q: What Would You Choose?

Programming Language
(e.g. JavaScript, Processing)

Direct Manipulation System
(e.g. Illustrator, PowerPoint)























	Programmatic Manipulation	Direct Manipulation	VISION: "Prodirect" Manipulation
Immediate Feedback			
Rapid Prototyping			
Abstraction Capabilities			

	Programmatic Manipulation	Direct Manipulation
2D Graphics		 
Presentations		 
Documents		 
Spreadsheets		 
Web Apps		 

General-Purpose Languages

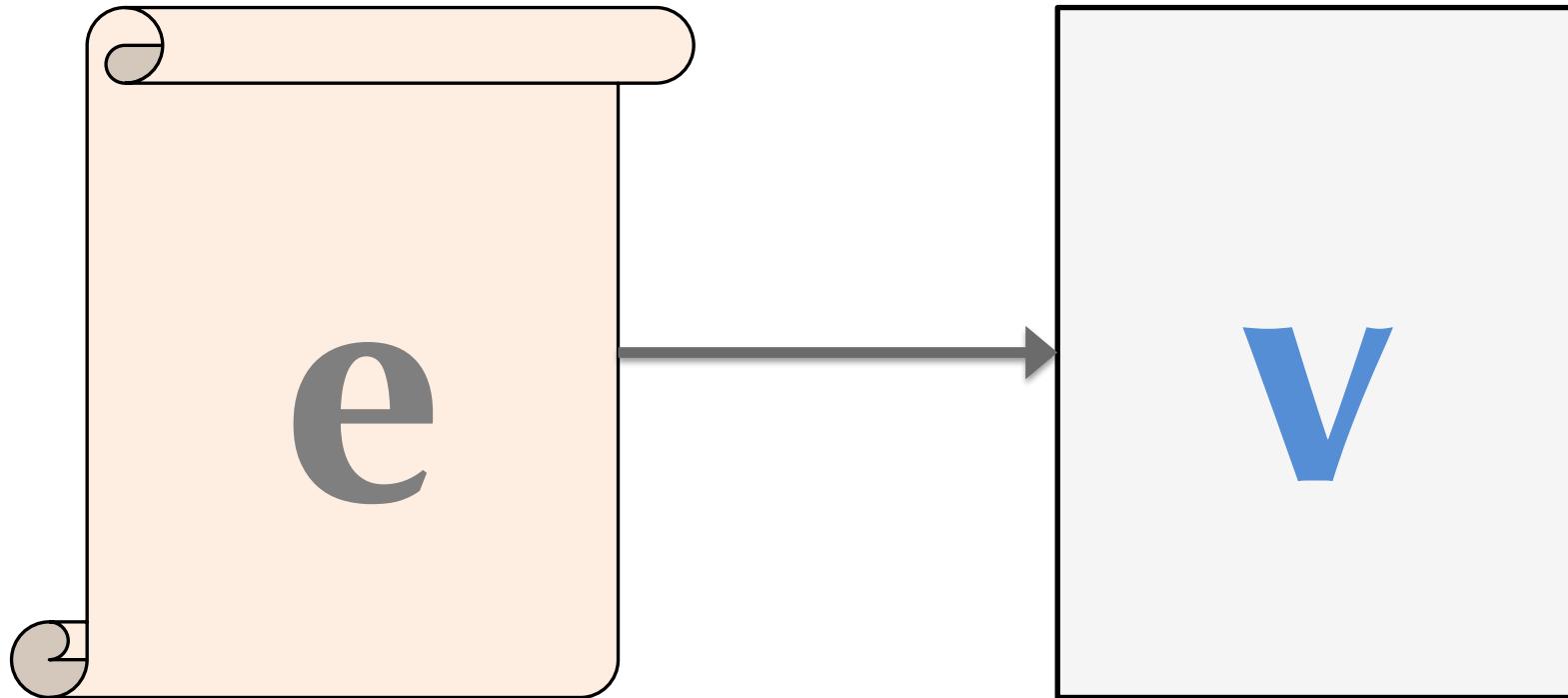
Domain-Specific Languages or Libraries

Domain-Specific GUI Tools

	Manipulation	Manipulation	Manipulation
2D Graphics			 
Presentations		 	 
Documents		 	 
Spreadsheets			 
Web Apps			 

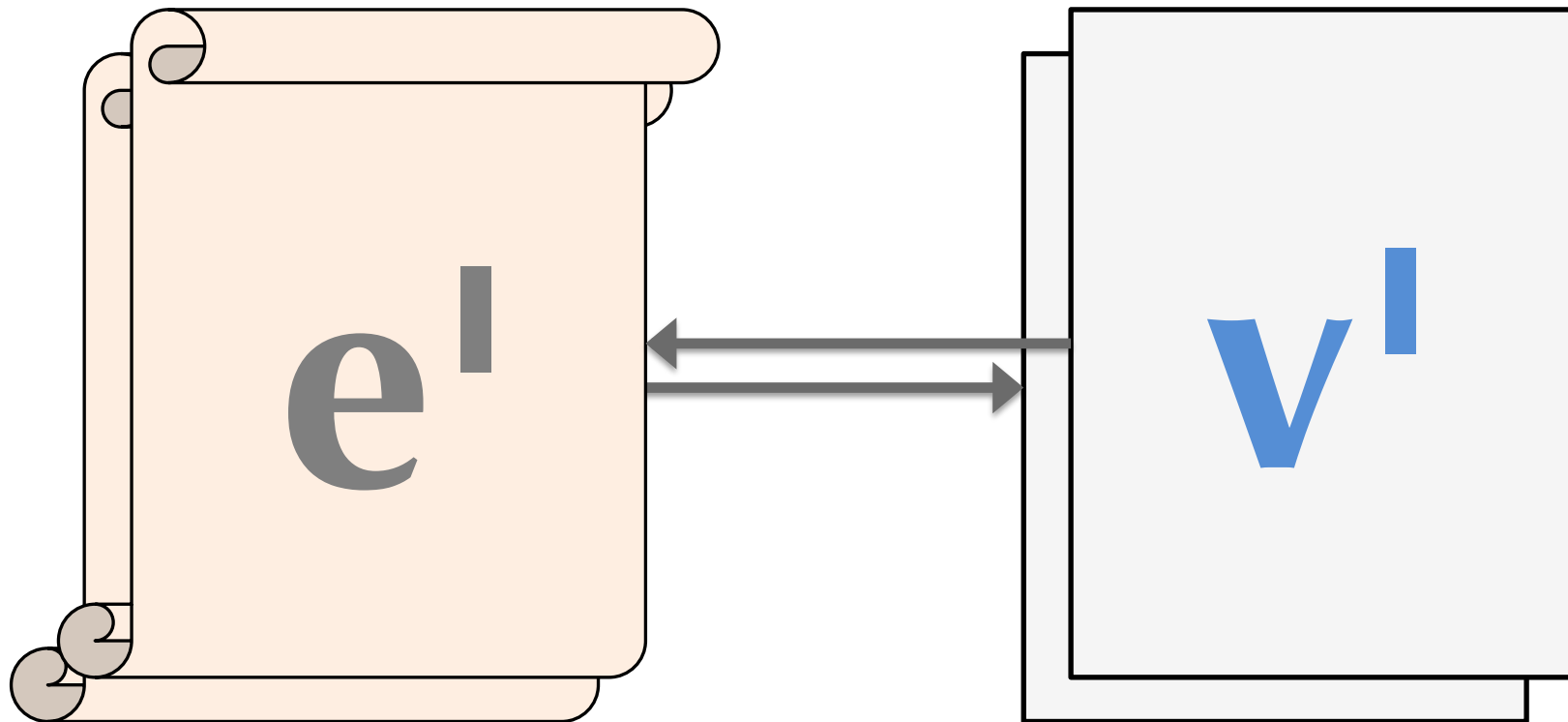
General-Purpose
Programming
Language

Domain-Specific
Graphical User
Interface



General-Purpose
Programming
Language

Domain-Specific
Graphical User
Interface

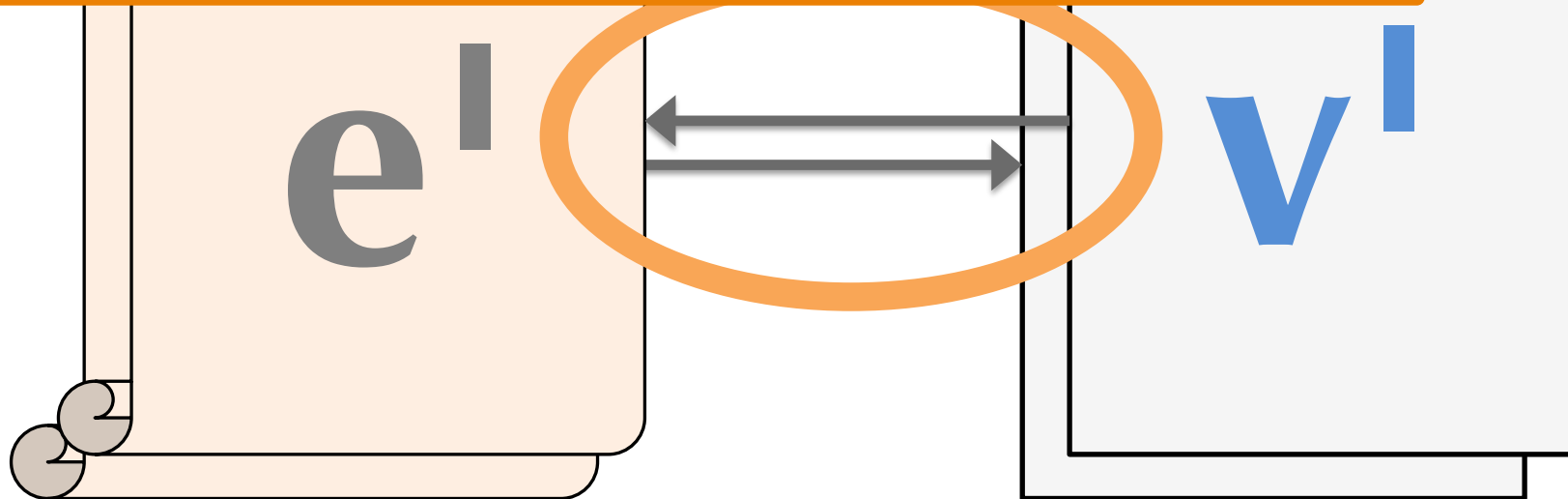


Demo: Sketch-n-Sketch

`ravichugh.github.io/sketch-n-sketch`

Challenges:

- Predicting User Intent
- Machine-Assisted Programming
- Language / Library / UI Co-Design
- Intuitive, Interactive Workflow



Constraint-Oriented Programming

constraints in
programming model

v.

Prodirect Manipulation

constraints (only) in
program synthesis

Bidirectional Programming

domain-specific PL,
strong guarantees

v.

Prodirect Manipulation

general-purpose PL,
weak guarantees

Programming by Manipulation

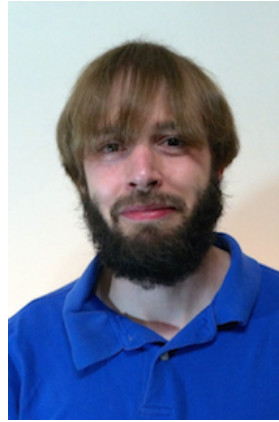
"add Pro to DM"

v.

Prodirect Manipulation

"add DM to Pro"

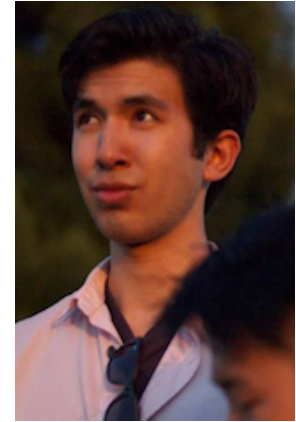
Thanks!



Brian
Hempel



Mitch
Spradlin



Jacob
Albers

Prodirect Manipulation =
Programmatic + Direct Manipulation

Sketch-n-Sketch =
Prodirect Manipulation for SVG

