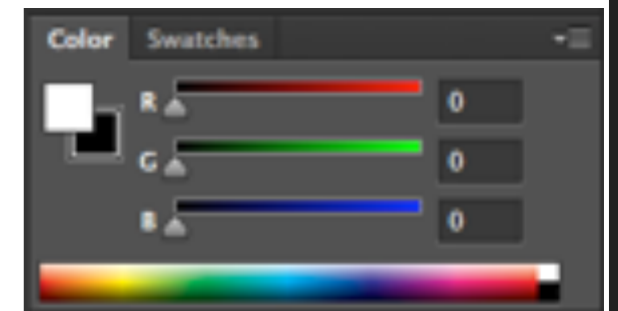
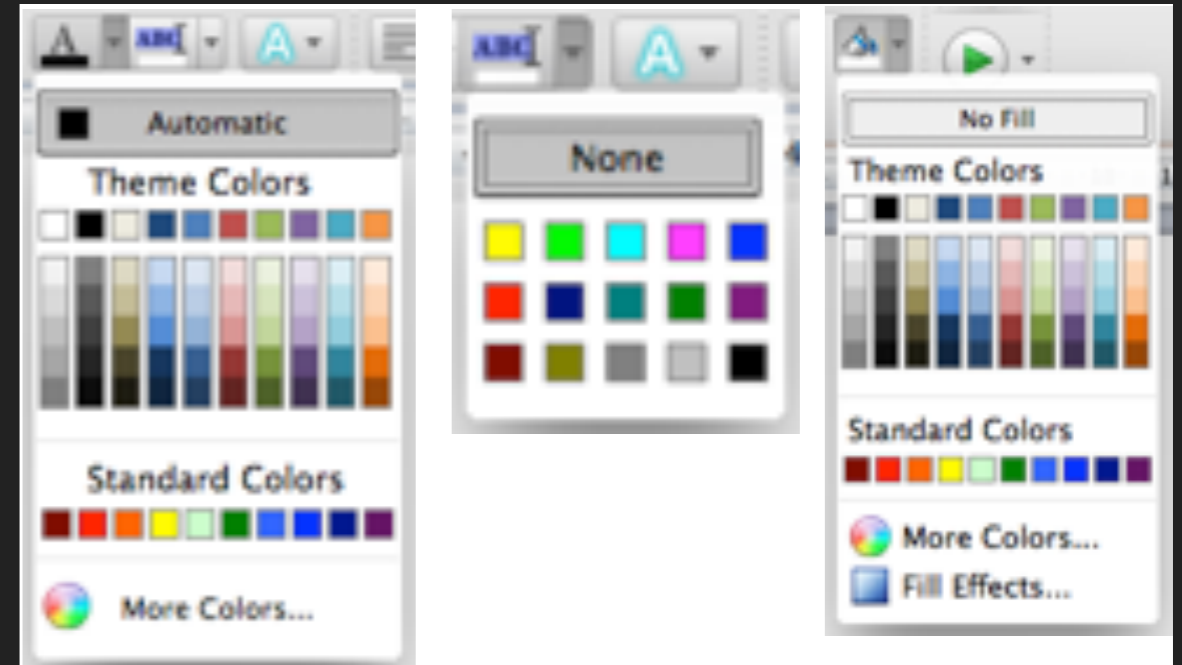


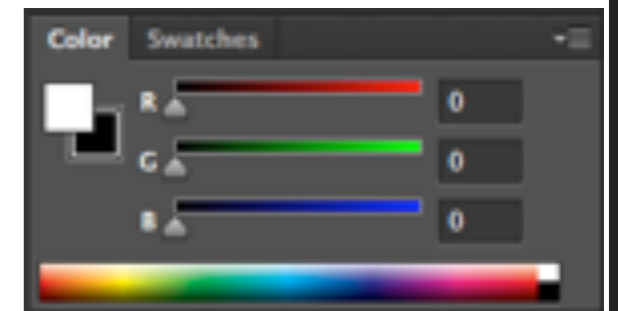
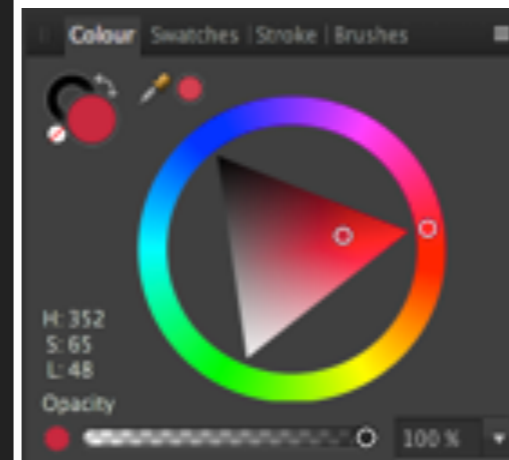
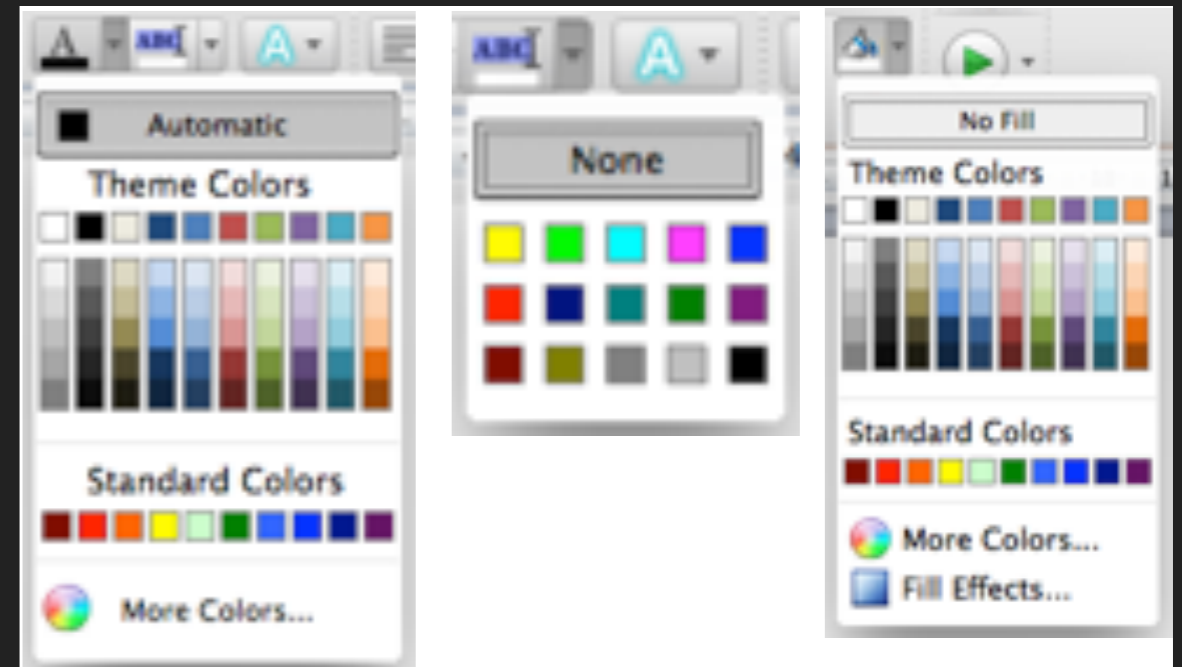
POLYMORPHISM

- ▶ The same tool can be used in different contexts
- ▶ Example : color selector
 - ▶ Change color of:
 - Text
 - Border
 - Background
 - Highlight
 - ...



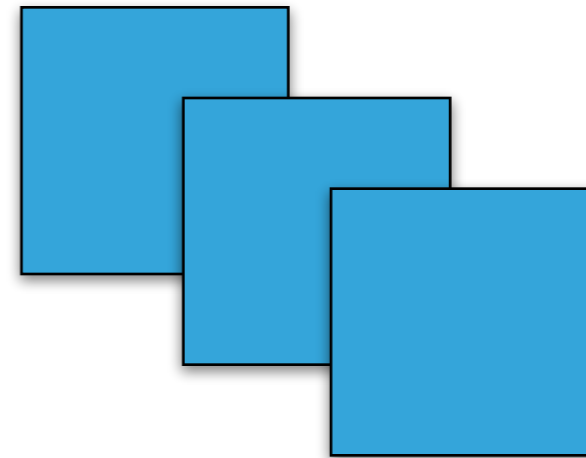
POLYMORPHISM

- ▶ The same tool can be used in different contexts
- ▶ Example : color selector
- ▶ Common examples:
 - Open, cut, paste, delete, move
- ▶ Apply command to group:
 - apply to each object, if meaningful
- ▶ Free the tools from the applications where they are trapped!



REUSE

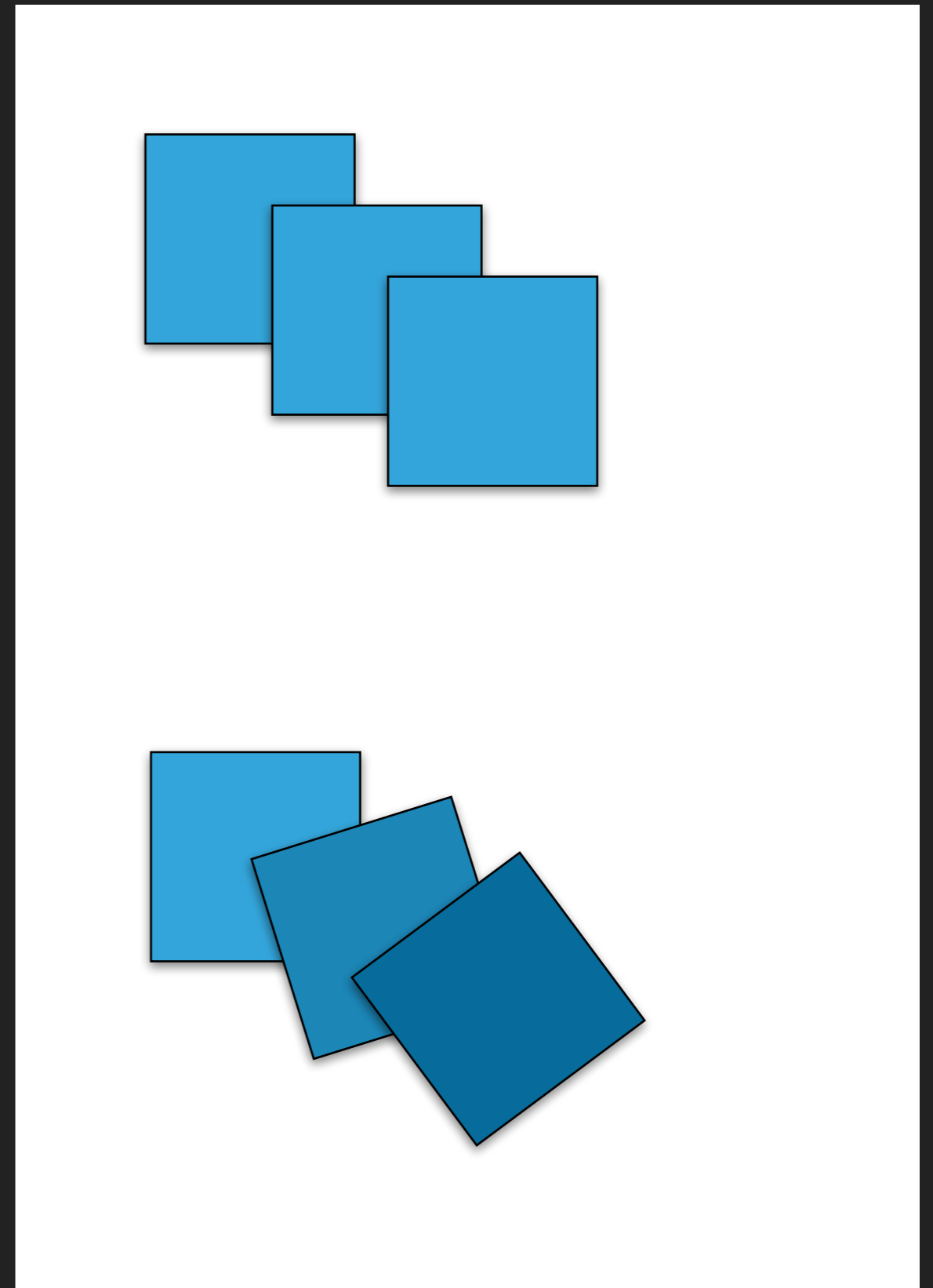
- ▶ Output reuse (objects)
- ▶ Example : copy-paste, duplicate



REUSE

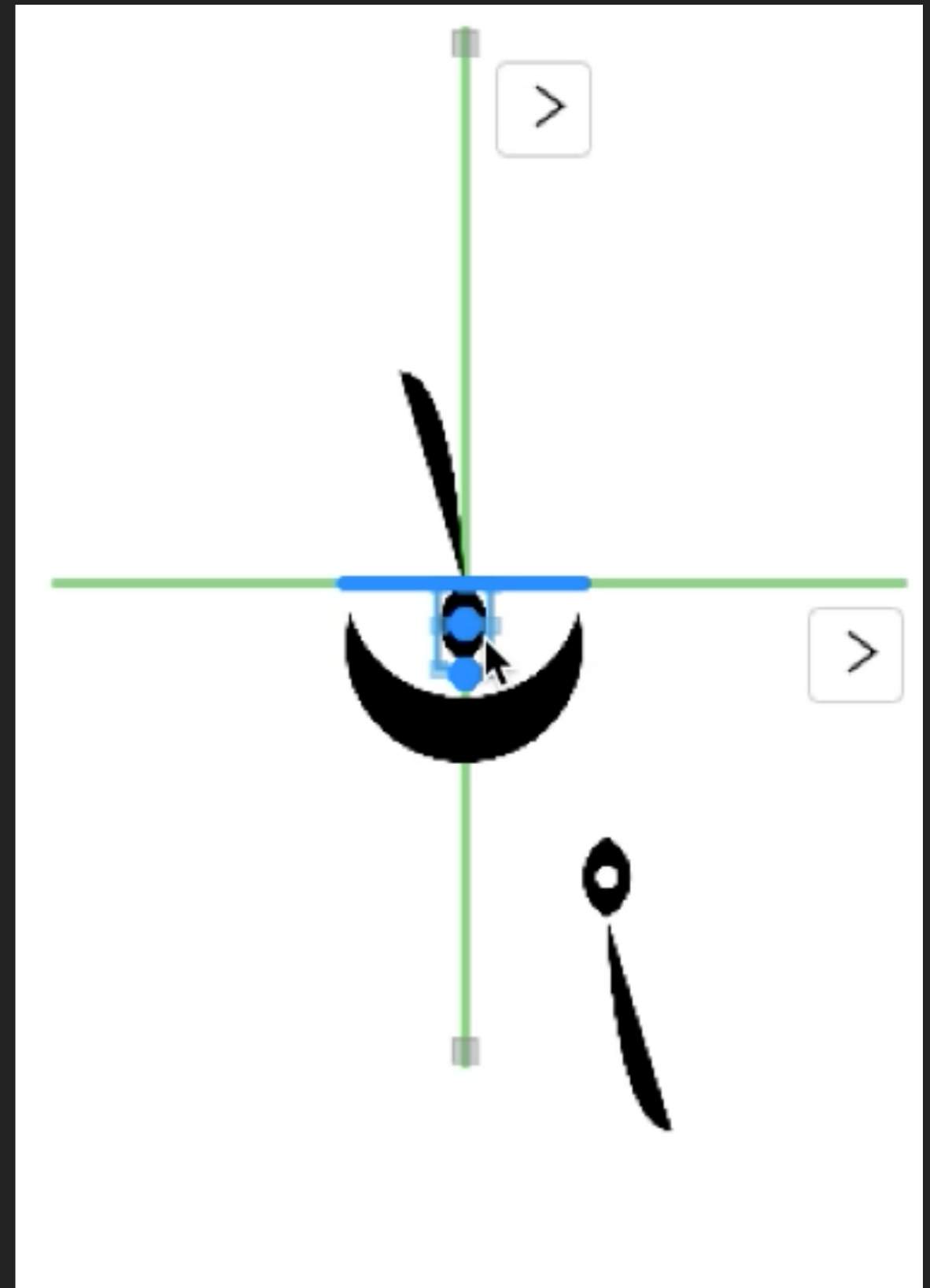
- ▶ Output reuse (objects)
- ▶ Example : copy-paste, duplicate

- ▶ Input reuse (commands)
- ▶ Example : redo, history, macros



ANALYZING STICKYLINES

- ▶ Reification of alignment
- ▶ Polymorphic
 - ▶ Align objects of different types
 - ▶ Move command adds/removes object to/from StickyLines
- ▶ Reusable
 - ▶ Copy StickyLine (with objects)
 - ▶ Copy tweaks



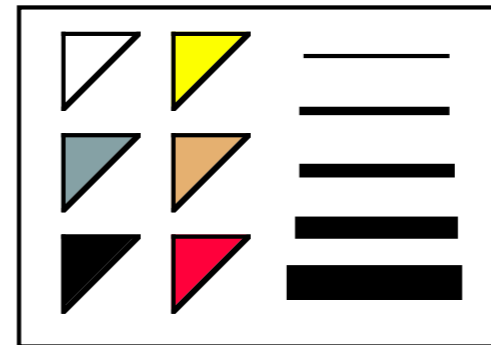
INTEGRATING THE PRINCIPLES

- ▶ Reification and polymorphism:
 - ▶ More objects and fewer commands
- ▶ Reification facilitates output reuse:
 - ▶ More first-class objects can be reused
- ▶ Polymorphism facilitates input reuse:
 - ▶ Increases the scope of commands

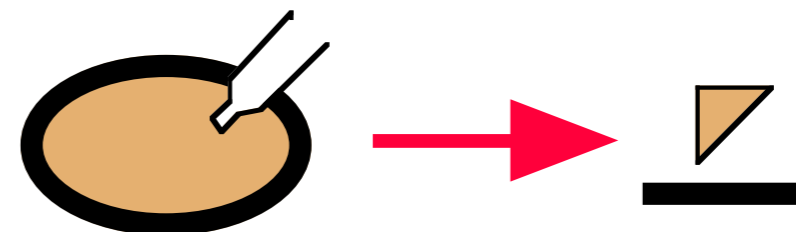
STYLES

- ▶ Reification of a collection of attributes
- ▶ Polymorphism
 - ▶ Apply style to different objects
- ▶ Reuse
 - ▶ Extract style from object
 - ▶ Apply to other objects

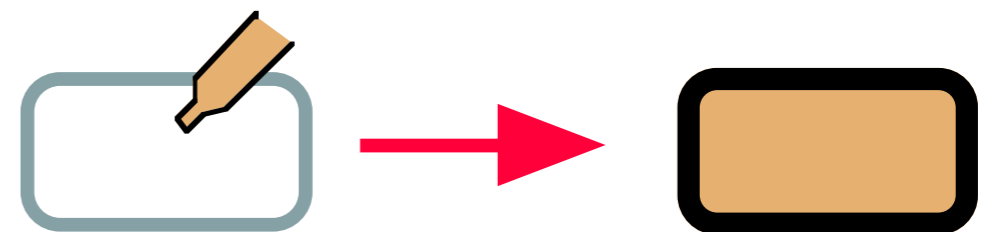
Style



Style picker

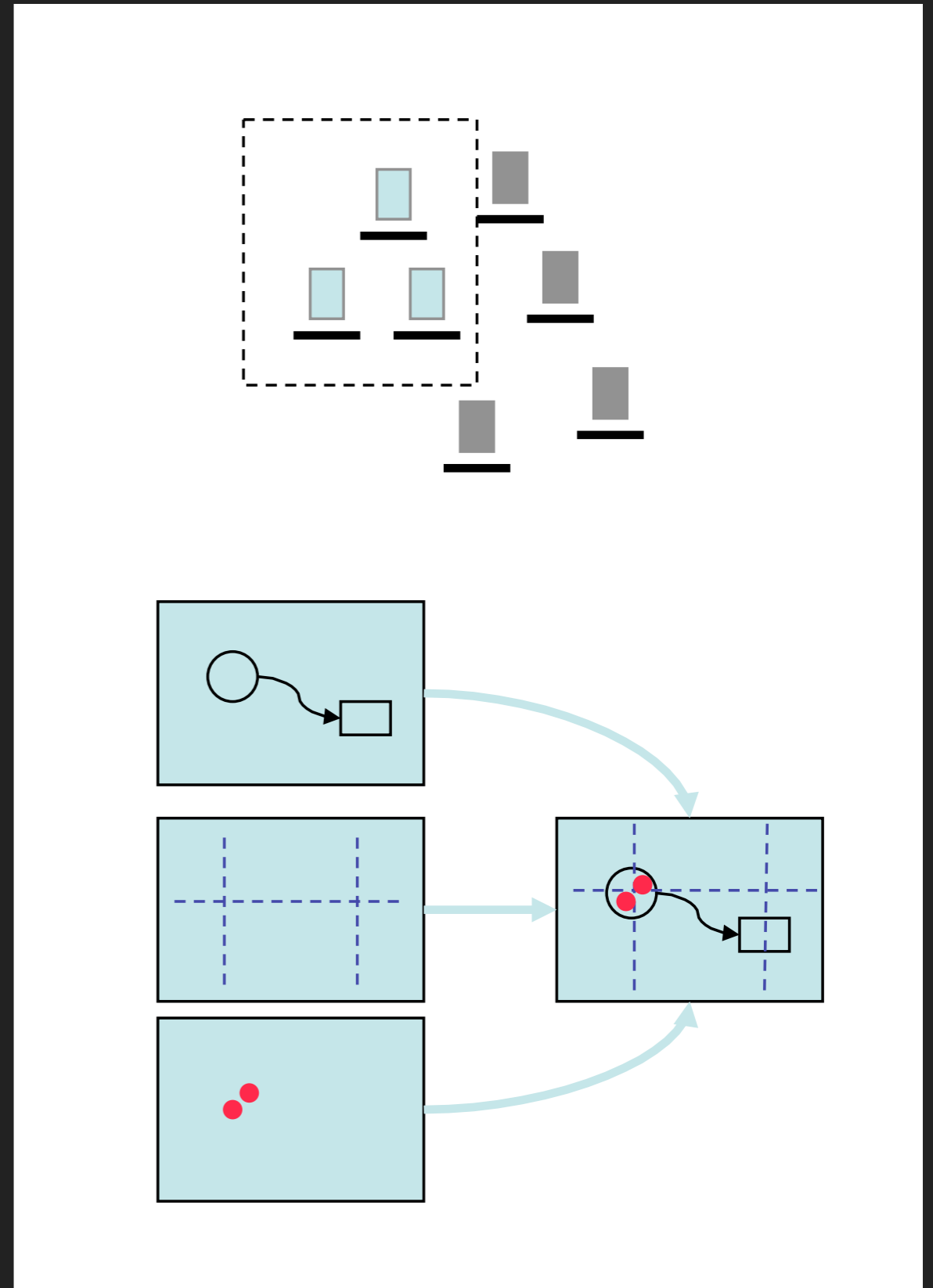


Style dropper



OTHER EXAMPLES

- ▶ Groups
 - ▶ Reify a selection
 - ▶ Support polymorphism
- ▶ Layers
 - ▶ Reify modes
- ▶ Macros
 - ▶ Reify sequences of commands



OBJECT-ORIENTED DRAWING

H. Xia, B. Araujo, T. Grossman, D. Wigdor

Object-Oriented Drawing

Haijun Xia¹, Bruno Araujo¹, Tovi Grossman², Daniel Wigdor¹

¹University of Toronto

²Autodesk Research



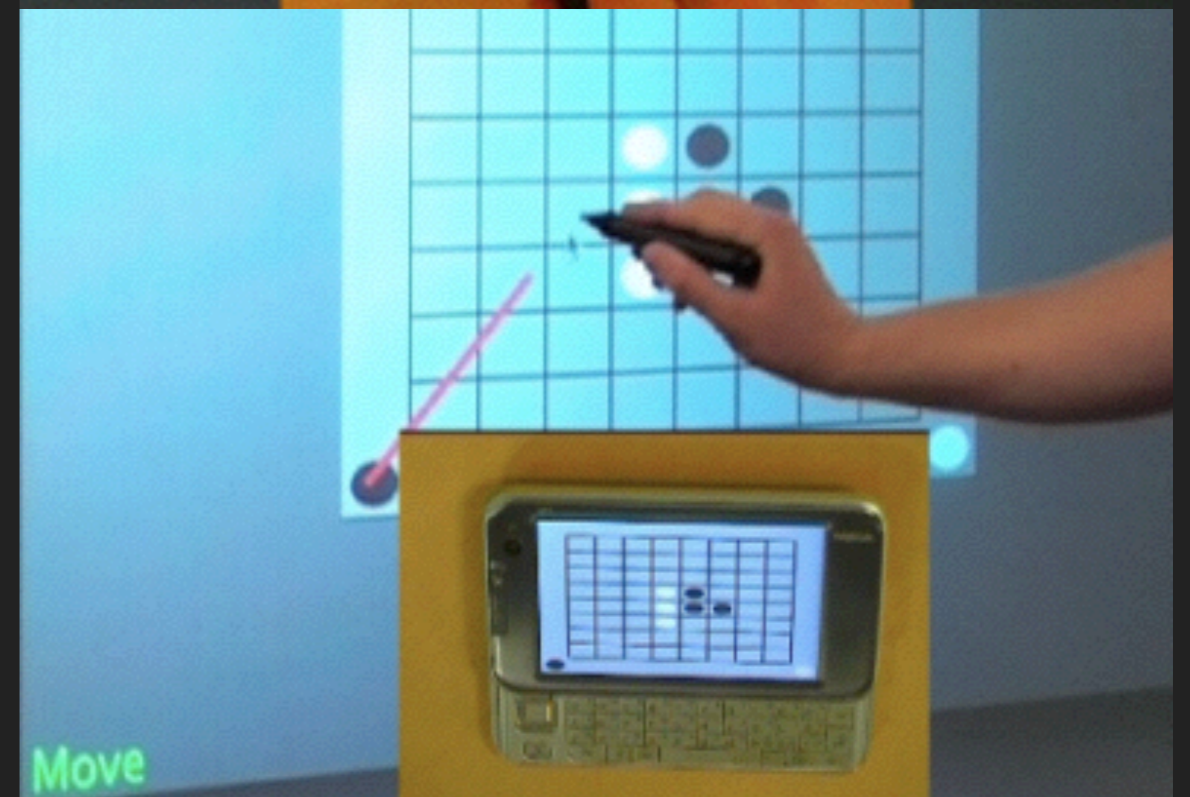
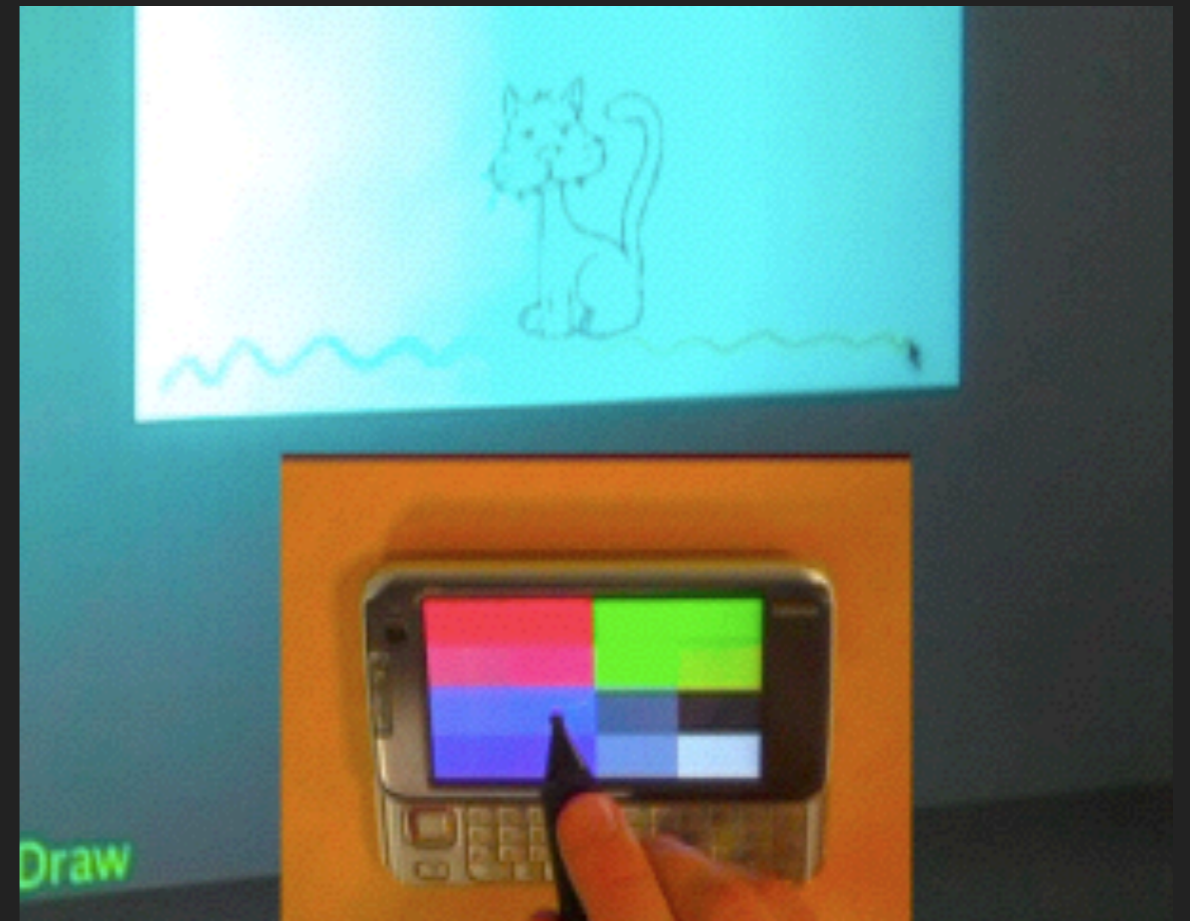
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AUTODESK.
RESEARCH

UBICOMP INSTRUMENTS

- ▶ Instruments spanning multiple interaction surfaces
- ▶ Multi surface interaction
- ▶ VIGO (CHI'09)



EXERCISE

- ▶ Work in groups and use last week's homework
- ▶ Identify tools that are common between the applications you analyzed
- ▶ Pick tools that seem specific to an application, and see if you can make them useful in the others