

KINEMATIC TEMPLATES: MANIPULATING CONTROL-DISPLAY RATIO IN END-USER DRAWING TOOLS



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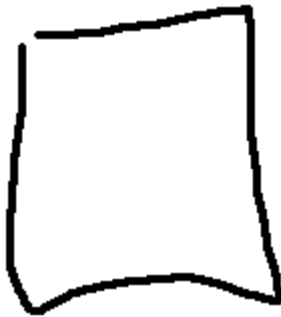
University of Waterloo

BACKGROUND

Freehand



Precise



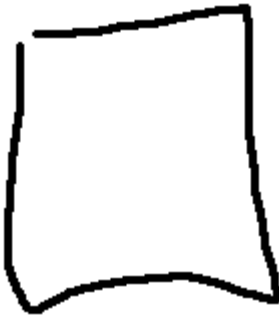
Pencil tool

BACKGROUND

Freehand



Precise



Pencil tool



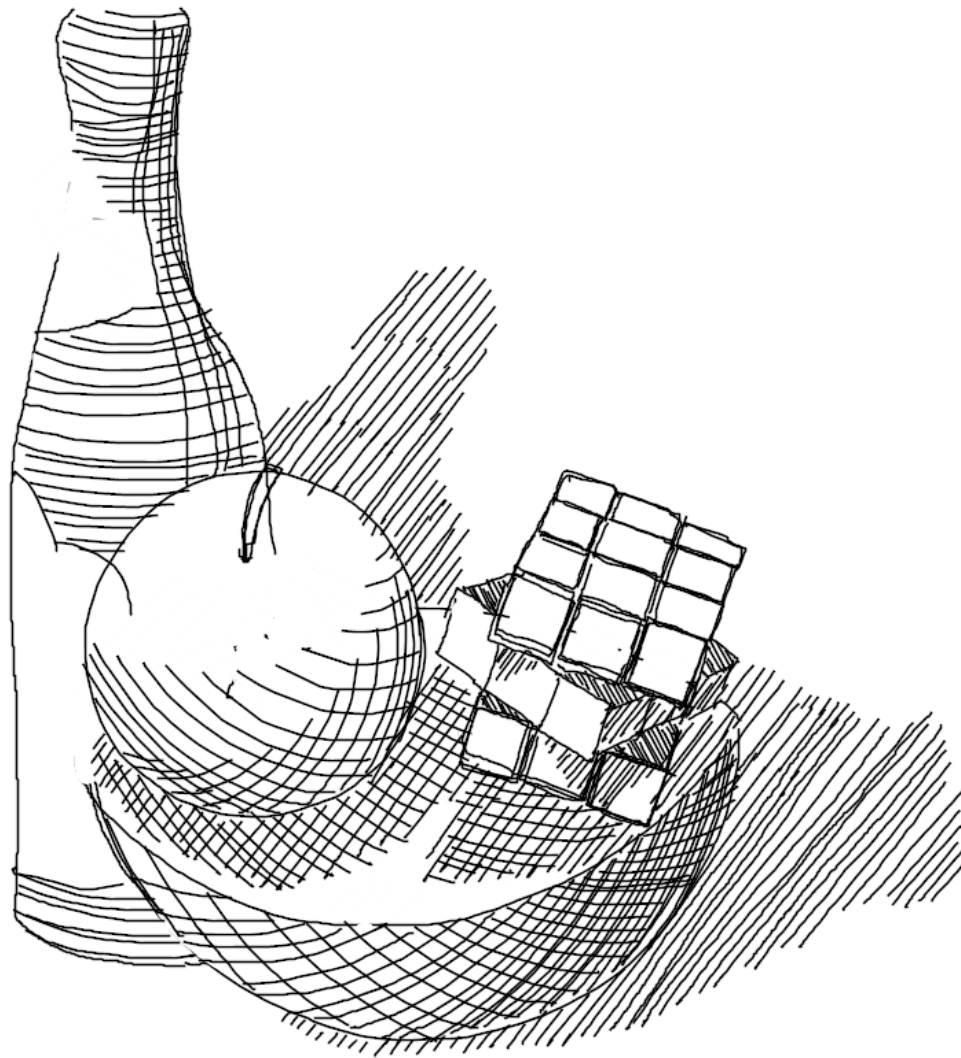
Geometric tools

MOTIVATION



MOTIVATION

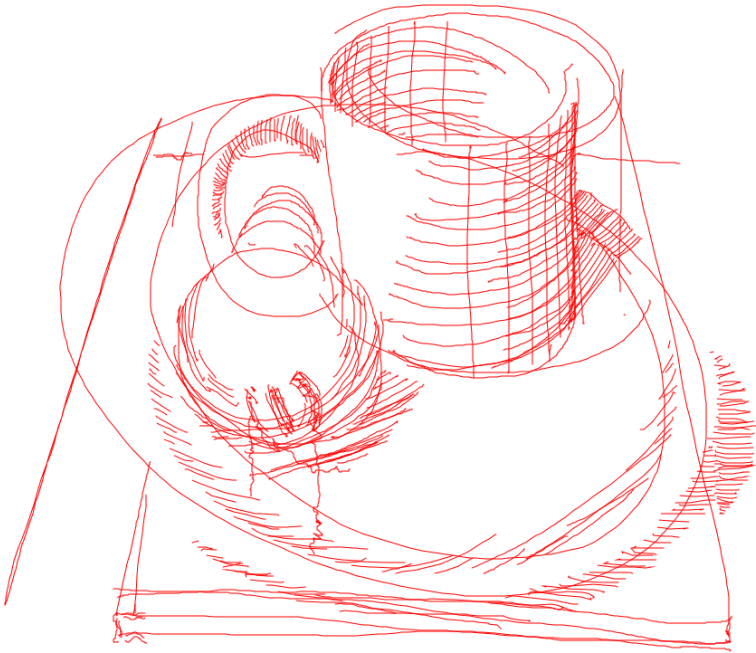




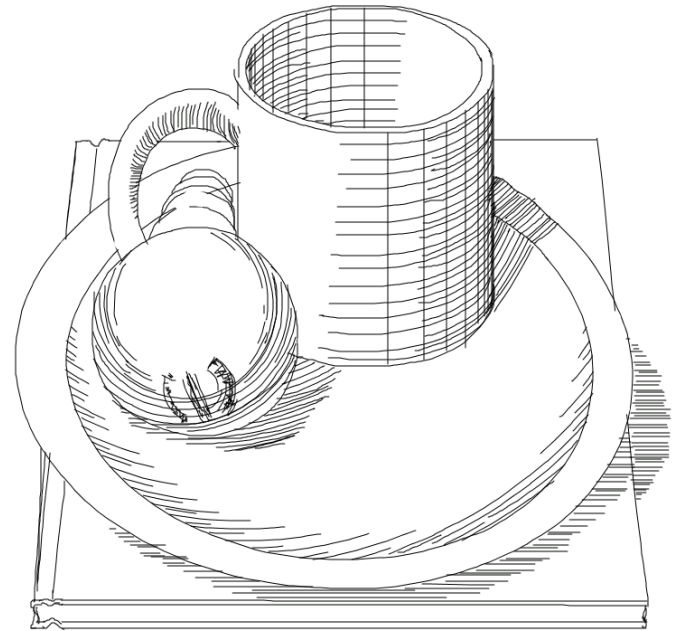
Crosshatching consistency

EVALUATION

1. Consistency and uniformity in strokes



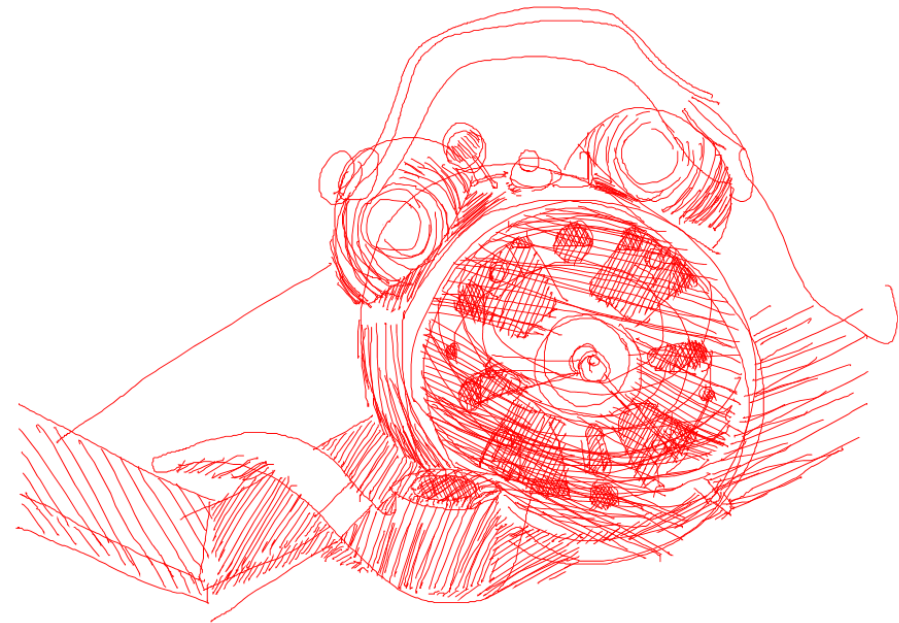
input recorded from the Wacom stylus



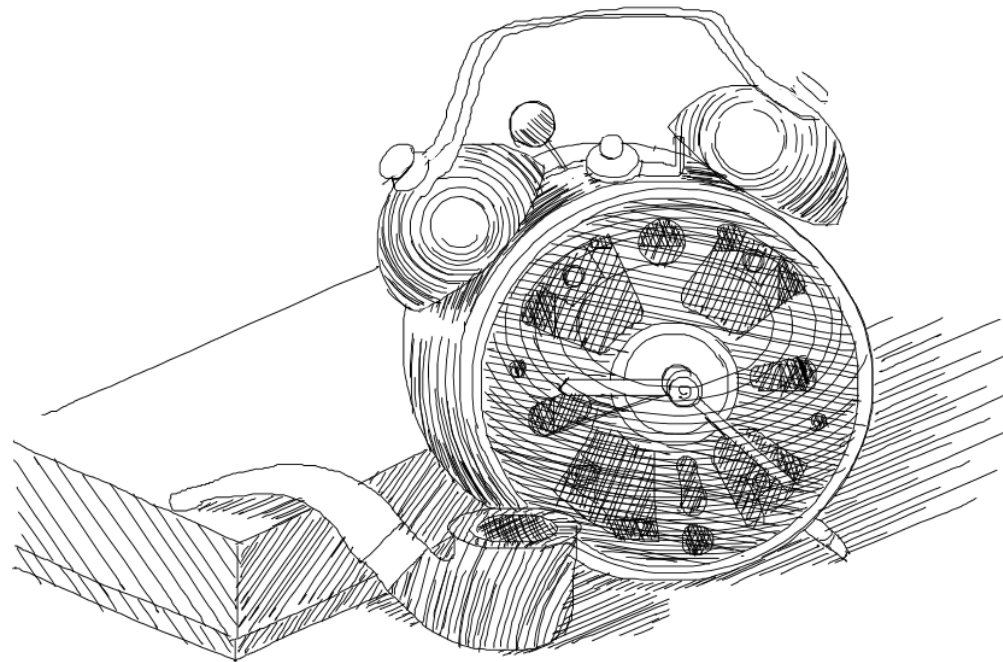
drawing visible to the participant

EVALUATION

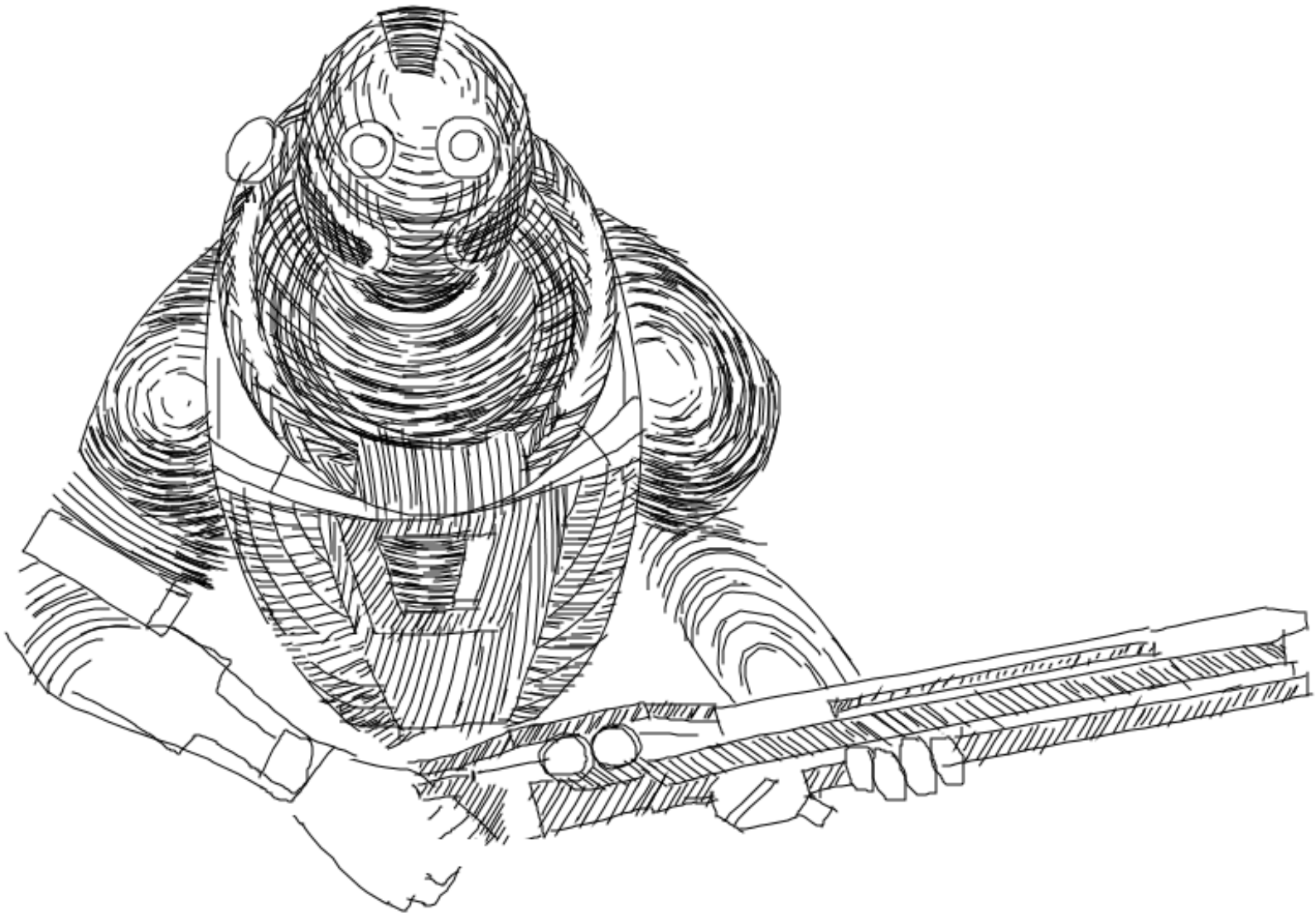
2. Faster to draw strokes



input recorded from the Wacom stylus



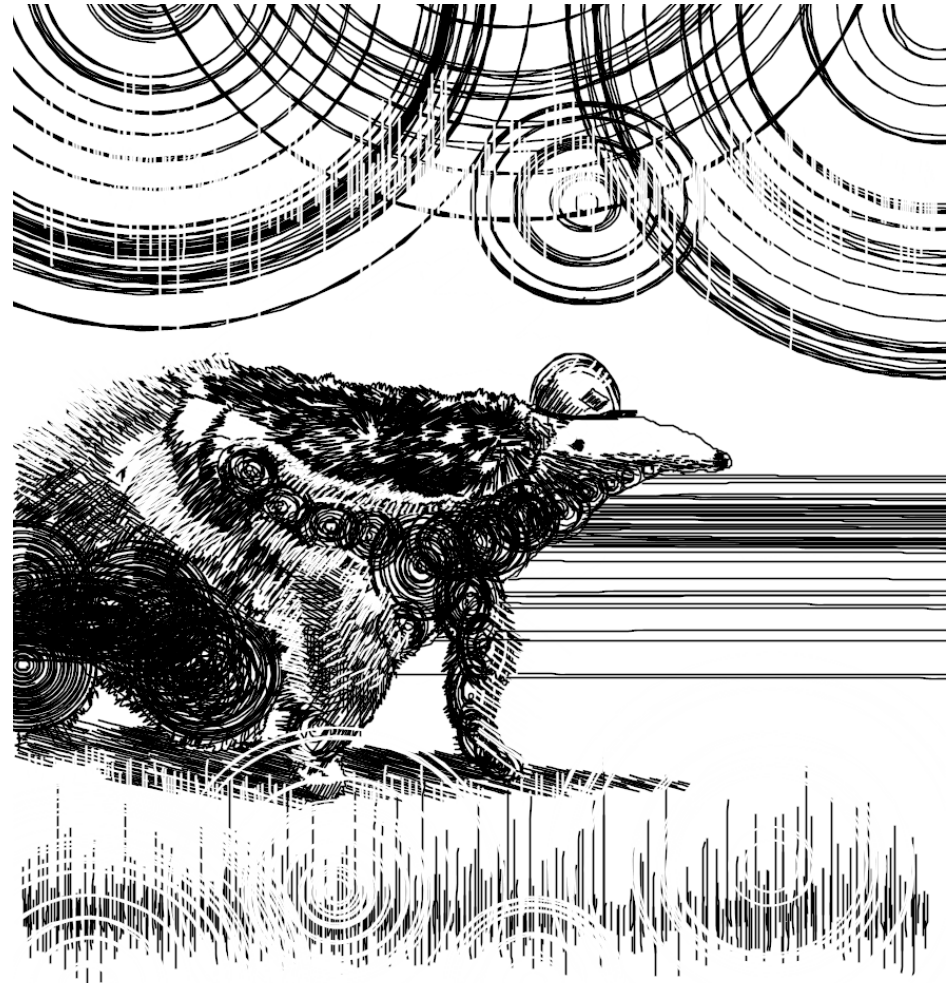
drawing visible to the participant



Particular styles of drawing

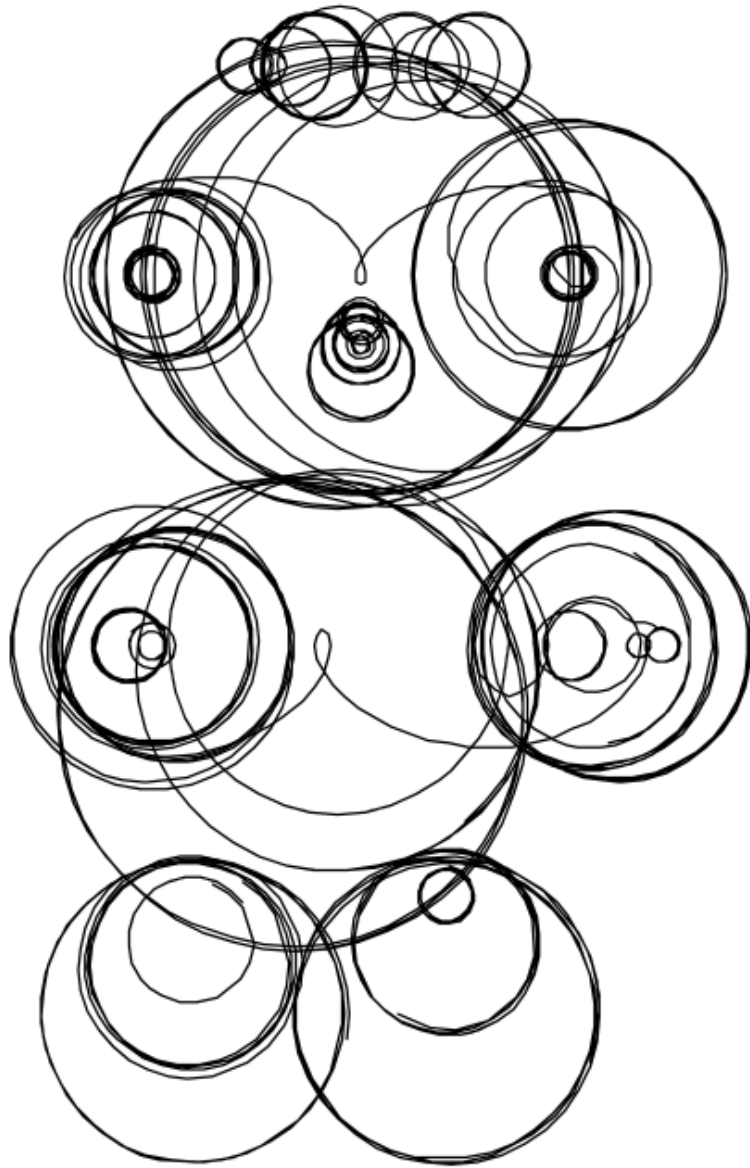
EVALUATION

1. Consistency (continued)



EVALUATION

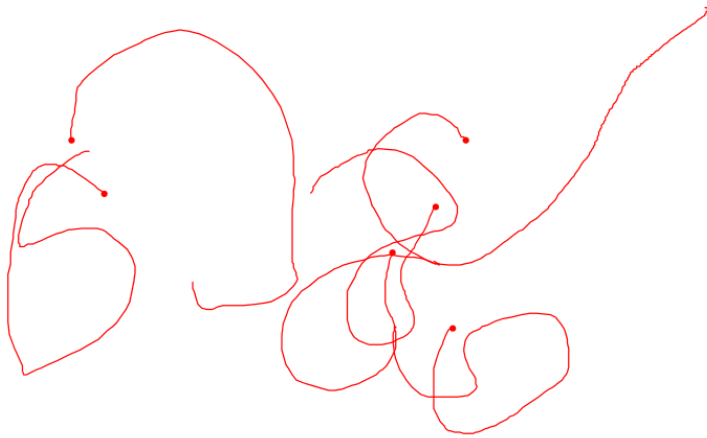




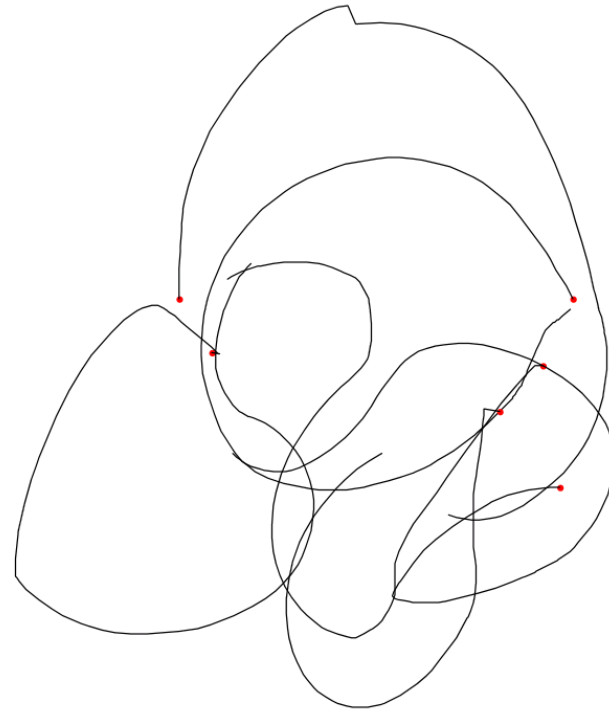
Serendipitous outcomes

EVALUATION

4. Introducing serendipity



input recorded from the Wacom stylus

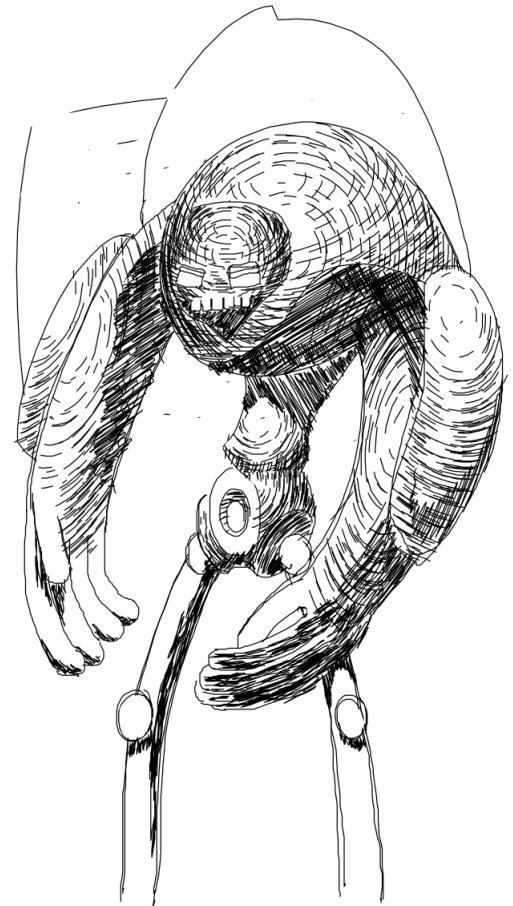


visible to the participant

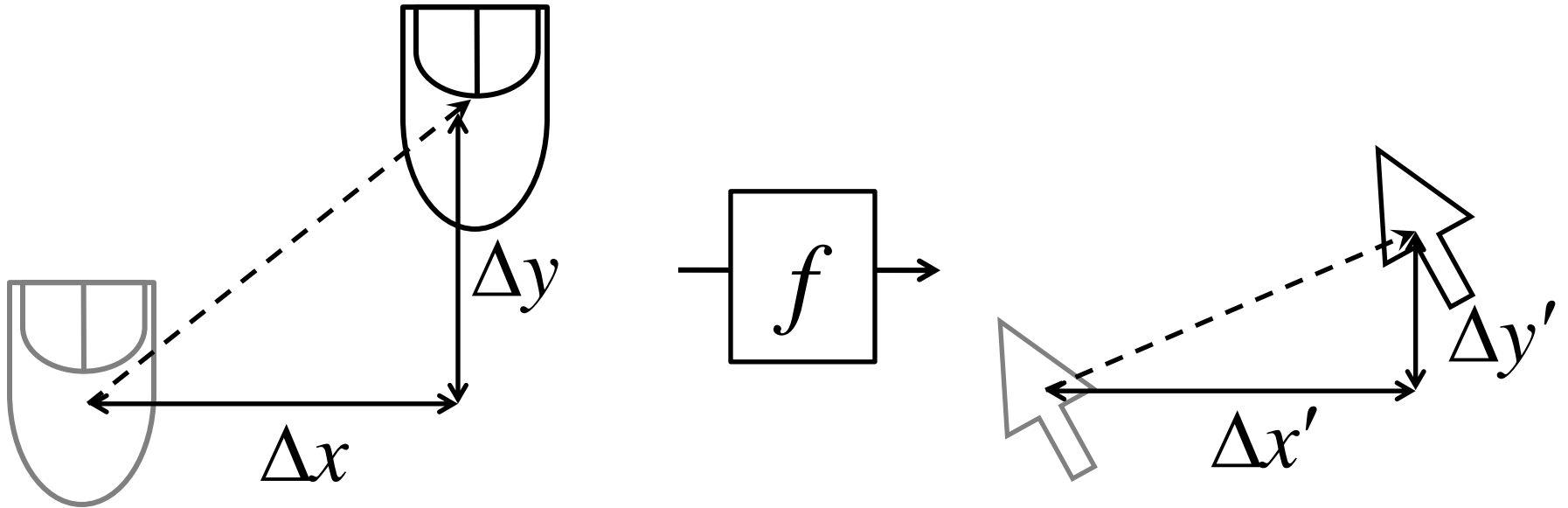
EVALUATION

4. Introducing serendipity

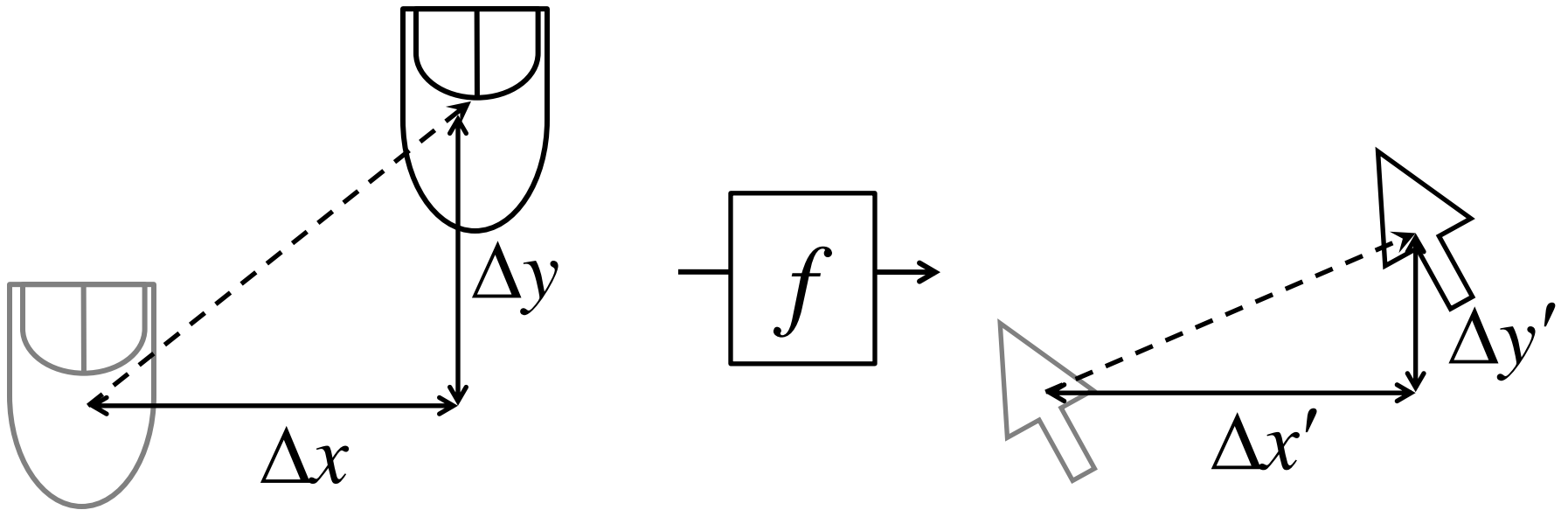
“The positive and negative space, I didn’t come up with it — I found it. The tools sort of helped me.”



IMPLEMENTATION



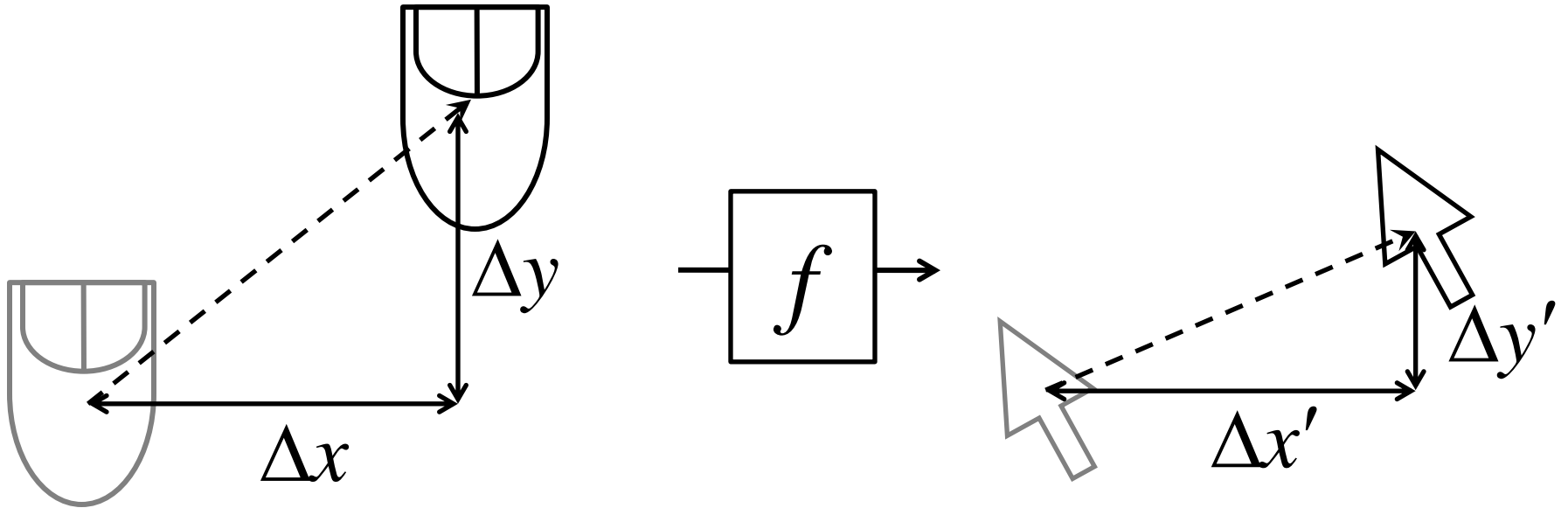
IMPLEMENTATION



Passive

$$\begin{matrix} \text{output} \\ \left[\begin{array}{c} \Delta x' \\ \Delta y' \end{array} \right] \\ \text{input} \end{matrix} = \begin{matrix} \text{scale} & \text{input} \\ \left[\begin{array}{cc} s_x \cdot \Delta x \\ s_y \cdot \Delta y \end{array} \right] \end{matrix}$$

IMPLEMENTATION



Active

$$\begin{bmatrix} \text{output} \\ \Delta x' \\ \Delta y' \end{bmatrix} = \begin{bmatrix} \text{input} \\ \Delta x \\ \Delta y \end{bmatrix} + \begin{bmatrix} \text{add displacement} \\ a_x \\ a_y \end{bmatrix}$$

IMPLEMENTATION

Passive Templates

Active Templates

≡ Hatching

≡ Grid

○ Compass

* Vanishing point

⇒ Speed up

⌘ Slow down

Min/max paint

Tunnel line

⇒ Conveyor belt

○ Orbit

✦ Point magnet

✦✦ Magnetic line

→ → → Inertia