

INTERFACES FOR COLLABORATION

CMPT 381

Outline

- CSCW and groupware
- Types of groupware
- MVC and distribution of the UI

CSCW and Groupware



- Computer-Supported Cooperative Work
 - ▣ The study of people working together through computers
- Groupware
 - ▣ Software that supports collaboration

Types of groupware

	Same Time	Different Time
Same Place	Digital tables Handhelds Single-display groupware	Digital whiteboards Location-aware messaging
Different Place	Shared editors Real-time games	E-mail Asynchronous editing

Types of groupware

	Same Time	Different Time
Same Place	Digital tables Handhelds Single-display groupware	Digital whiteboards Location-aware messaging
Different Place	Shared editors Real-time games	E-mail, IM, Twitter, Snapchat Asynchronous editing

Types of groupware



- Centralized architecture
 - ▣ One server, many clients
 - ▣ Server can be for data or messaging
- Replicated architecture
 - ▣ No server, all clients are connected peer-to-peer

Real-time distributed groupware

- Different place, same time
- Main issues:
 - ▣ Distribution of the interface
 - Illusion of working on the same data
 - ▣ Input management
 - How to merge multiple input streams?
 - ▣ Consistency maintenance
 - Ensuring that models don't diverge
 - ▣ Awareness of the other people
 - Who, What, Where
 - ▣ Network delay
 - Latency and Jitter

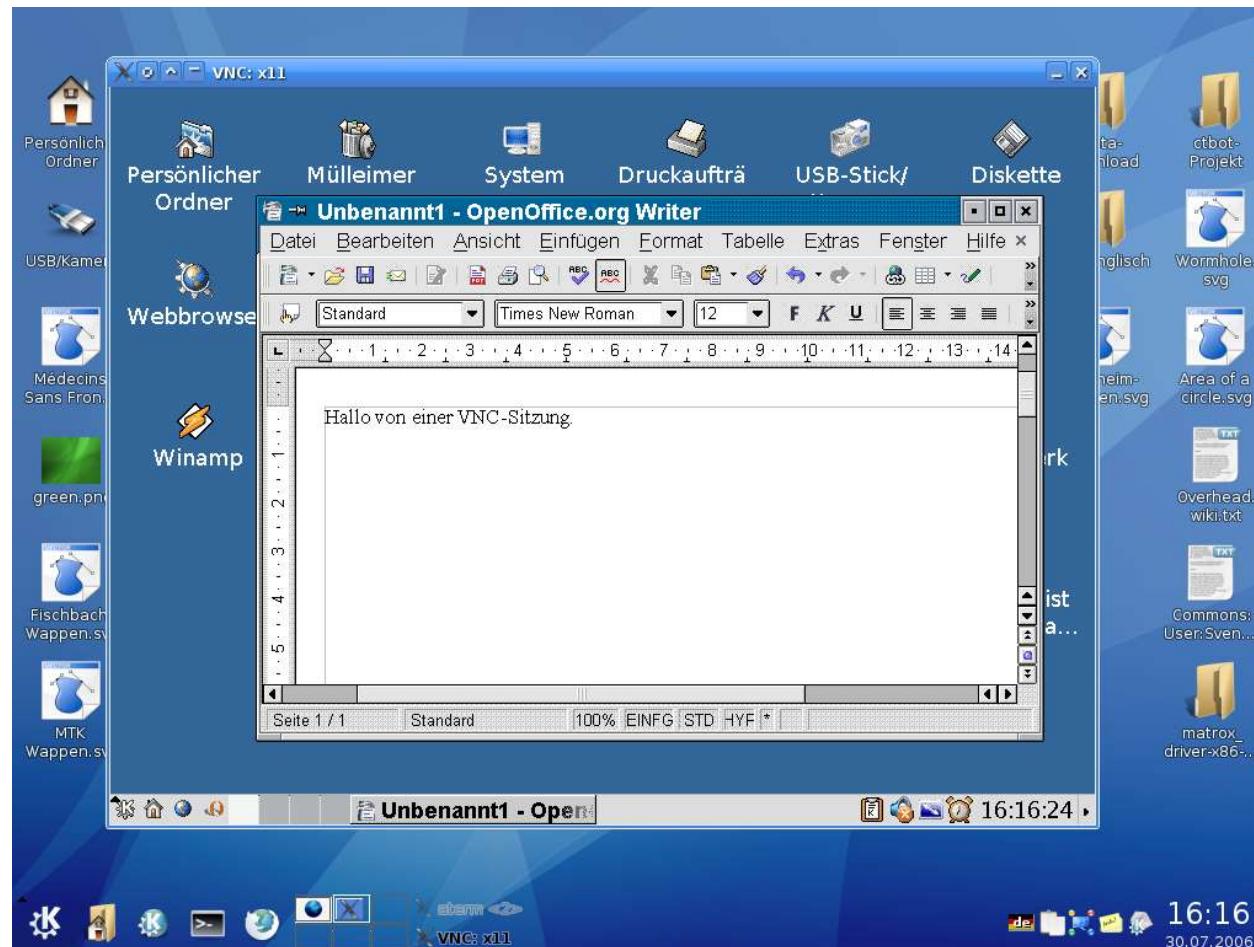
Distribution of the interface

- How to create the illusion that people are working on the same data?
 - ▣ Pixel/event distribution
 - ▣ Toolkit layer distribution
 - ▣ Model replication

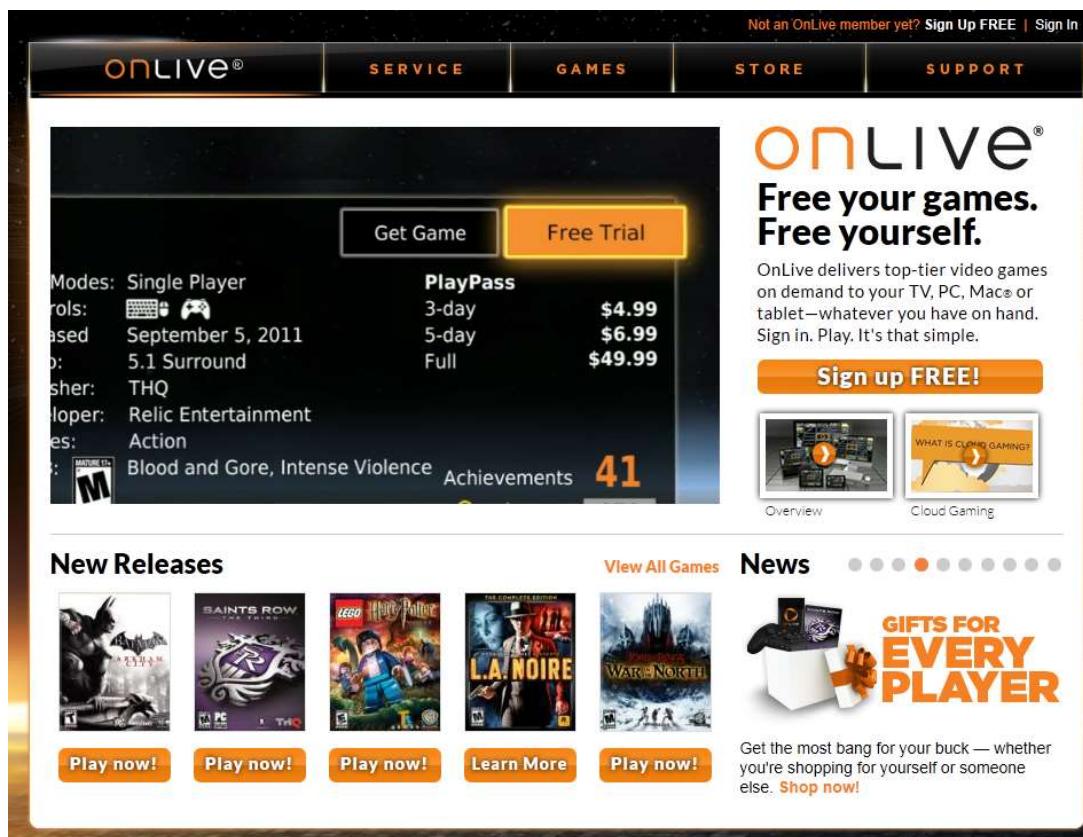
Pixel/event distribution

- Centralized view architecture
 - ▣ View is maintained at the server
 - ▣ Pixels in the view are sent over the network
 - ▣ Input events are serialized and merged
- Advantages:
 - ▣ Software does not need to know there is a group
 - ▣ “Collaboration transparent”
- Disadvantages:
 - ▣ Network bandwidth requirements
 - ▣ No support for multiple users doing different actions
 - Only one cursor, only one view (“strict WYSIWIS”)

VNC screen sharing



OnLive



Wikipedia: “The OnLive service received mixed reception. Critics noted that the video quality and amount of input lag varied on a game-by-game basis, and did not consider OnLive to be a complete substitute to owning games and playing them on local hardware”

PlayStation Now

The image shows the PlayStation Now website homepage. At the top, there is a dark navigation bar with the PlayStation logo, the text "PLAYSTATION NOW" (underlined), and links for "GAMES", "DEVICES", and "SUPPORT". On the far right of the bar is a red "GET PS NOW" button. Below the navigation bar is a large banner for the game "JOURNEY". The banner features a stylized illustration of the game's protagonist, a small figure with a large backpack, walking towards a bright sun over a mountain peak. The word "JOURNEY" is written in white, blocky letters at the bottom left of the banner. To the right of the banner, the PlayStation Now logo is displayed, followed by the text "Hundreds of Games" in large, bold, white letters. Below this, a description reads: "PS Now is the subscription service that lets you stream hundreds of PS3 games to your PS4 and Windows PC." A red "START 7-DAY FREE TRIAL" button is located below the description. At the bottom of the banner, there is a "Watch Video" link.

PLAYSTATION NOW

GAMES DEVICES SUPPORT

GET PS NOW

PlayStation. Now | PlayStation

Hundreds of Games

PS Now is the subscription service that lets you stream hundreds of PS3 games to your PS4 and Windows PC.

START 7-DAY FREE TRIAL

Watch Video

Toolkit layer distribution

- Send commands from the abstract canvas
- Draw at each client
- Input events as with pixel approach
- Advantages:
 - ▣ Draw commands are smaller than pixel updates
- Disadvantages:
 - ▣ Still poor local responsiveness under network delay
 - ▣ Still no support for multiple users doing different things

Model layer distribution

- Distributed MVC (DMVC):
 - ▣ Model is replicated at each client
 - ▣ Clients draw their own views
 - ▣ Clients handle their own input
- Advantages:
 - ▣ Good local responsiveness
 - ▣ People can do different things at the same time
 - ▣ Different views for each client (“relaxed WYSIWIS”)
- Disadvantages:
 - ▣ Multiple models to keep consistent

Consistency maintenance

- Maintain model integrity
 - In centralized systems, prevent simultaneous access
 - In replicated systems, ensure that models are consistent
- Floor control:
 - only one person interacts at a time
- Locking:
 - prevent simultaneous actions on an object
- Operational transform:
 - Transform conflicting operations back to consistent state
 - This is what Google Docs uses

Consistency maintenance

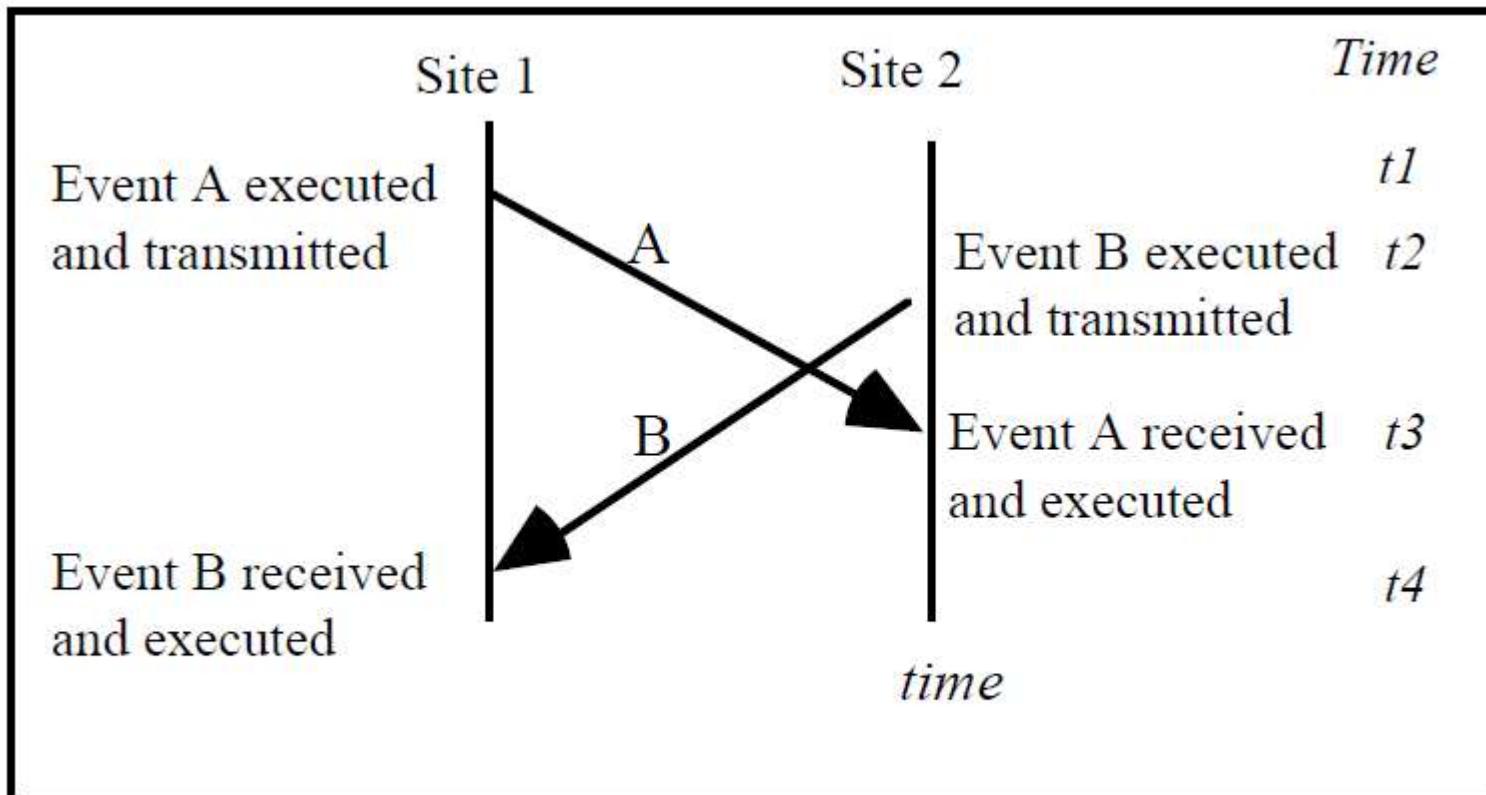


Figure 1: Example of event re-ordering resulting in possible loss of data integrity.

Awareness

- “Just like being there”

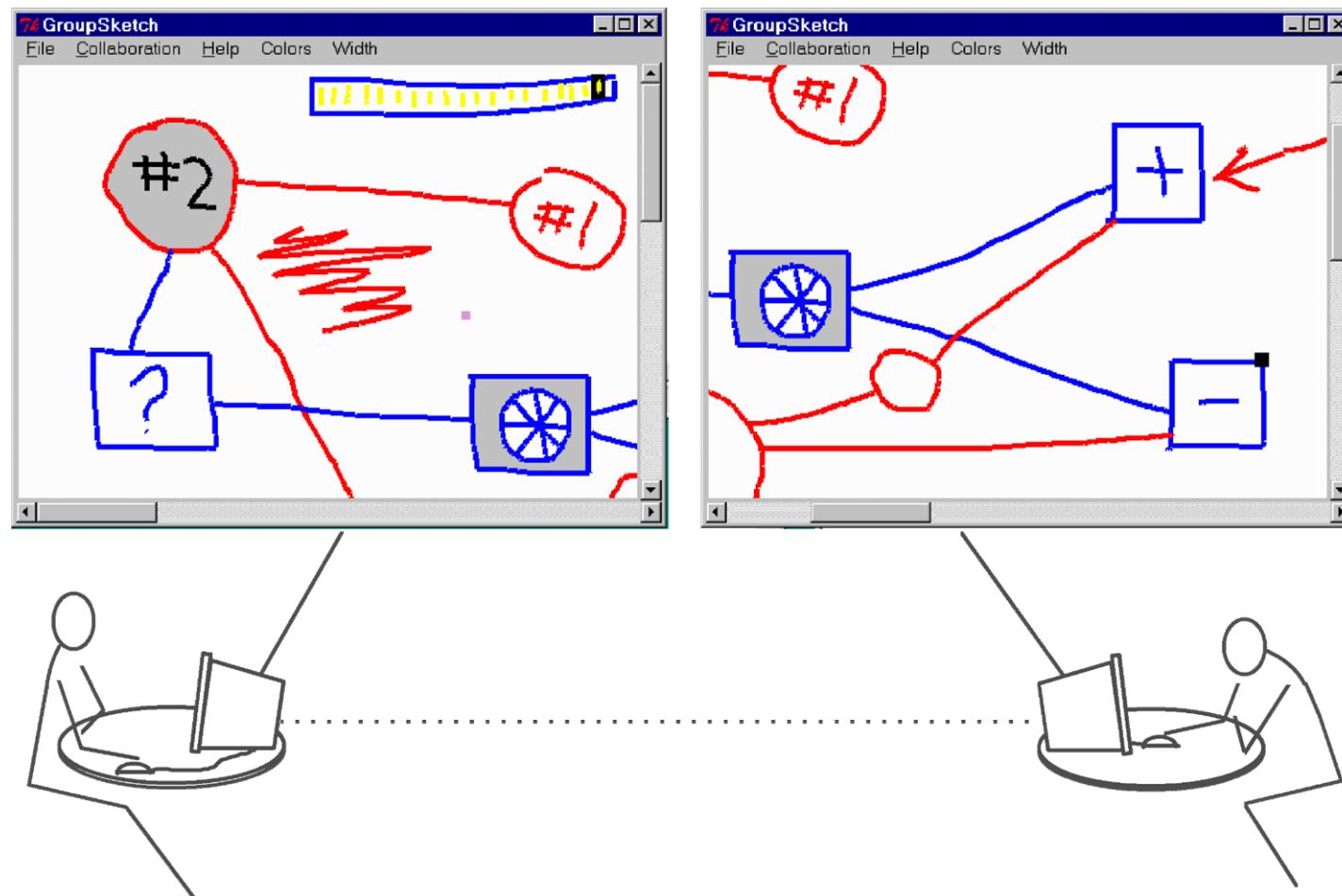
ACM CSCW 1994 Issue 87 - Seamless Media Design

ForteTuba 3 videos



<http://www.youtube.com/watch?v=m8KpyodEzK0>

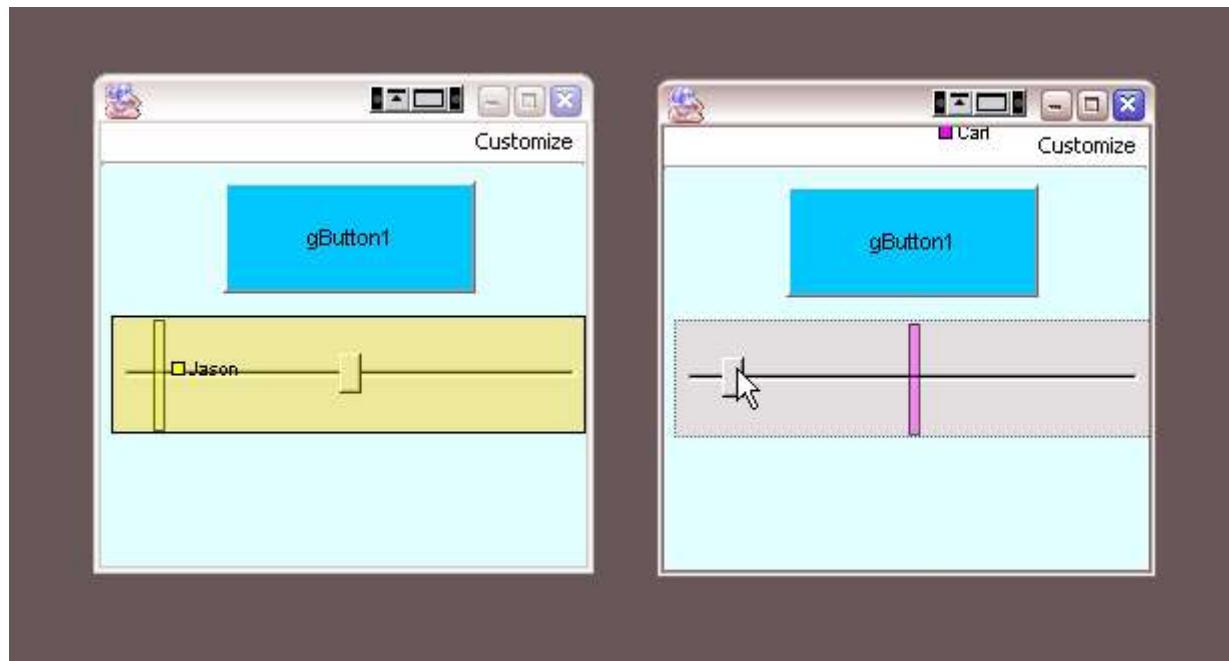
Awareness in distributed groupware



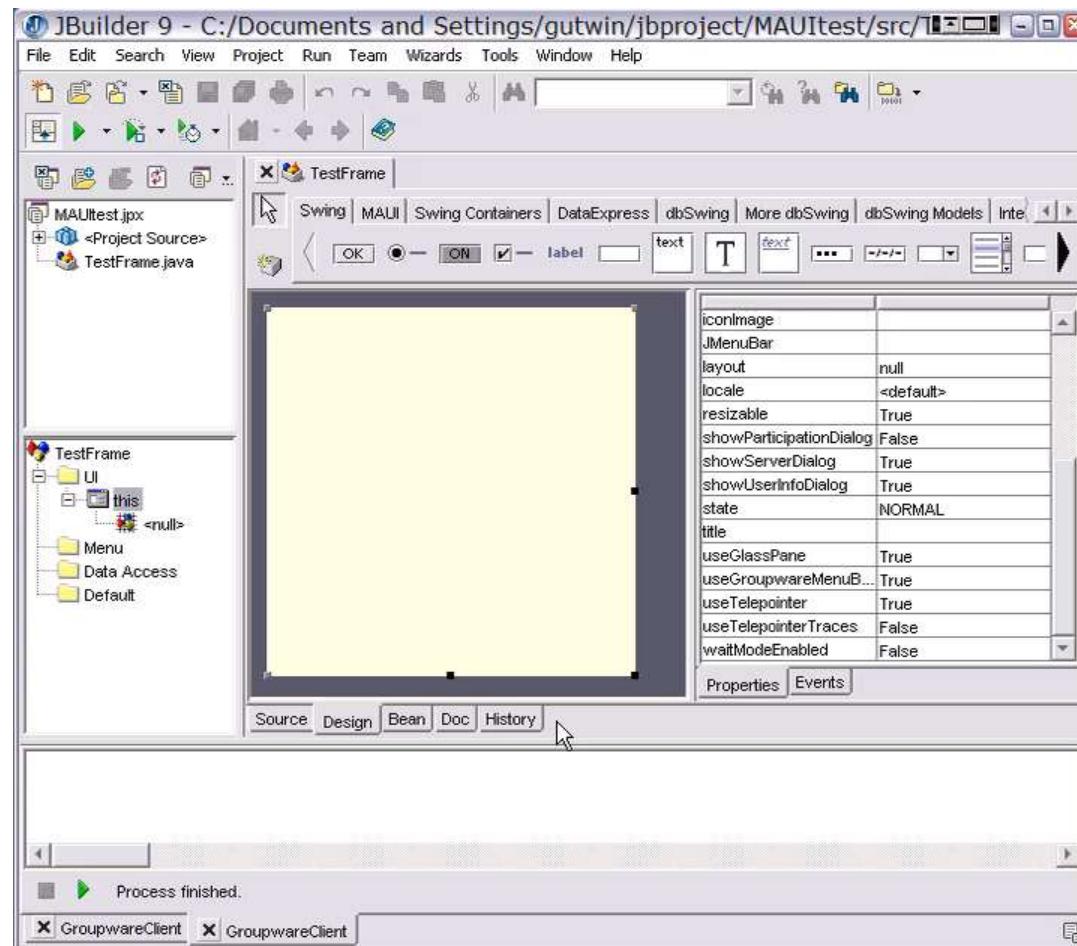
Awareness elements

Category	Element	Specific questions
Who	Presence	Is anyone in the workspace?
	Identity	Who is participating? Who is that?
	Authorship	Who is doing that?
What	Action	What are they doing?
	Intention	What goal is that action part of?
	Artifact	What object are they working on?
Where	Location	Where are they working?
	Gaze	Where are they looking?
	View	Where can they see?
	Reach	Where can they reach?

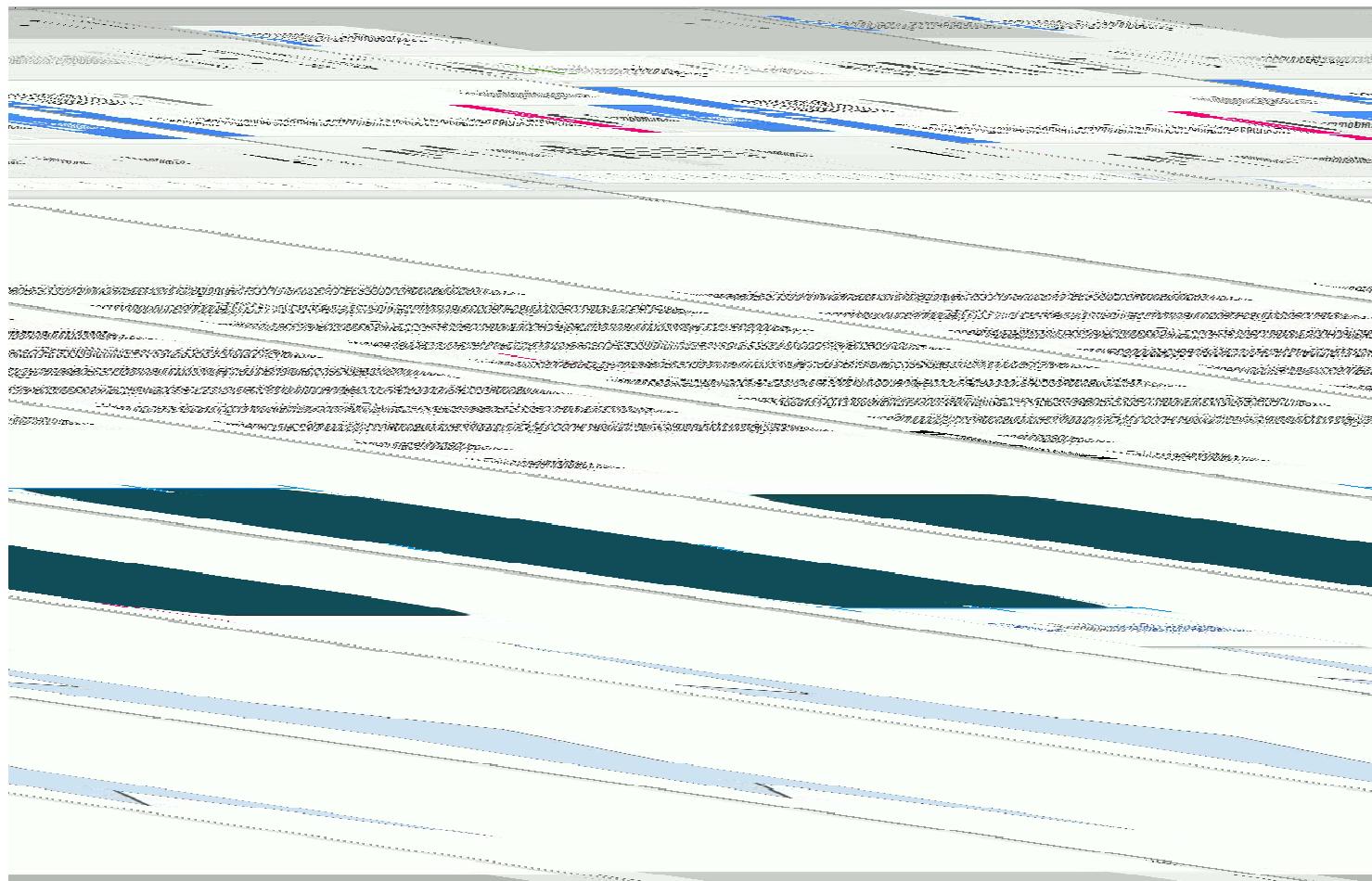
MAUI



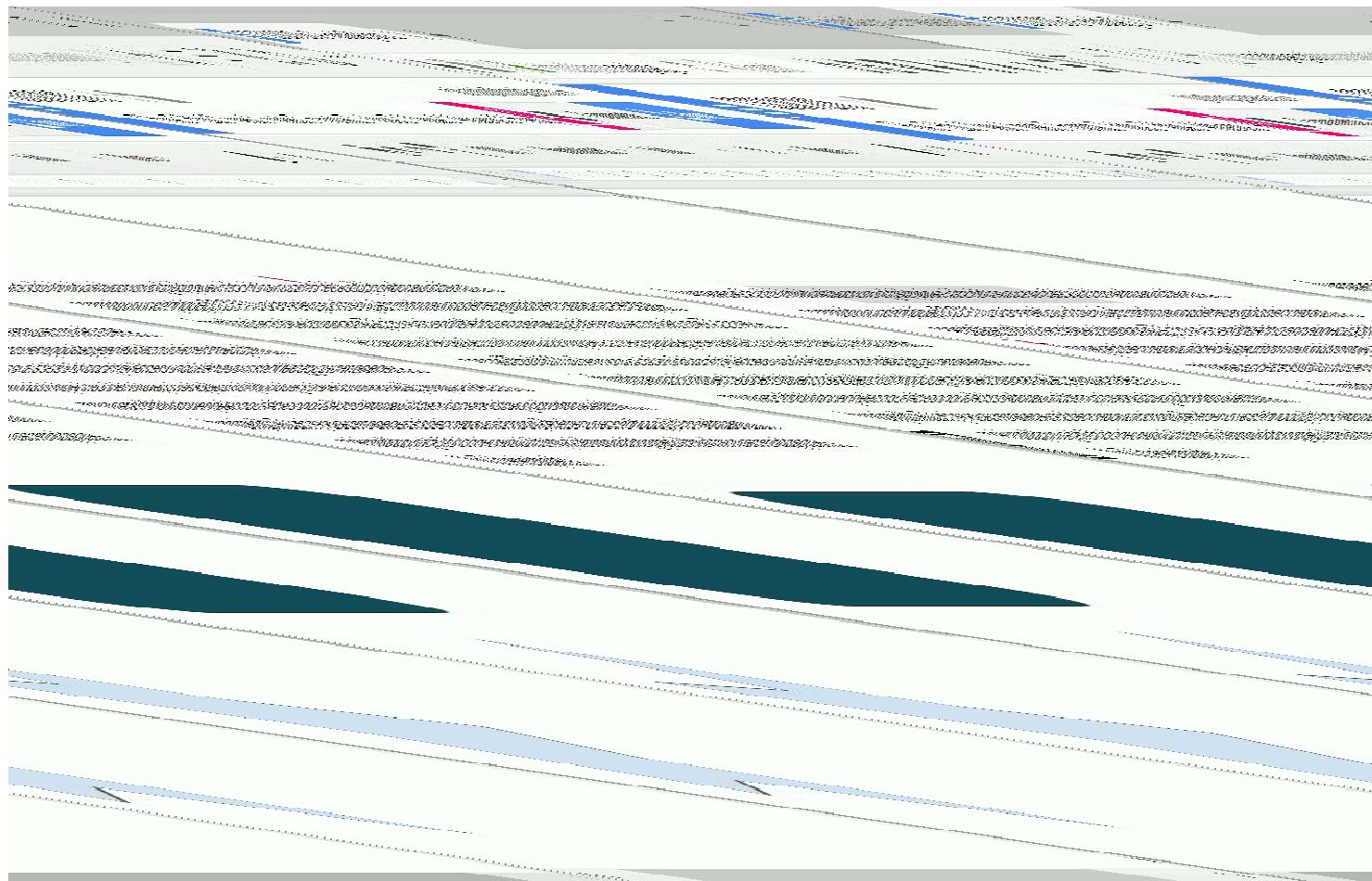
MAUI



Google Docs



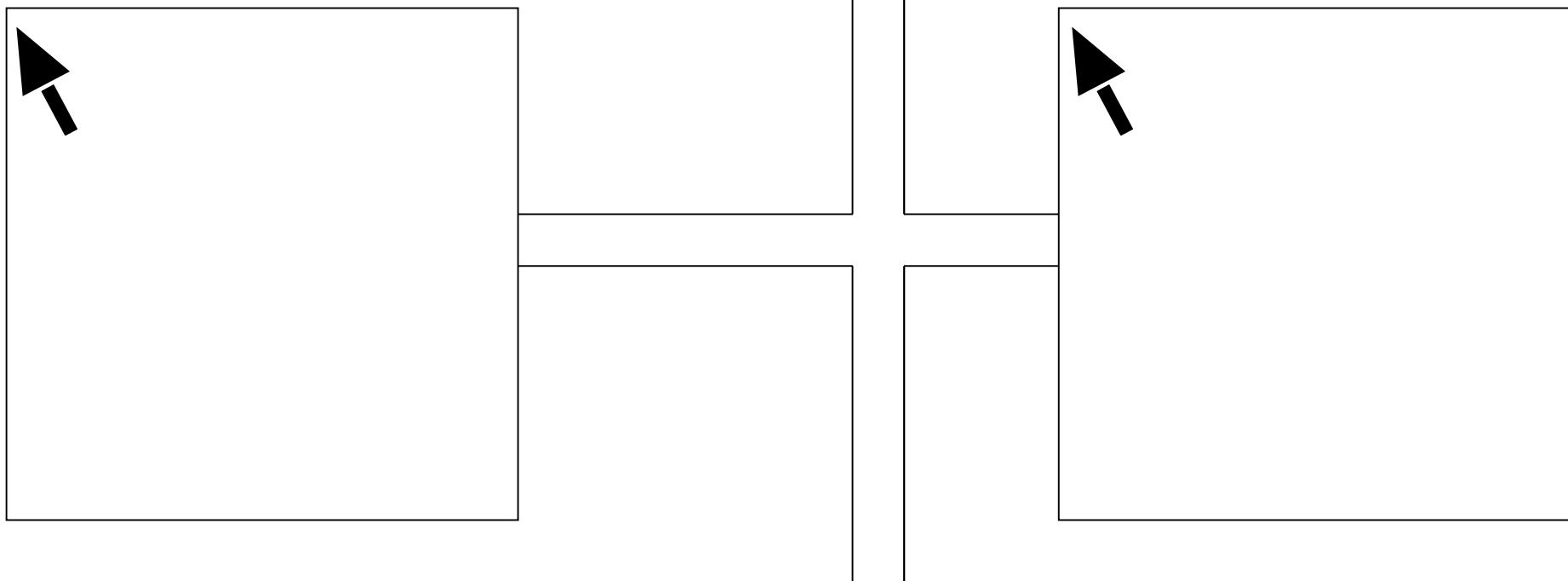
Google Docs



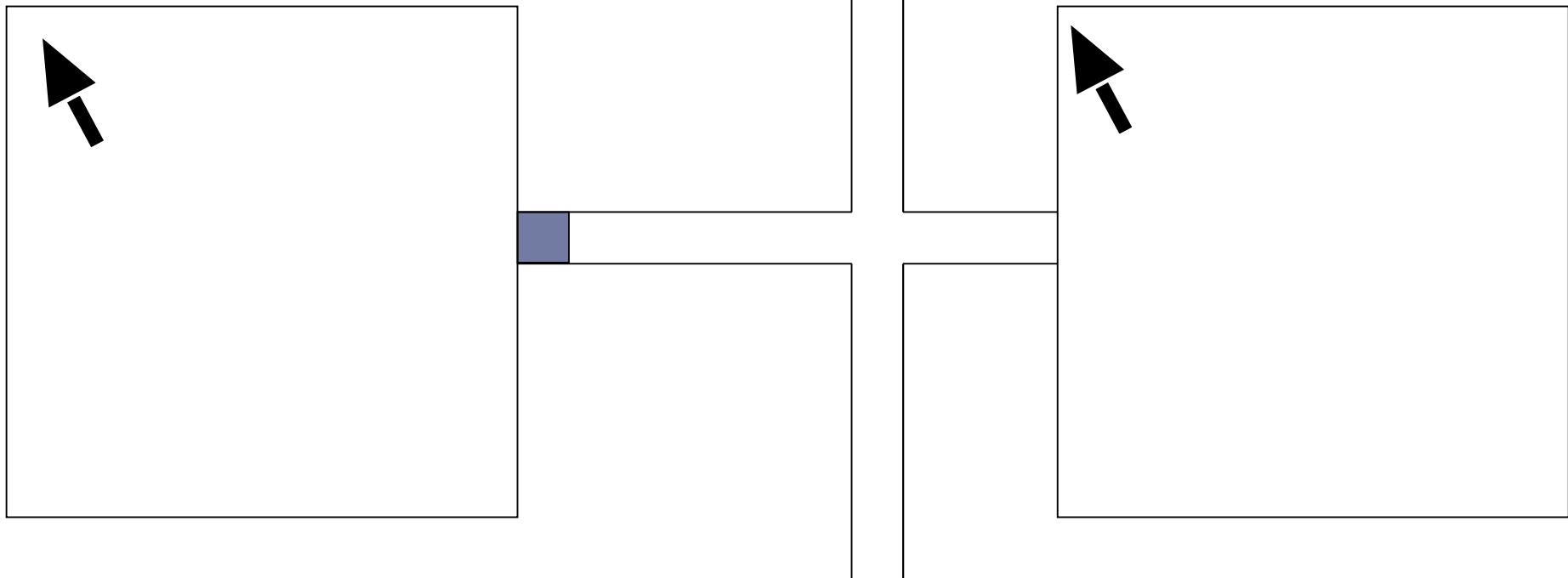
Network delay

- Latency: end-to-end time difference
 - ▣ Local user action → noticeable remote update
 - ▣ Motion is smooth but late
- Jitter: variance in latency
 - ▣ Messages pile up due to network congestion
 - ▣ Motion is halting and unsmooth

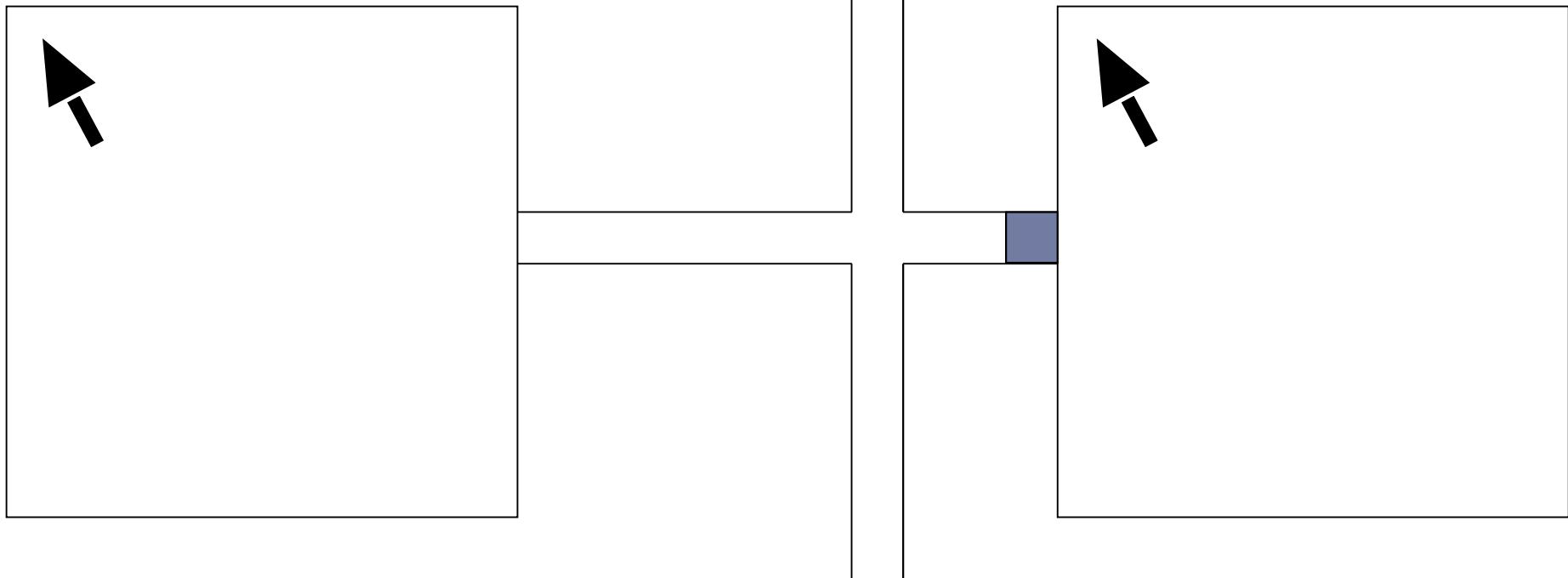
No jitter



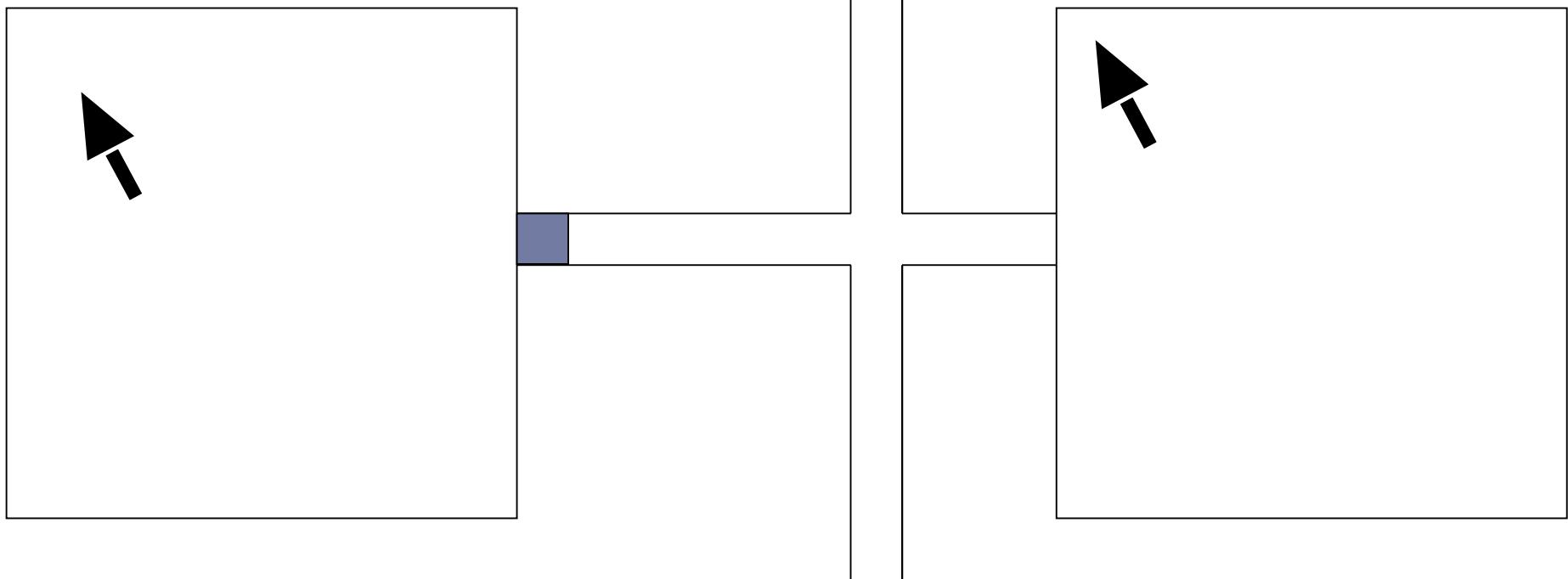
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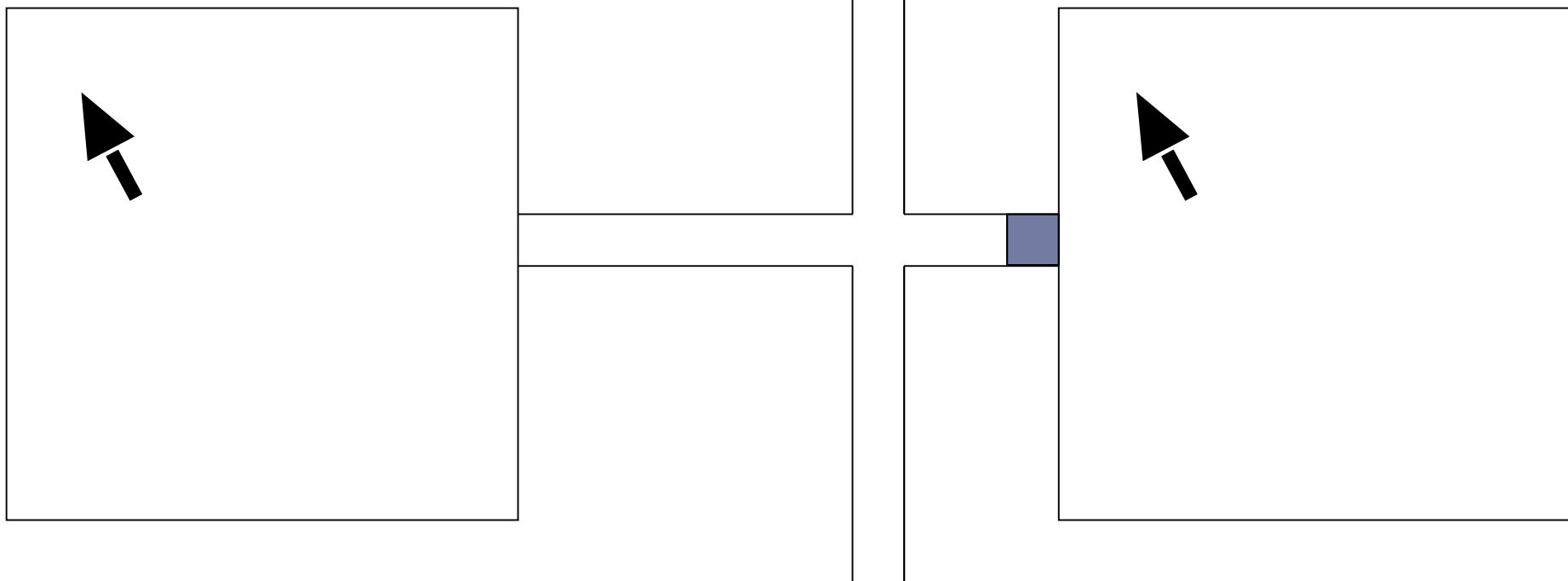
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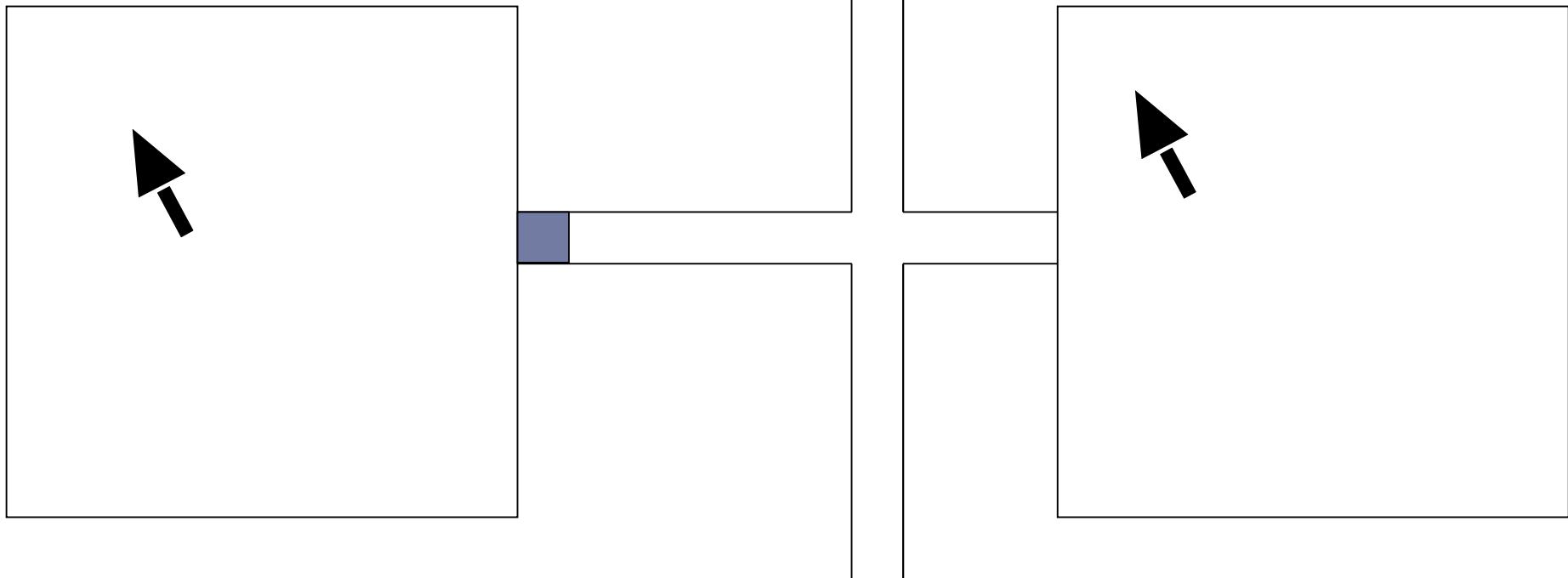
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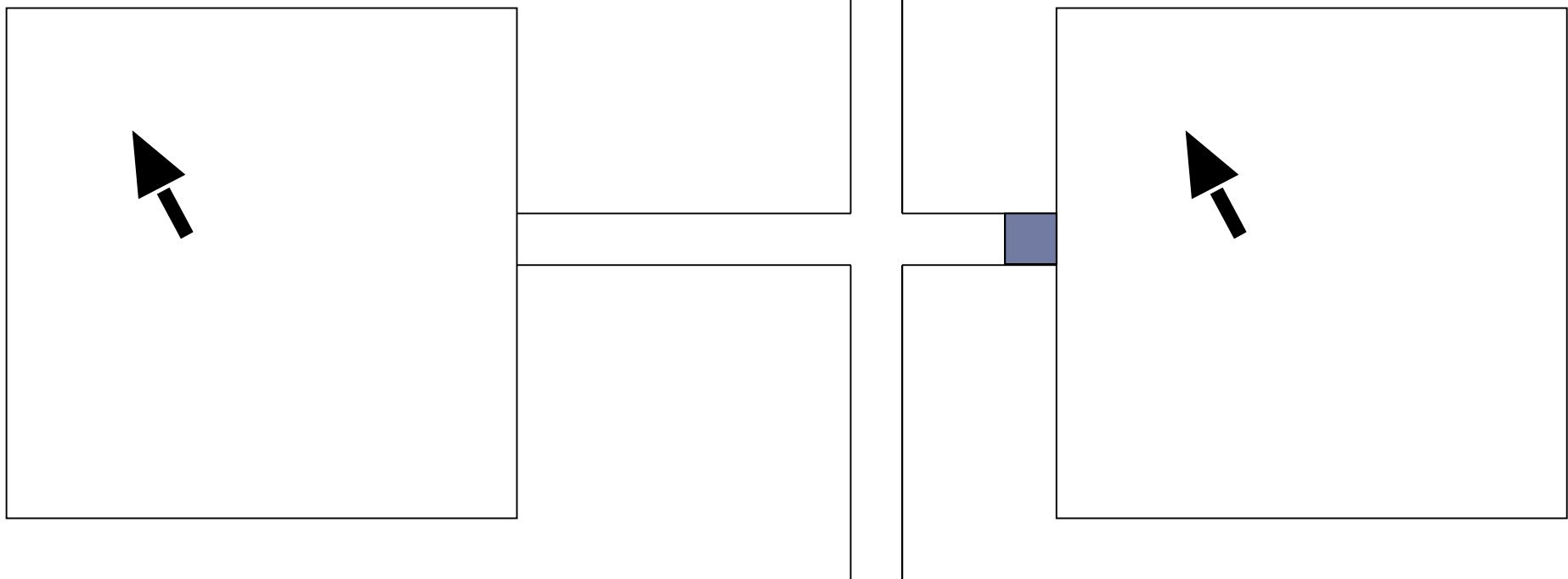
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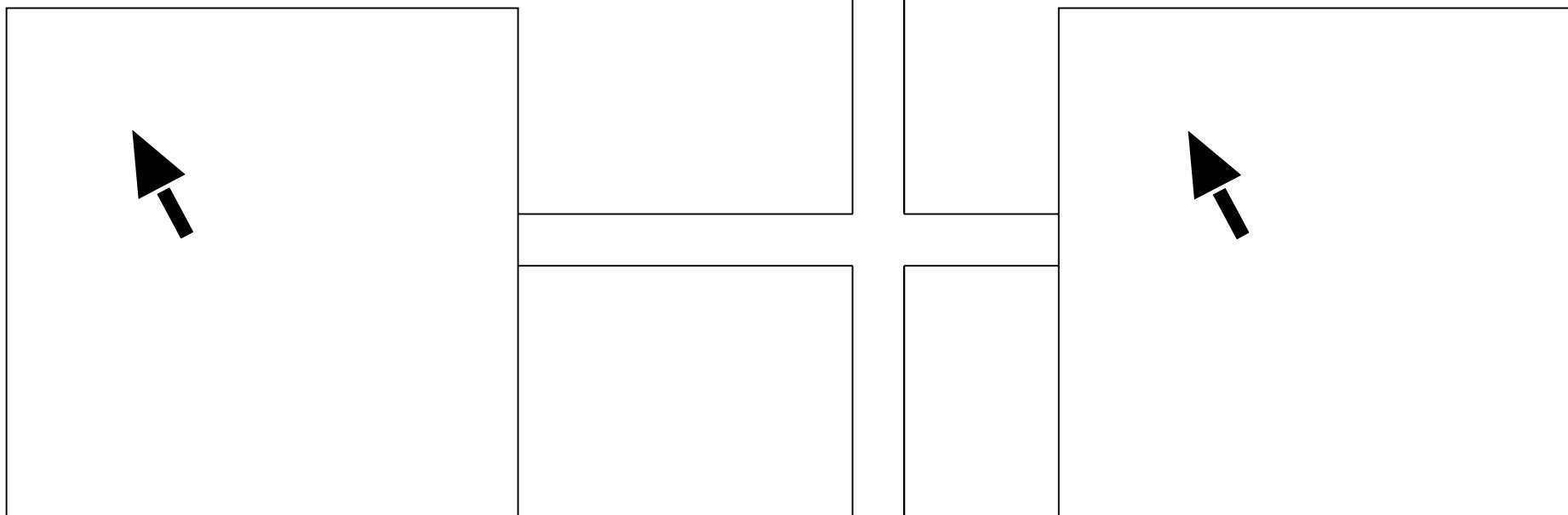
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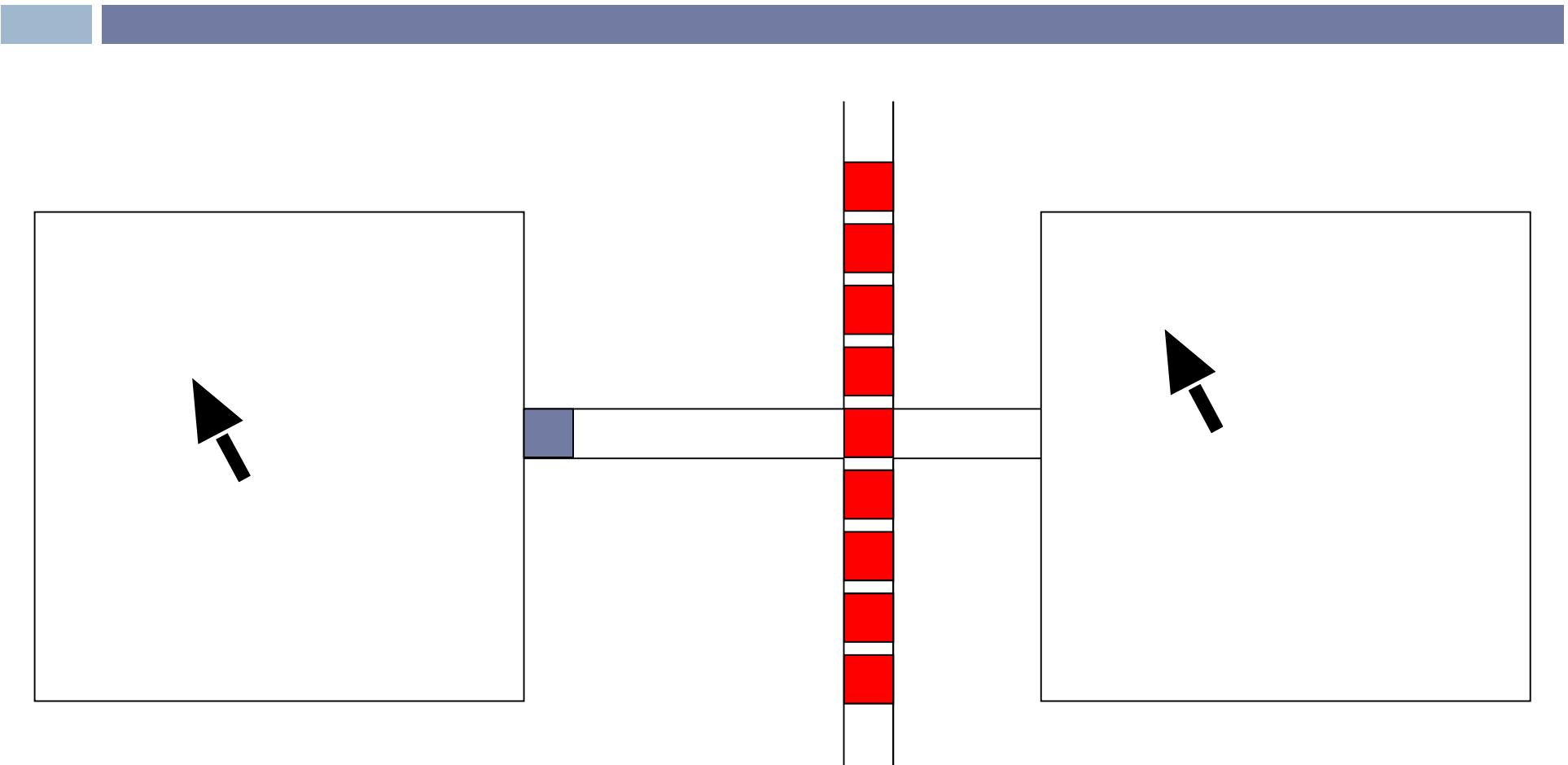
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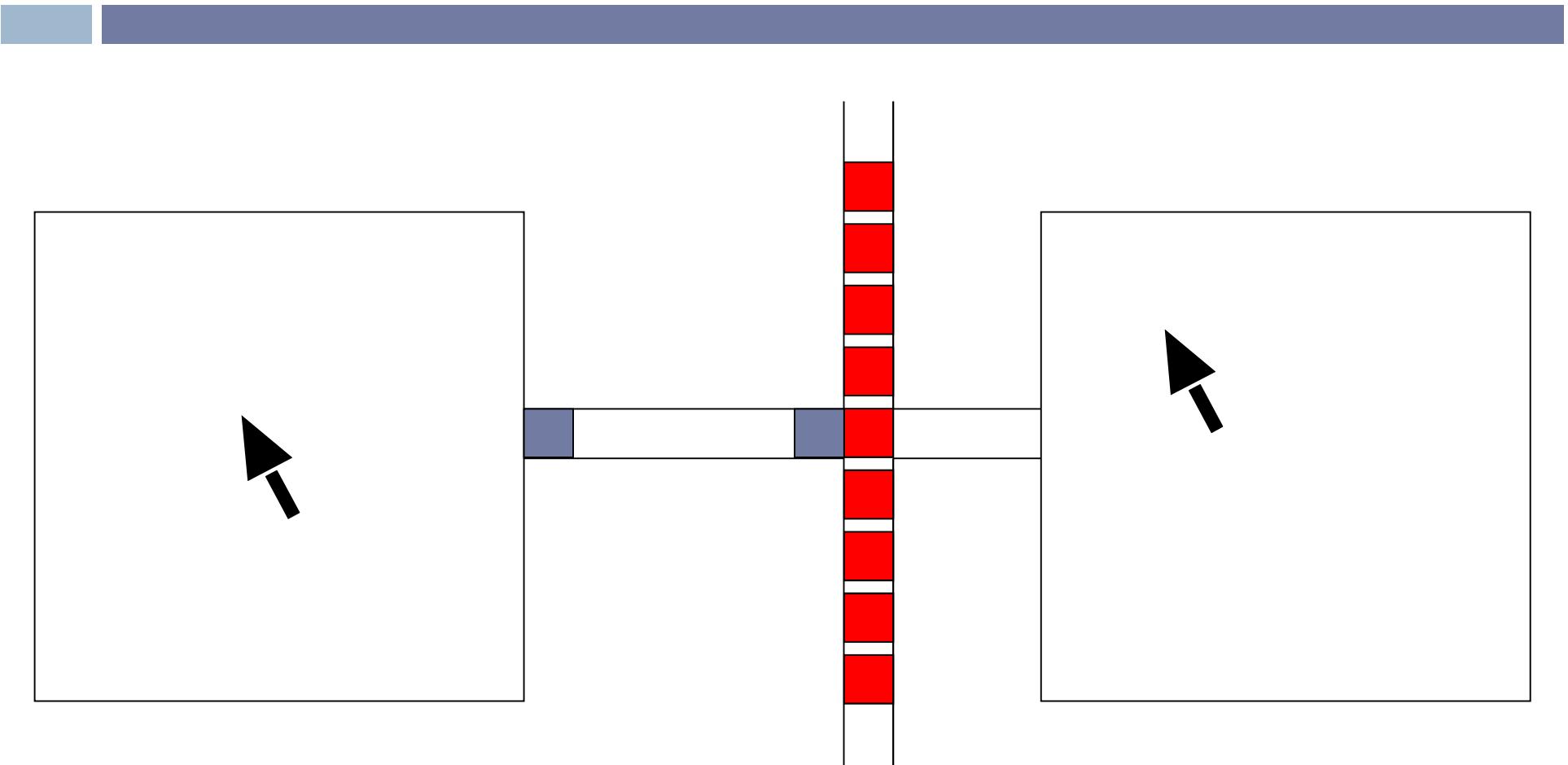
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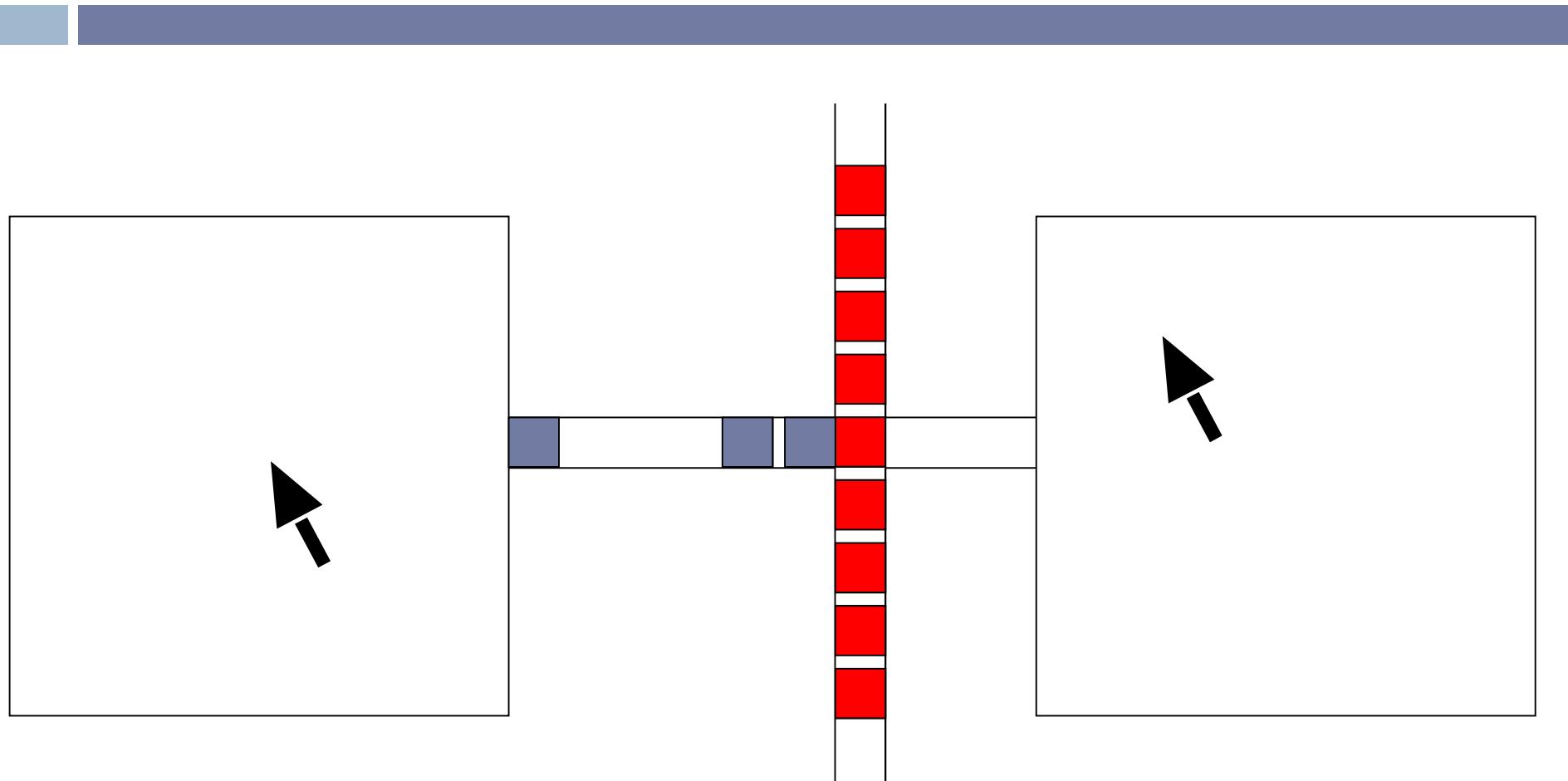
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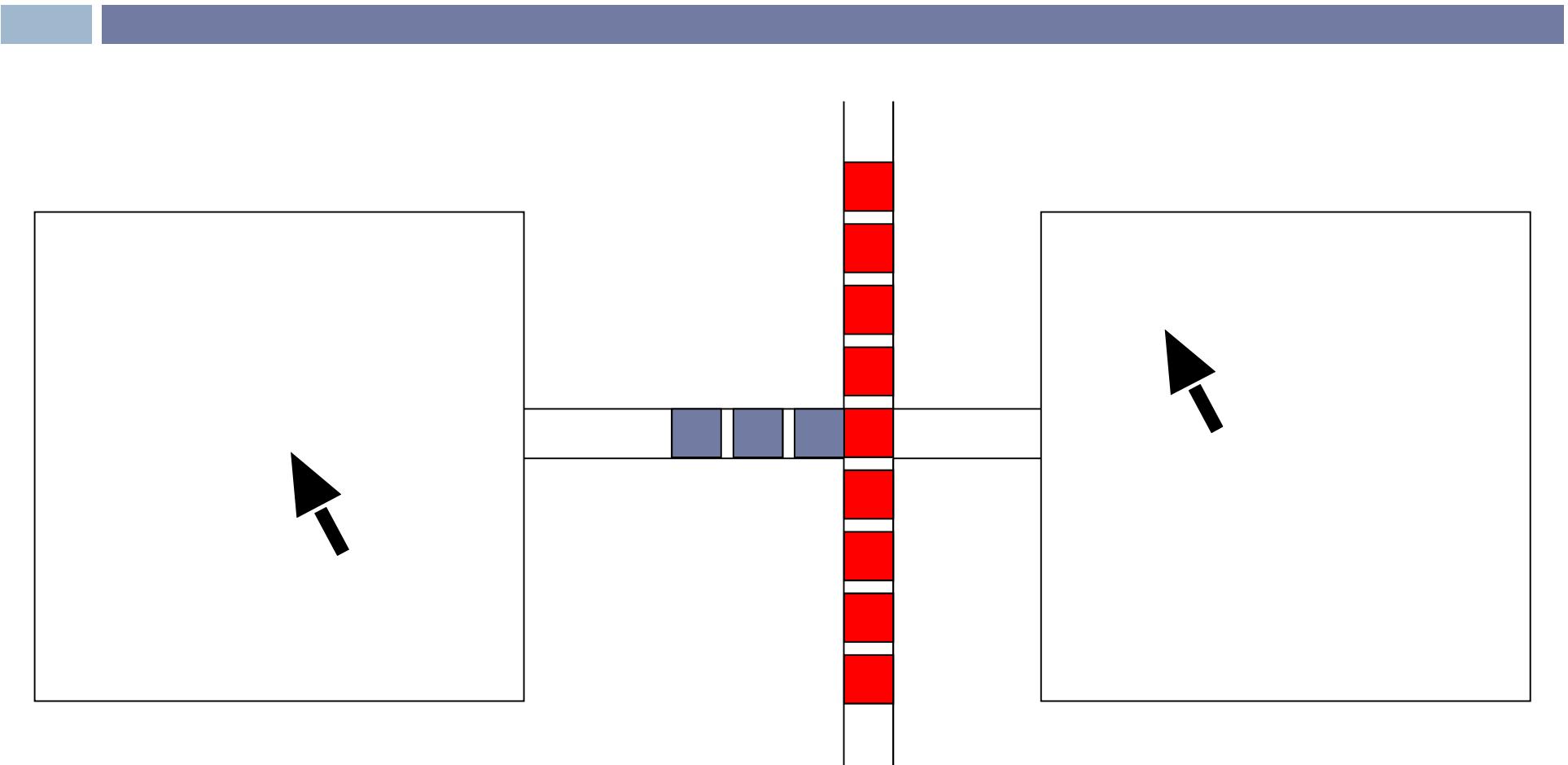
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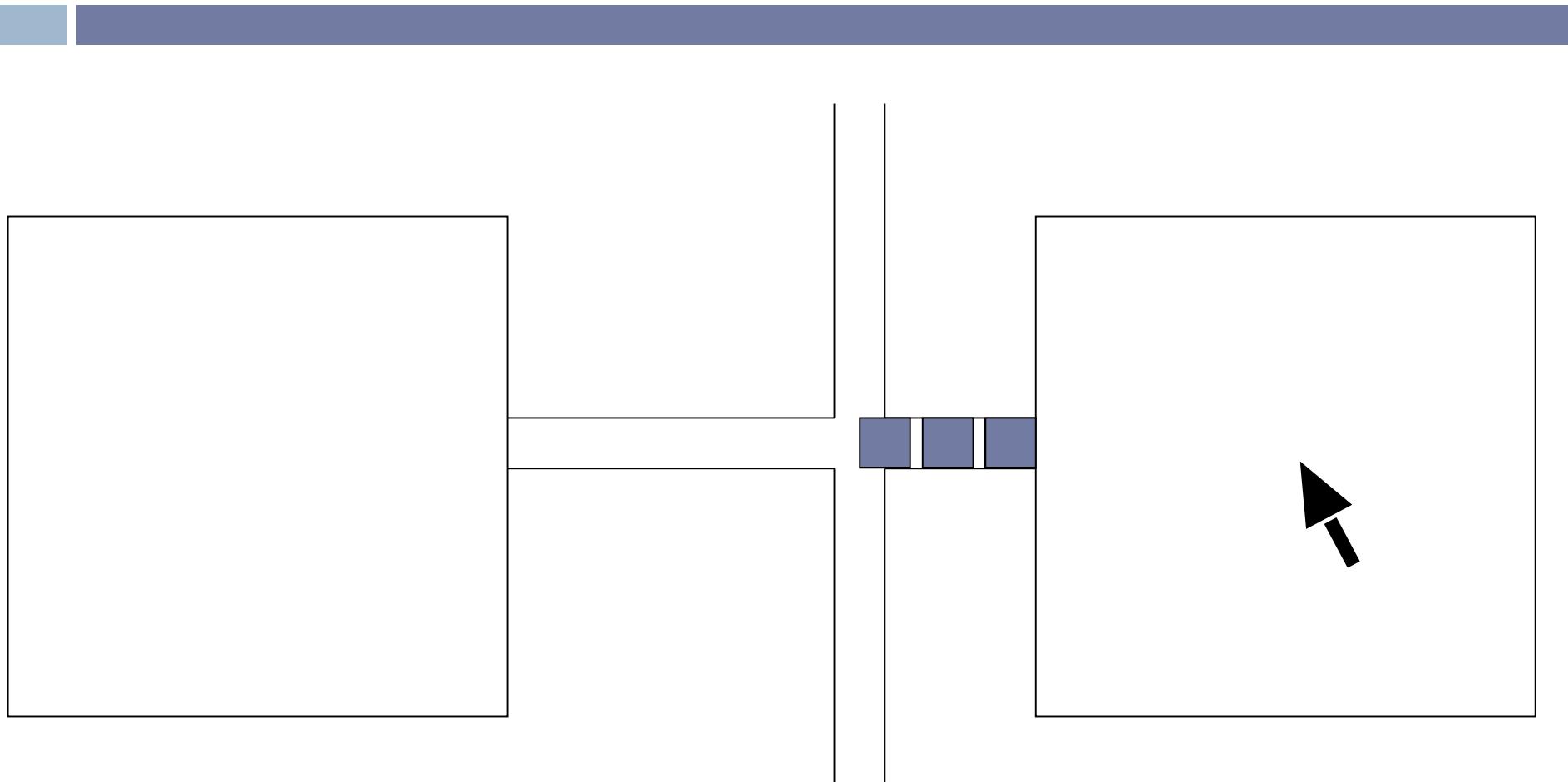
Jitter



Jitter

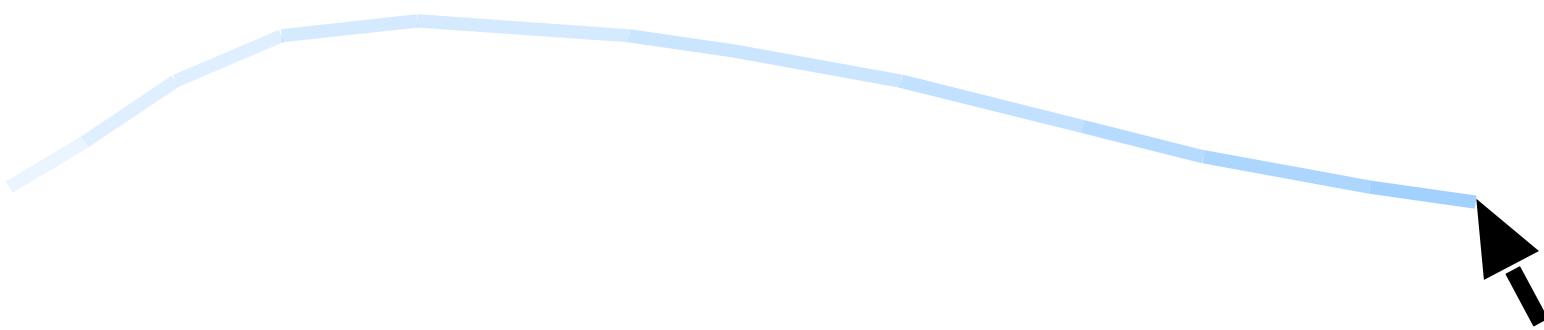


Jitter

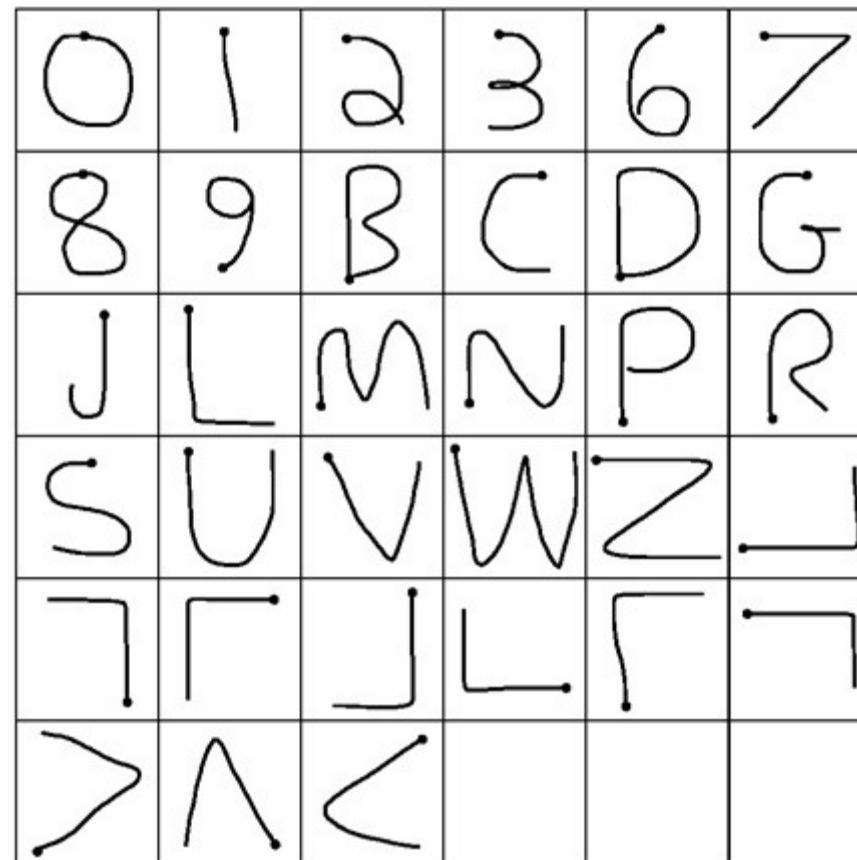




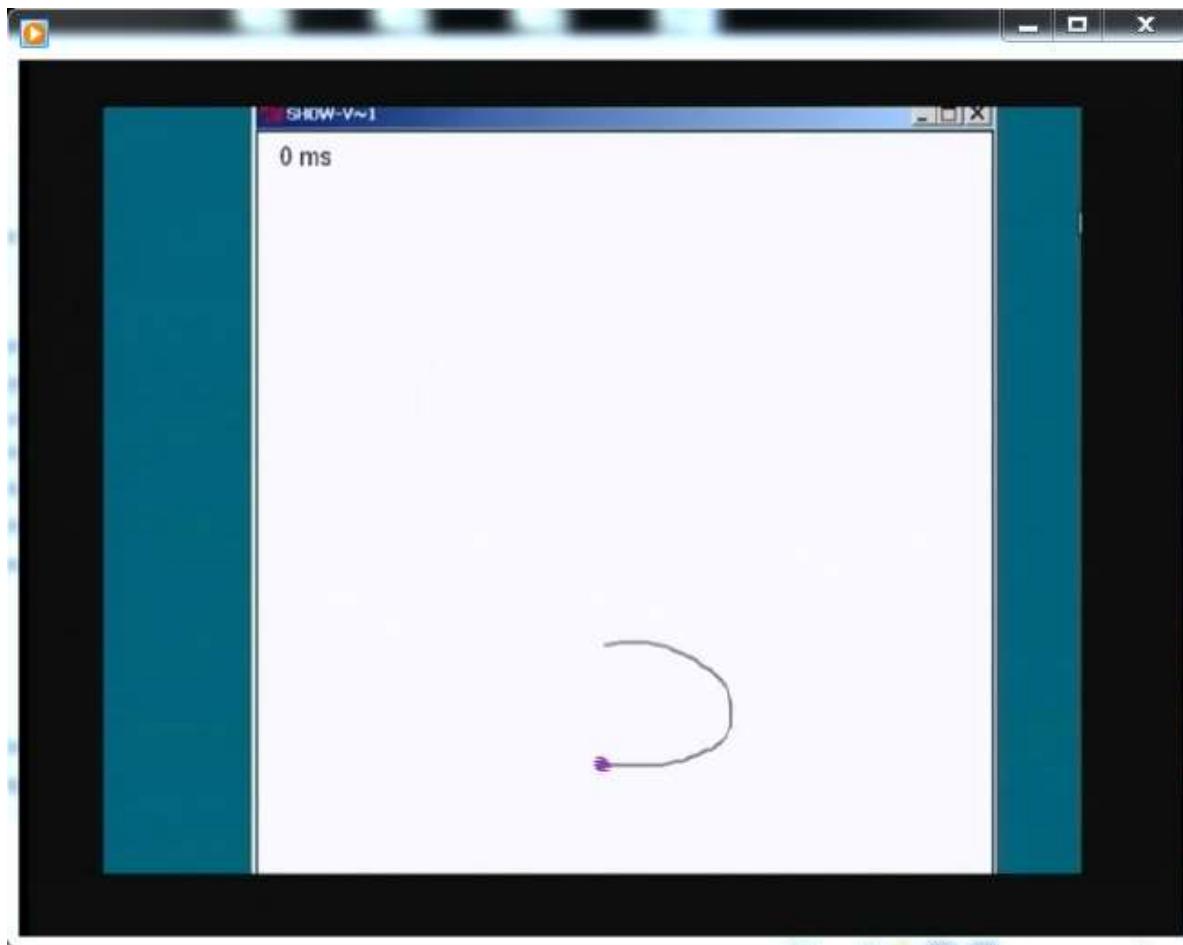
Carmine Infantino, *The Flash* (DC Comics), 1956-67



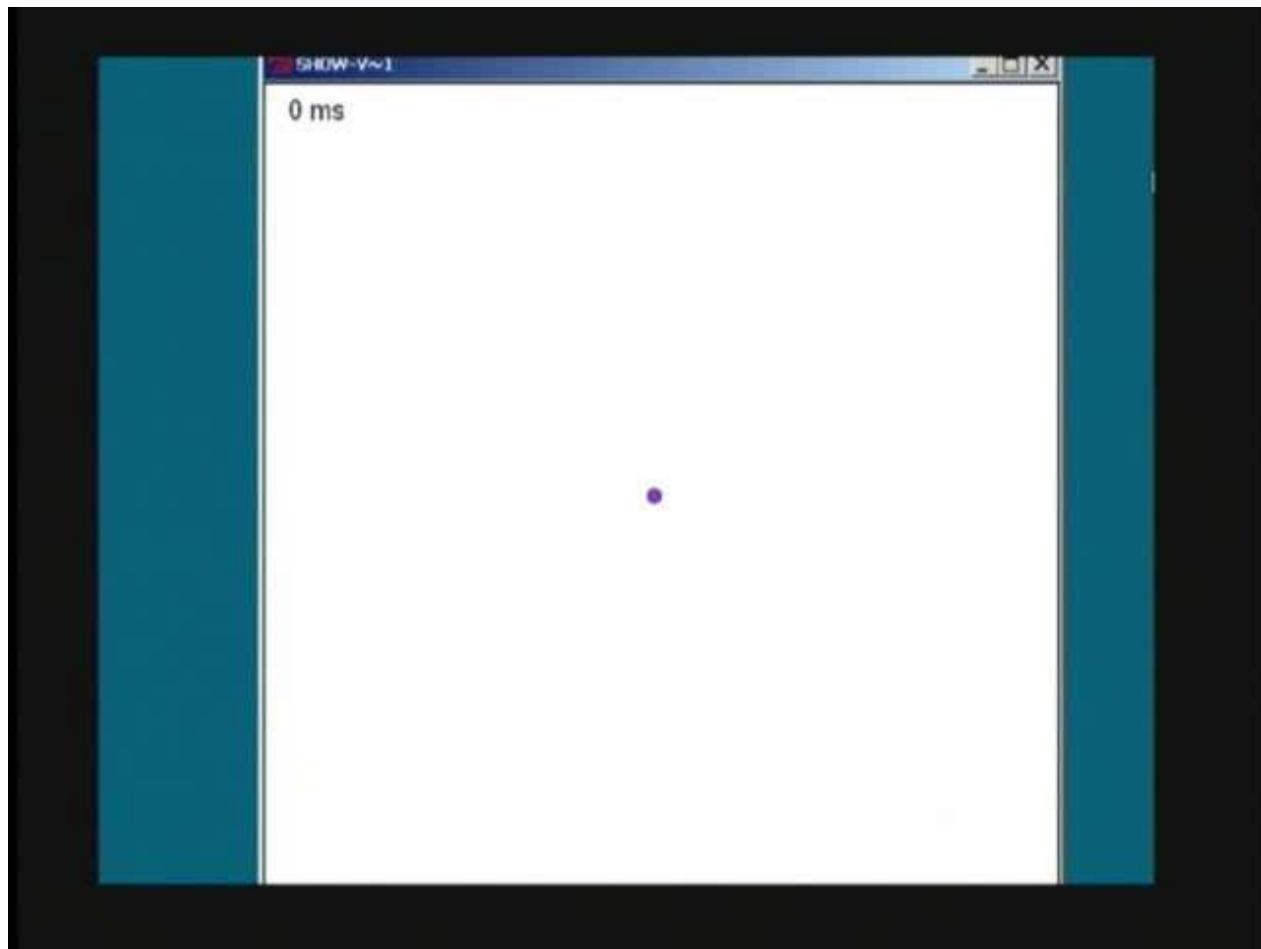
Recognition of shapes



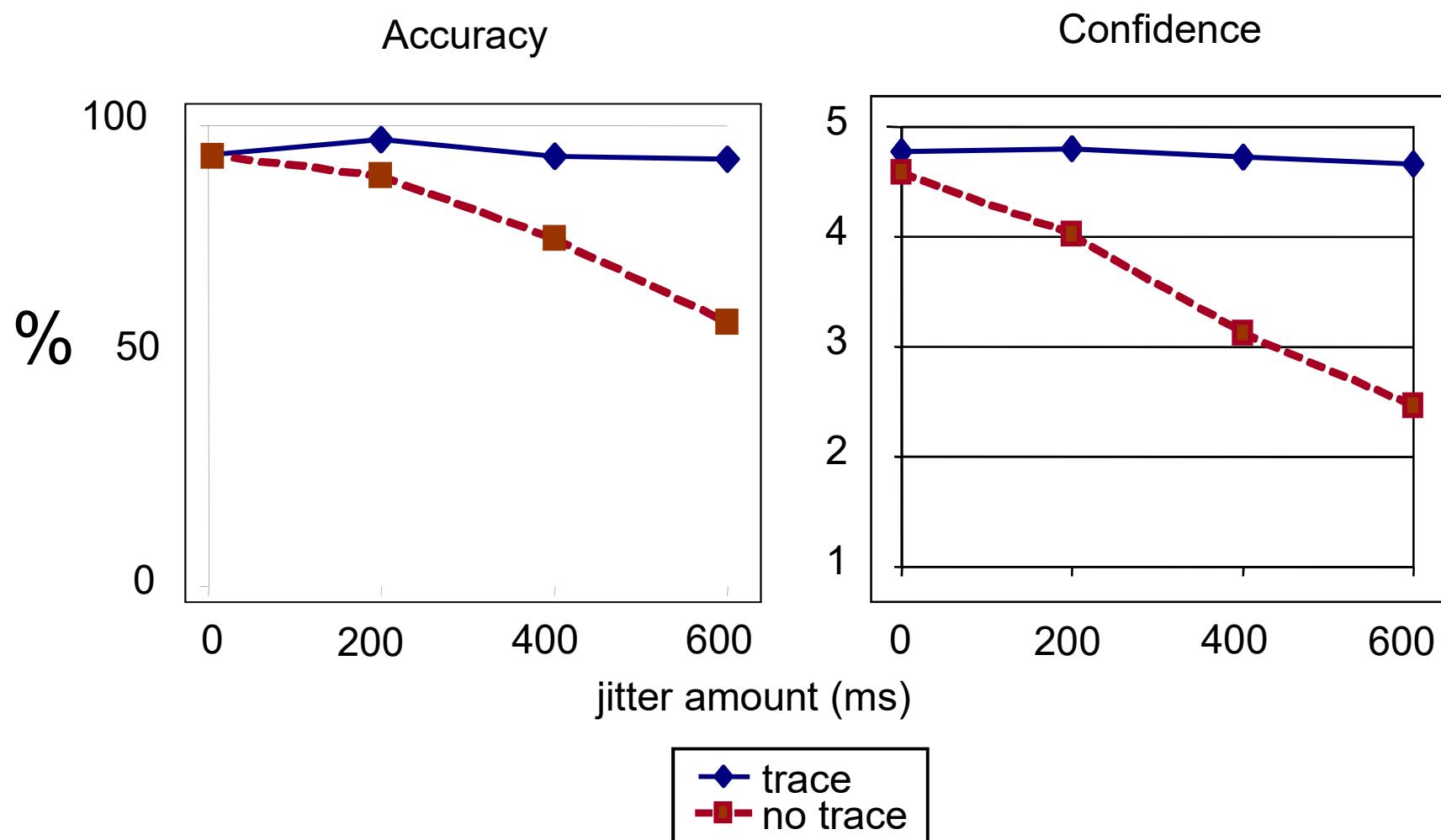
Recognition of shapes



Recognition of shapes



Gesture traces results



Examples

- Google Docs
- Cutouts
- RTChess
- LOL