Designing Interactive Systems 2

Lecture 1: Introduction, History, Design Space of Input Devices

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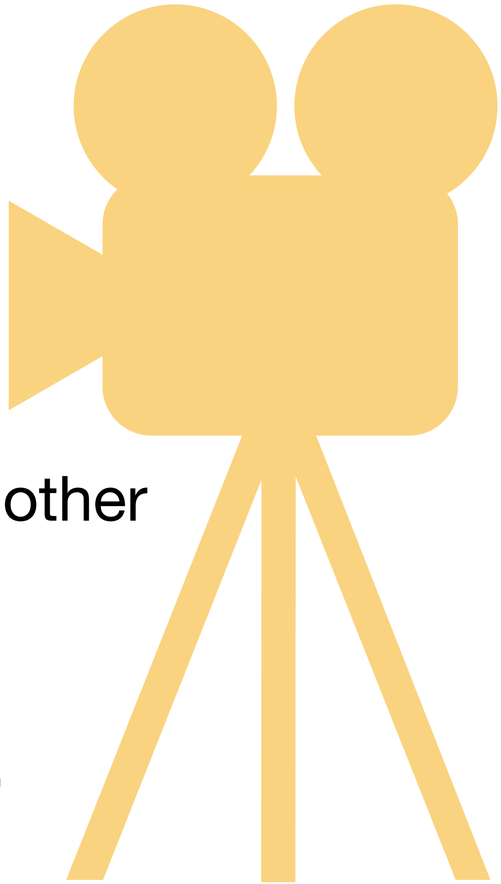
Media Computing Group
RWTH Aachen University

hci.rwth-aachen.de/dis2

RWTH AACHEN UNIVERSITY

Video Conferencing Etiquette

- We would like to have an interactive class
  - Please **turn on your video** so we can see each other
  - Your video will **not** be in the lecture recording
- Please **ask questions** (only your voice will be in the recording)
  - Use Zoom's **'Raise Hand' function** so we don't talk over each other
  - Otherwise, please **Mute** yourself to avoid echos
    (we may do this for you if you forget)
  - In Audio settings, turn on "press **Space** to temporarily unmute"
- Turn on your **lights** so you don't look like a zombie :)



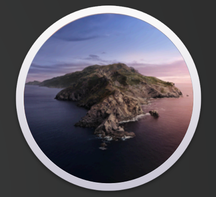
Class Syllabus

- Part 1
  Key Concepts

- Part 2
  Usage and Design of UI Toolkits and Design Systems

- Part 3
  UIs Beyond the Desktop

- Part 4
  Prototyping Process



Administrivia

- Format: V3/Ü2
- 6 Credit points
- Class times
  - **Lecture** on Wednesdays (9:30 — 12:00), Room 2222
  - **Lab** on Mondays (14:30 — 16:00), Room 2222

Zoom Meetings until further notice!

Team

**Prof. Dr.
Jan Borchers**

**Sebastian
Hueber**

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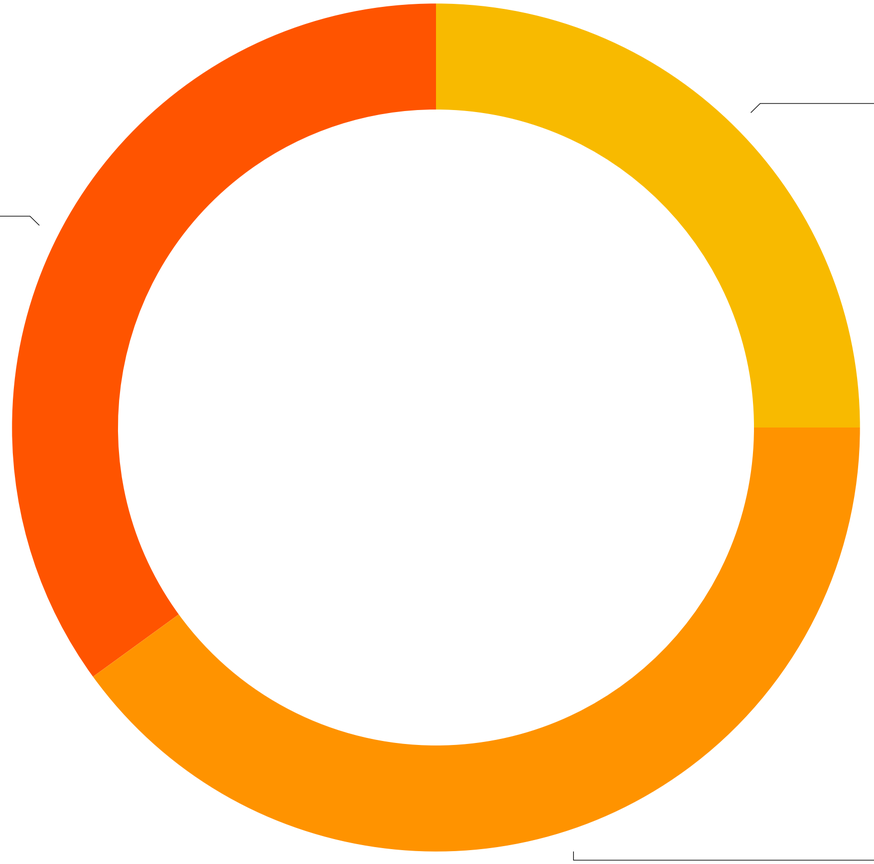
E-Mail Subject: [DIS 2]

Your Final Grade



25%
Midterm Exam (60 min)
June, 9th

35%
Final Exam (60 min)
July, 22nd
or August, 15th

40%
Weekly Assignments

Weekly Assignments

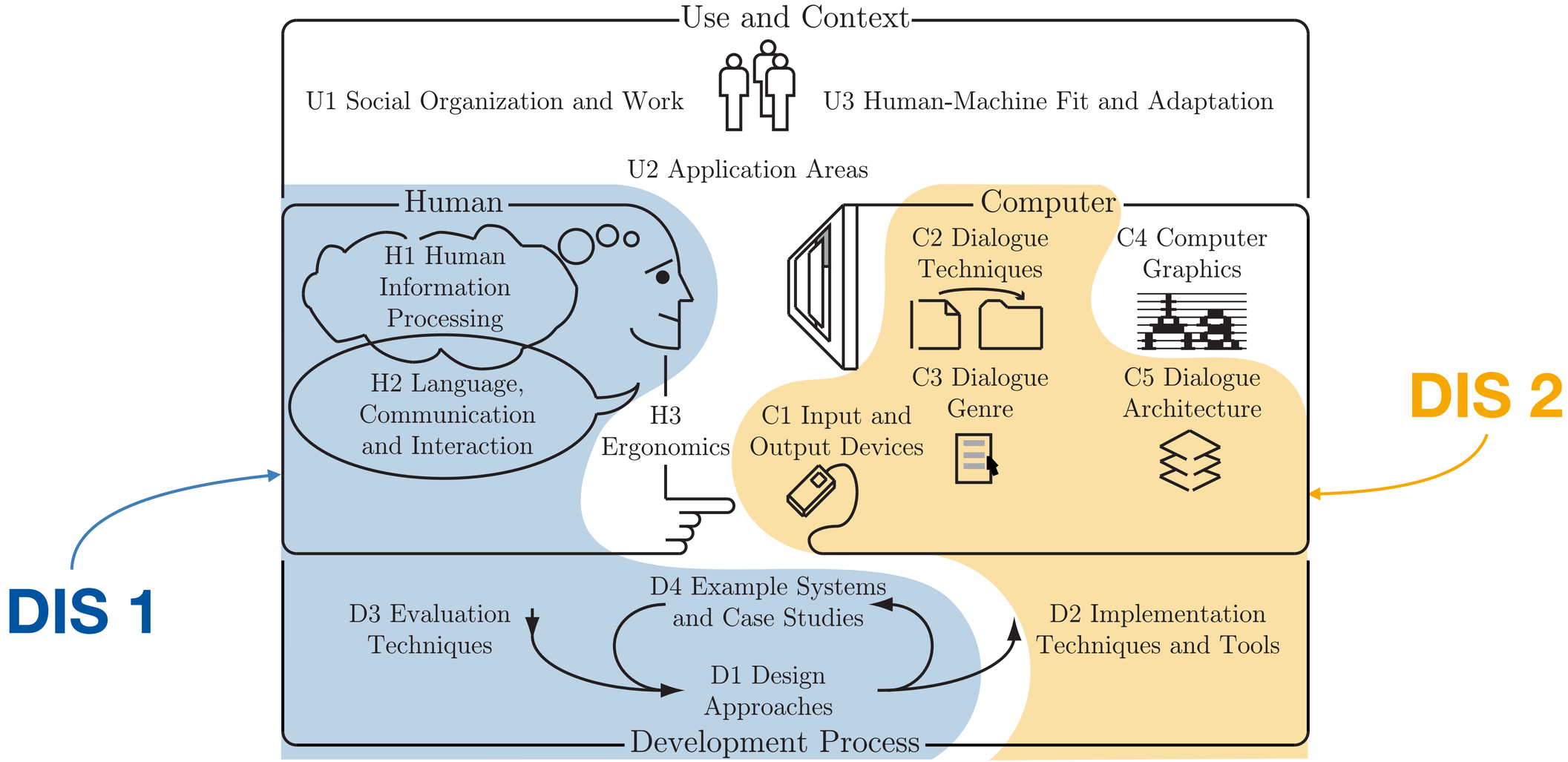
- We have a strict grading policy:
  - **Late submissions** will be graded 5.0 without feedback
  - **Team size** is 2 students (other only by permission). If you hand in a solution without a team partner: 5.0 without feedback
  - If your code does **not compile**: 5.0 without feedback
- For some assignments you will need a **Mac**
  - No Mac? Visit http://www-rbi.informatik.rwth-aachen.de/Pool+Helpdesk/
- Submission via **Moodle**

Website

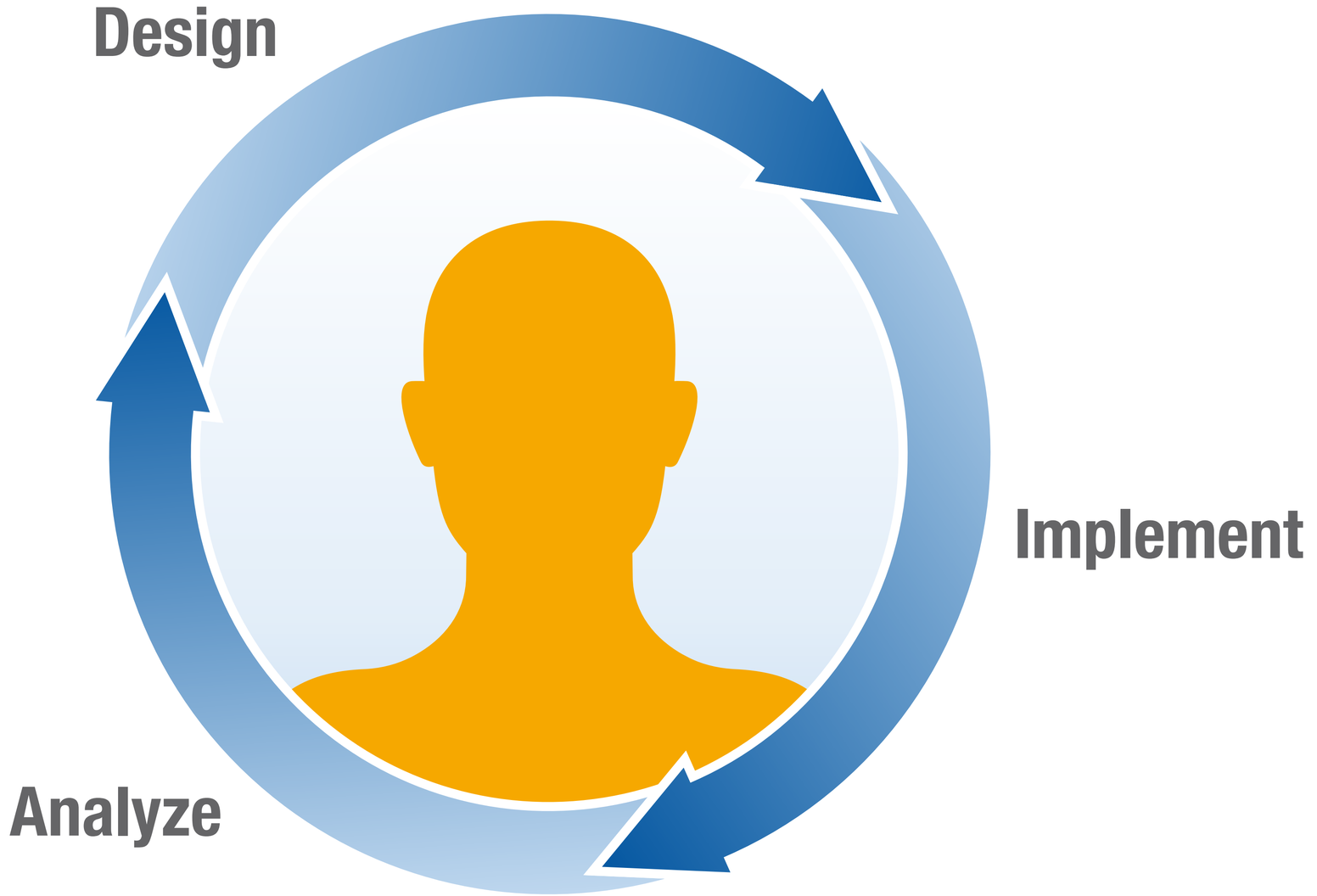
- All information about this course can be found online

- hci.rwth-aachen.de/dis2

How DIS1 and DIS2 Cover HCI



DIA Cycle

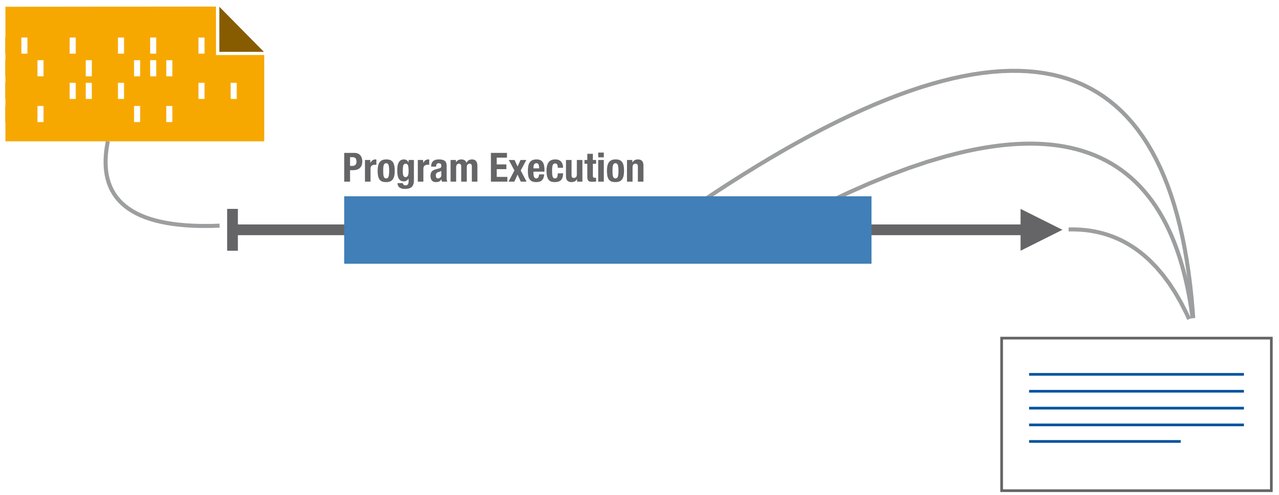


CHAPTER 1

History of User Interface Programming Paradigms

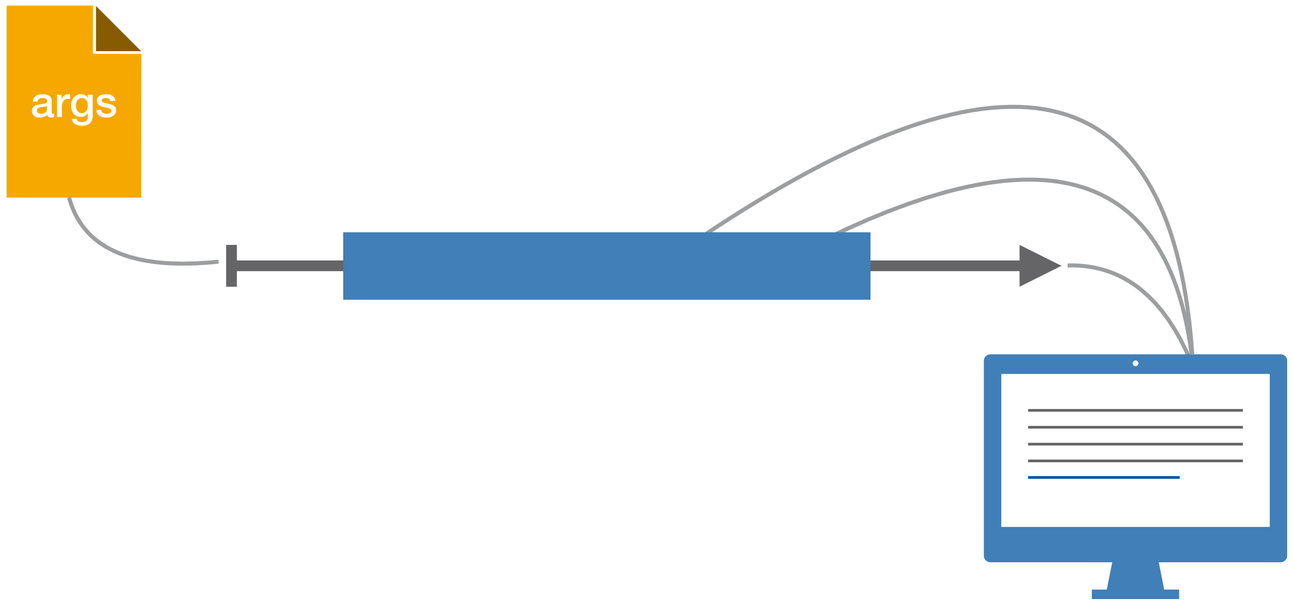
Batch Processing

- Prepare data on punch cards
- Wait for result as printout offline



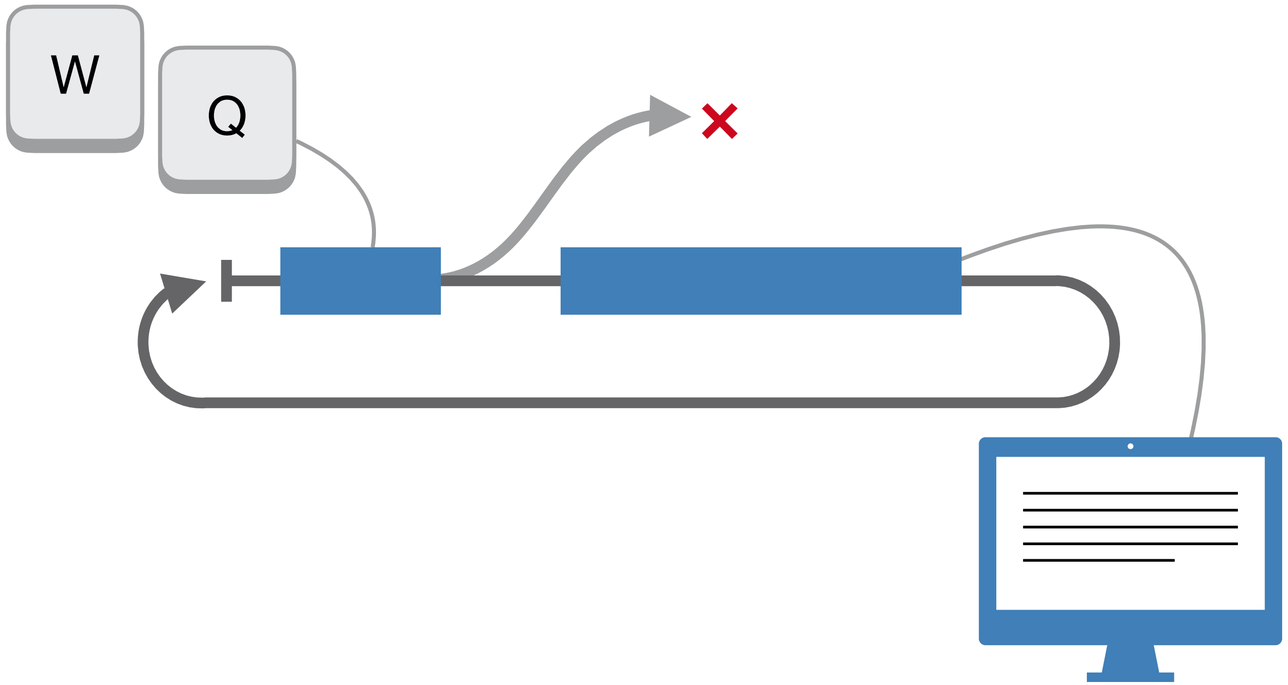
Time-sharing Systems

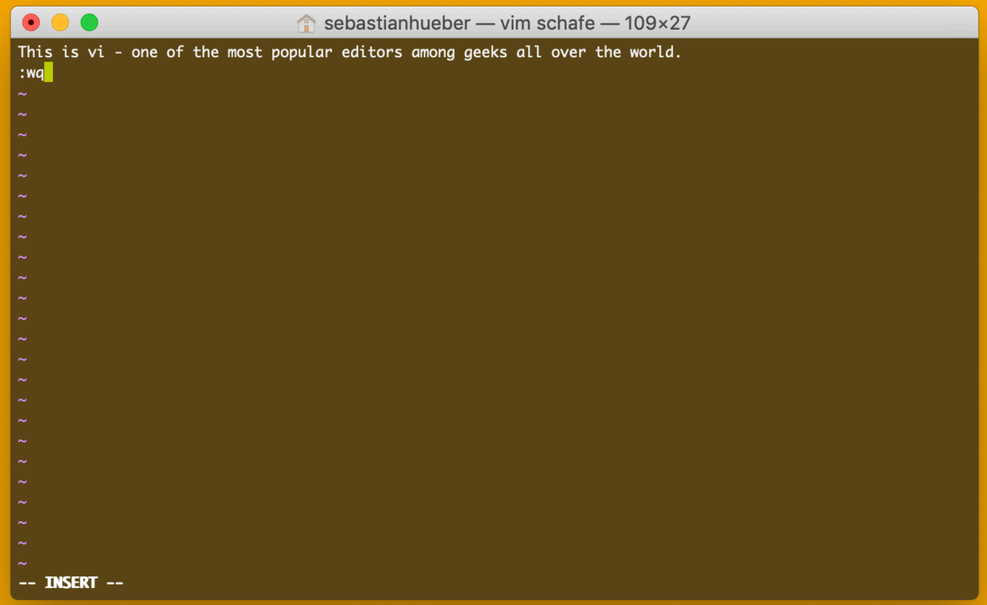
- Command-line based interaction
- Shorter turnaround (per-line)



Full-screen textual UIs

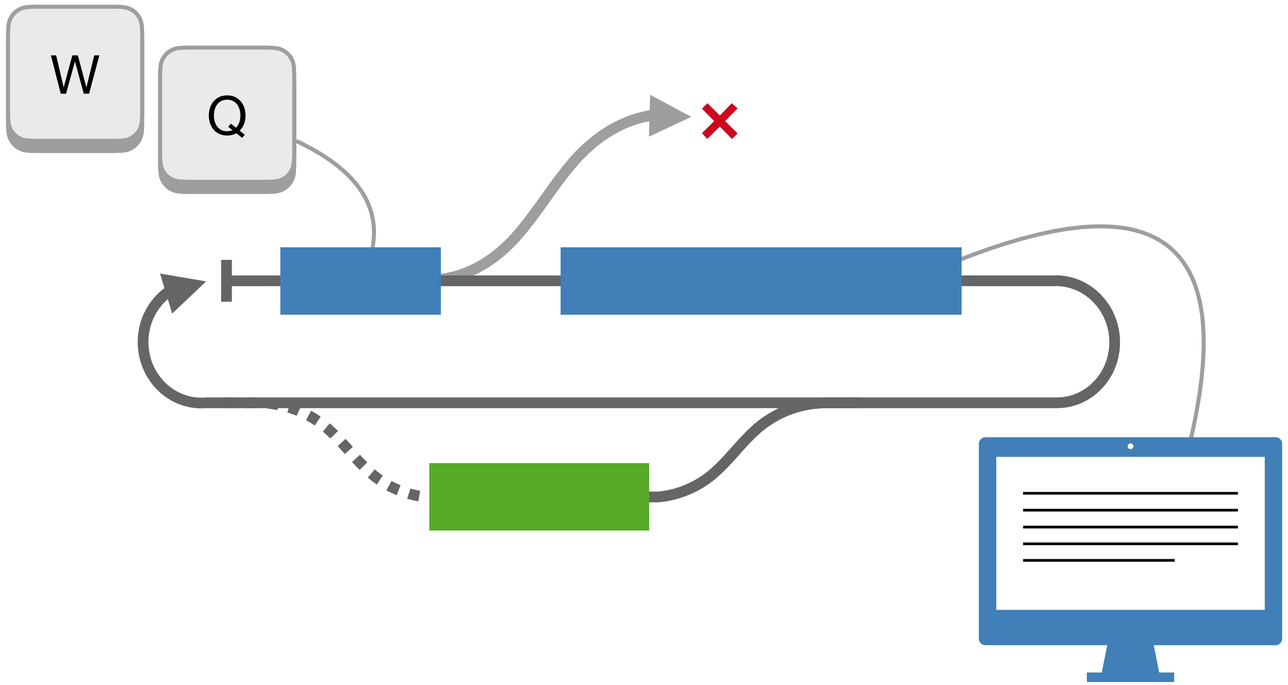
- Turnaround per character
- Interaction starts to feel “real-time”

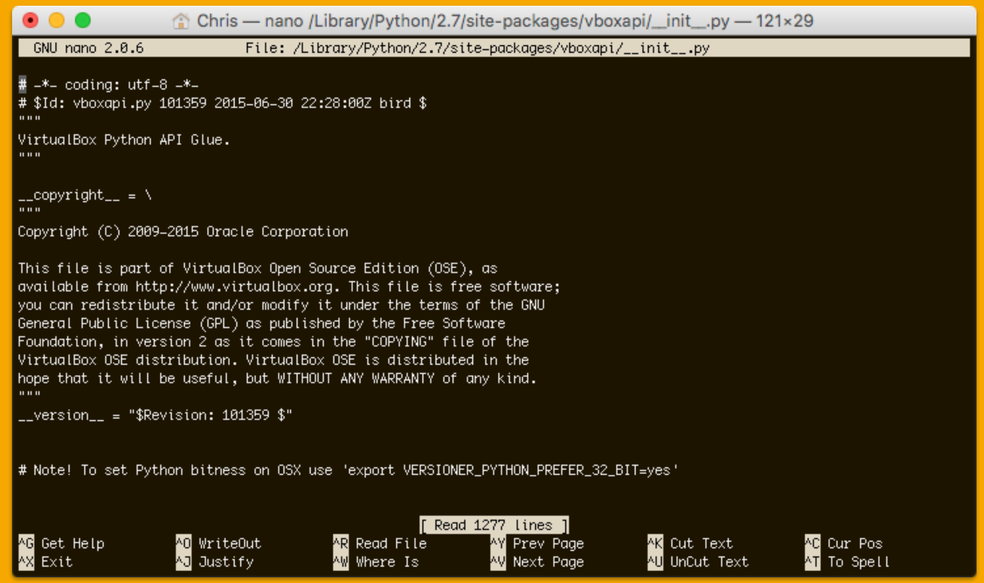




Menu-based Systems

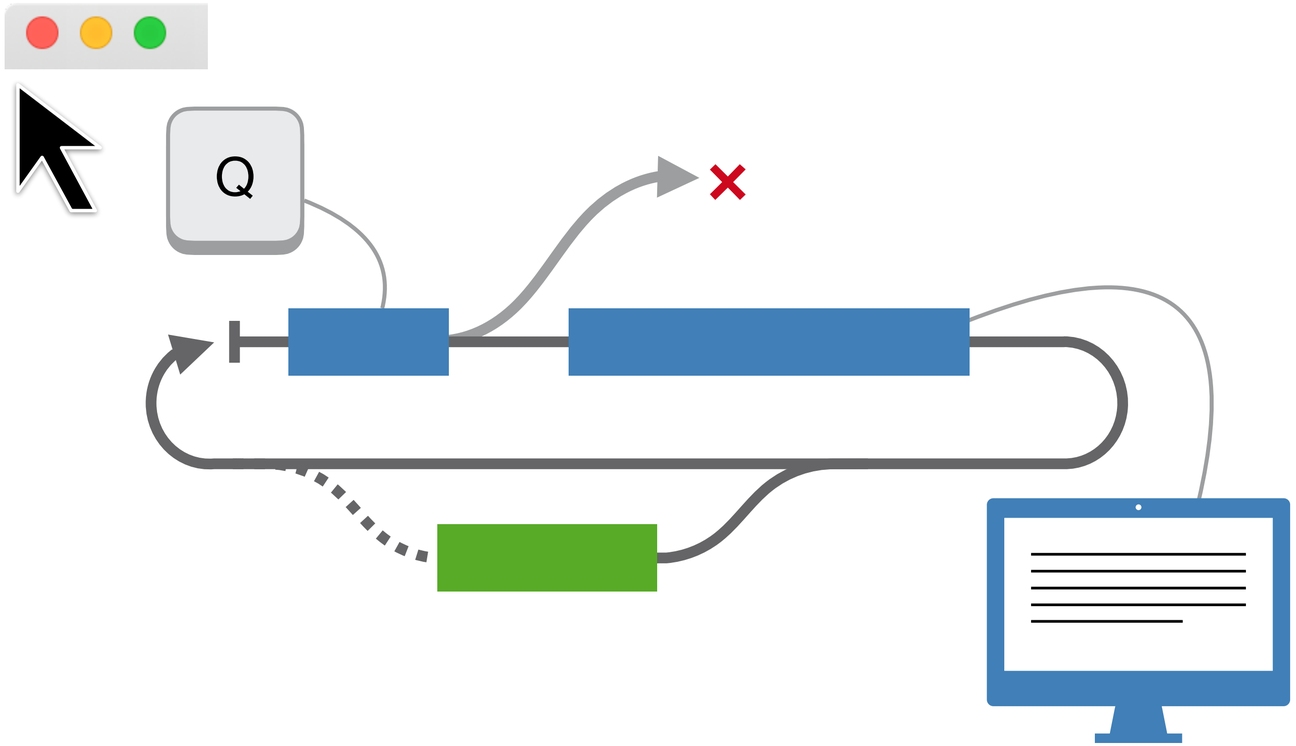
- Discover functionalities instead of memorizing them
- **Threading** becomes important





Graphical User Interface

- Event-based program structure
- Pointing devices in addition to keyboard

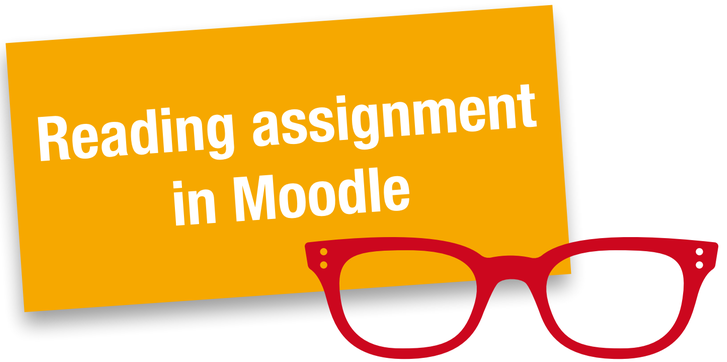


CHAPTER 2

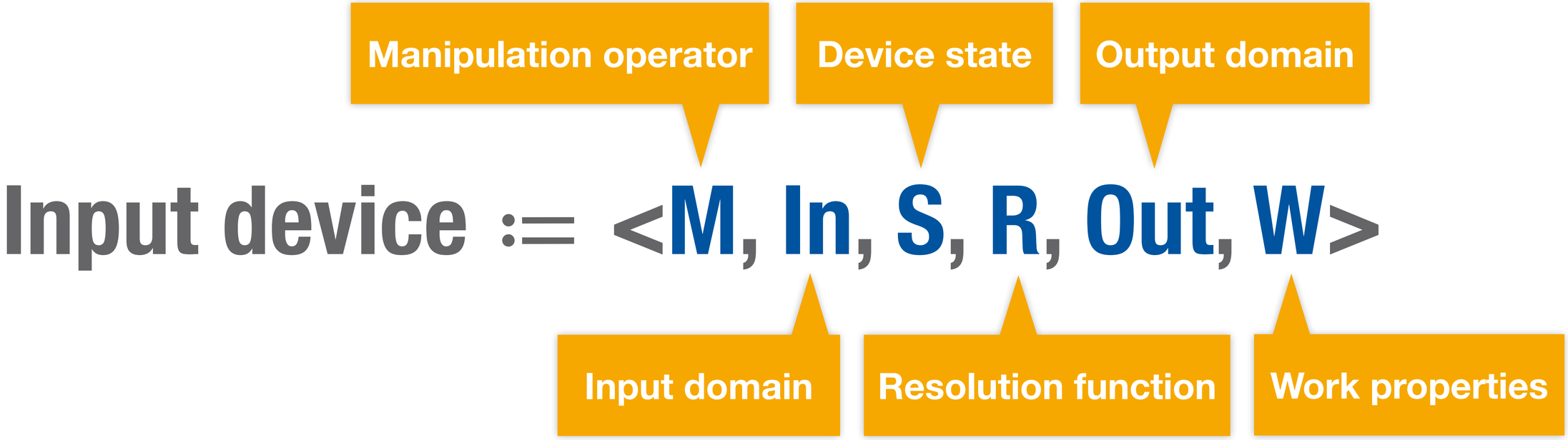
Design Space of Input Devices

Design Space of Input Devices

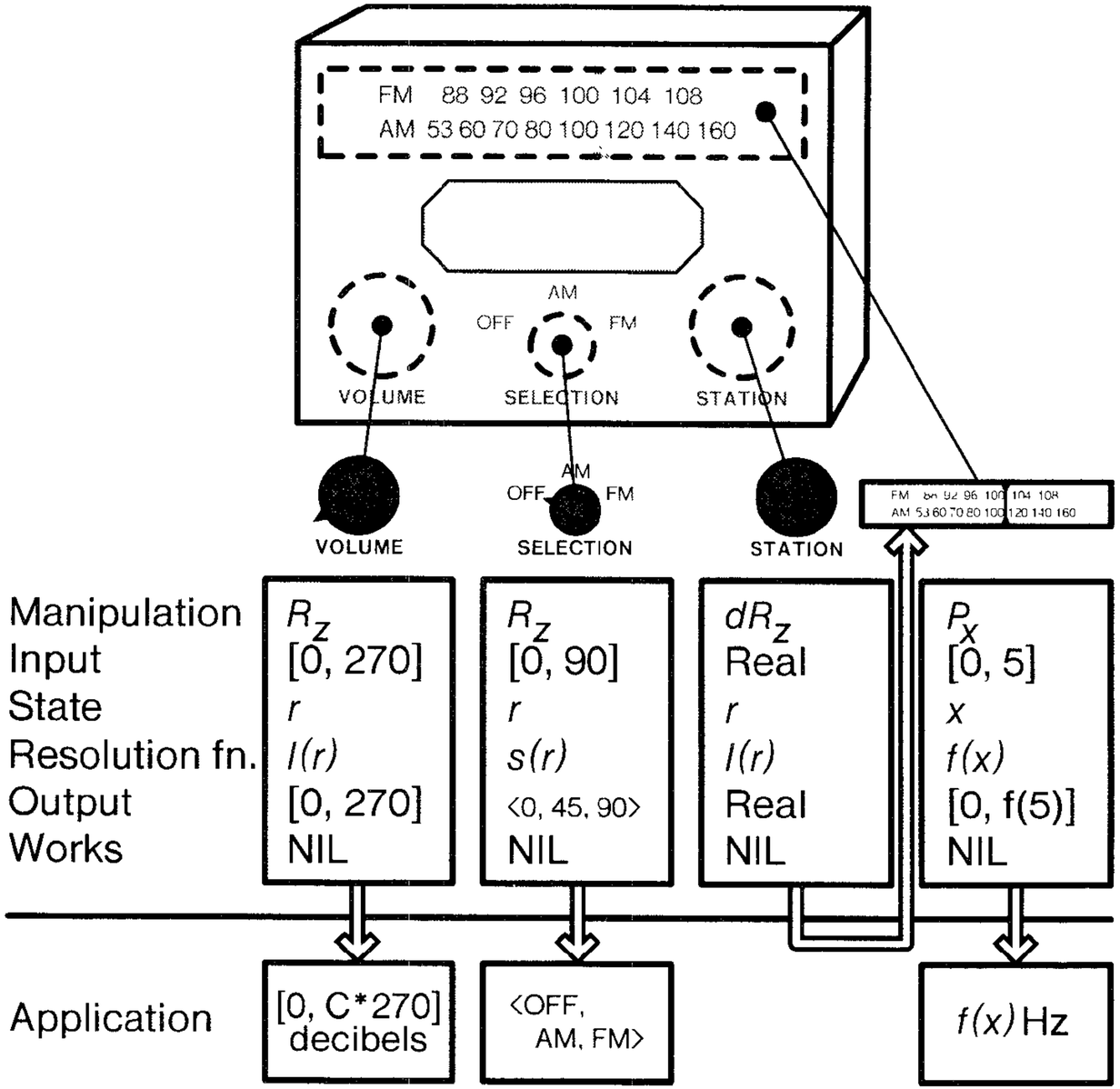
- Card, Mackinlay, Robertson 1991
- Categorization of input devices according to physical, mechanical and spatial properties
- **Why?**
  - Compare input devices
  - Identify new input modalities



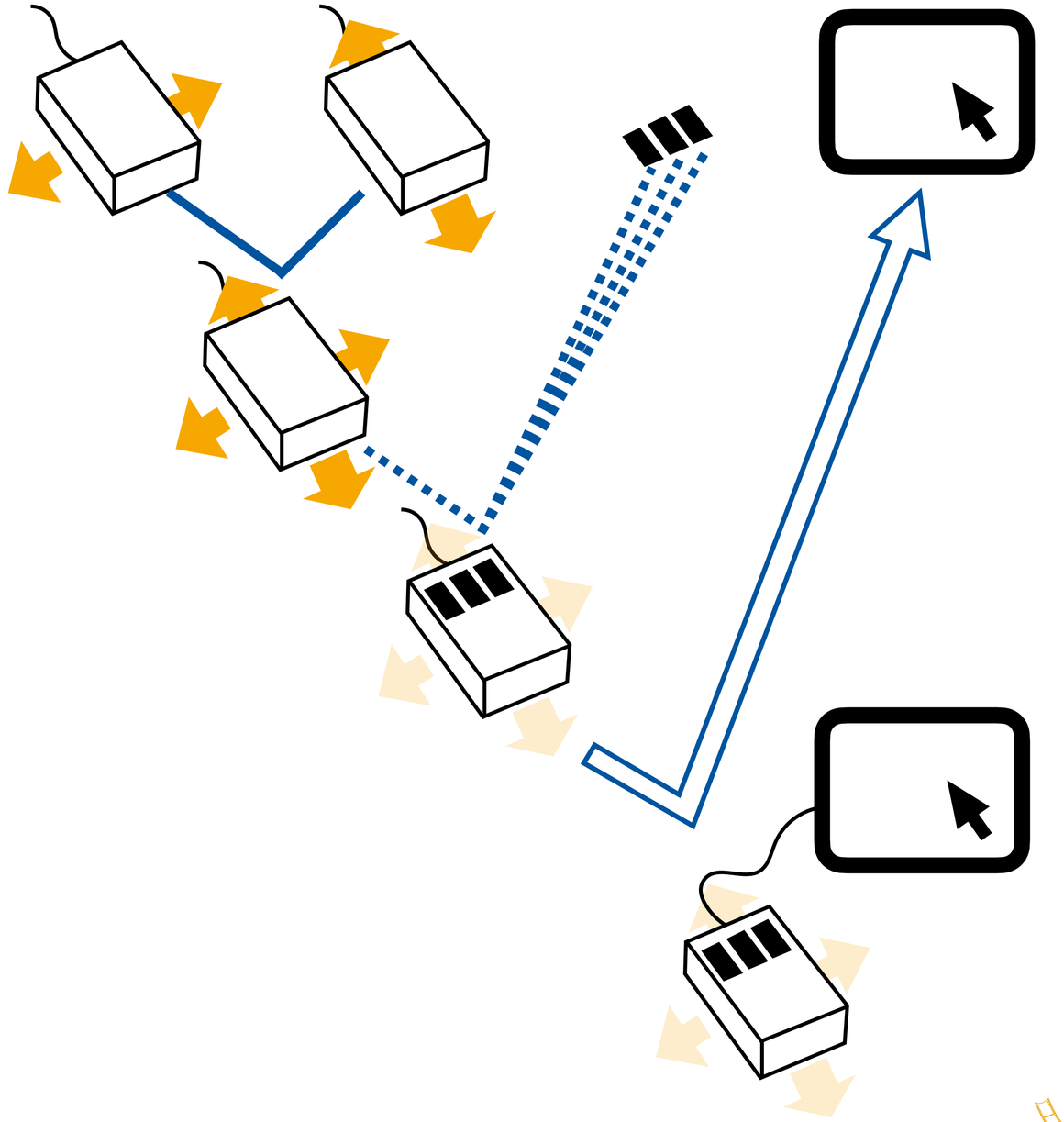
Movement Primitives



Example



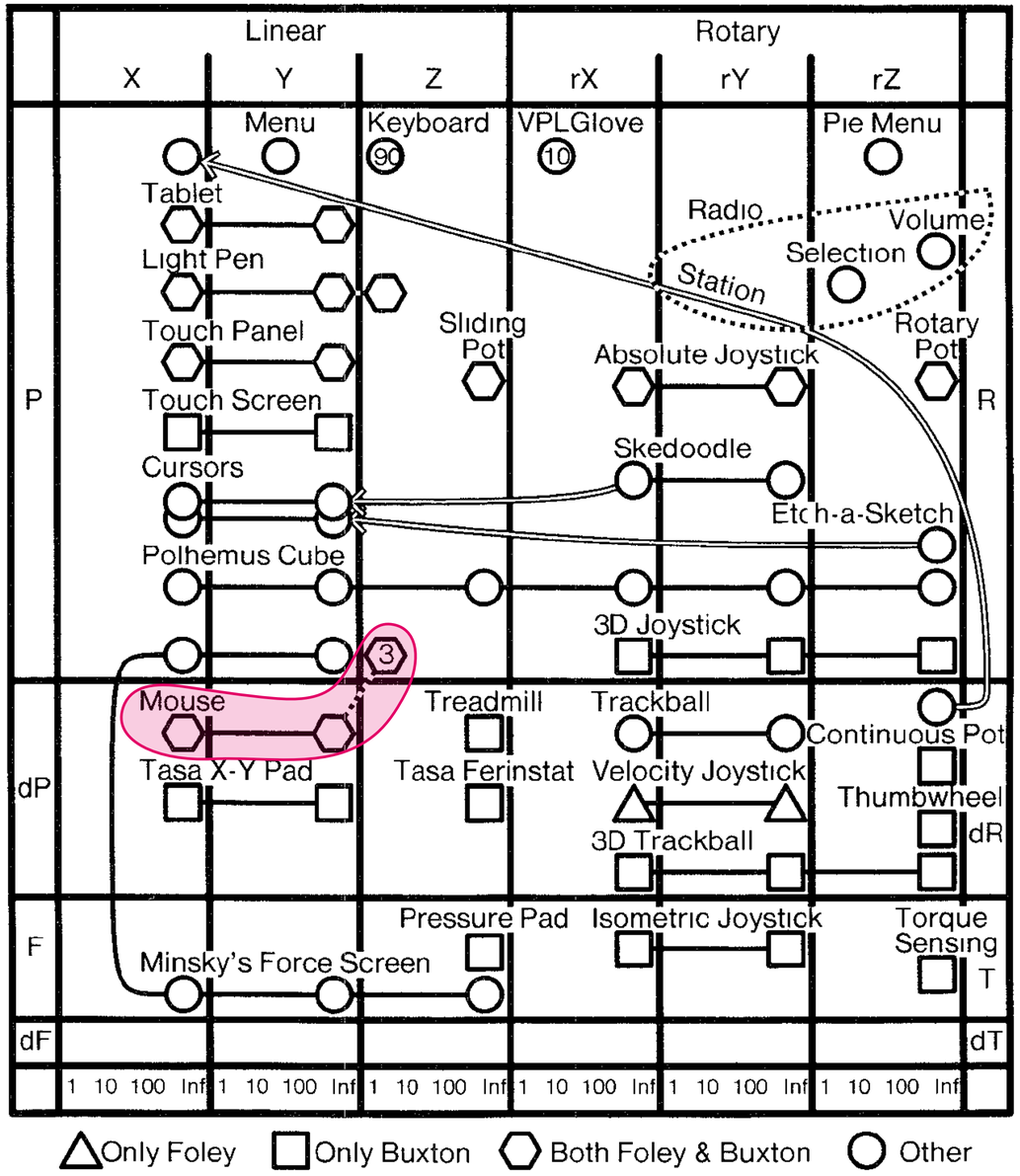
Compositions



Merge

Layout

Connect



In-Class Exercise

- Plot out the input capabilities of the Ferrari Racing Controller on the Card Design Space of Input Devices.

- The controller consists of a **steering wheel** with **8 buttons** and a **rotary switch** with 5 states, as well as **2 pedals**.

- Assume that the steering wheel can only have one full rotation.

In-Class Exercise

	Linear			Rotar			
	X	Y	Z	rX	rY	rZ	
P							R
dP							dR
F							T
dF							dT
	1 Inf	1 Inf	1 Inf	1 Inf	1 Inf	1 Inf	

8

2

1 switch with 5 states

8 buttons

2 pedals with an infinite number of states each

1 steering wheel with an infinite number of states

- - - Layout

Is This Space Complete?

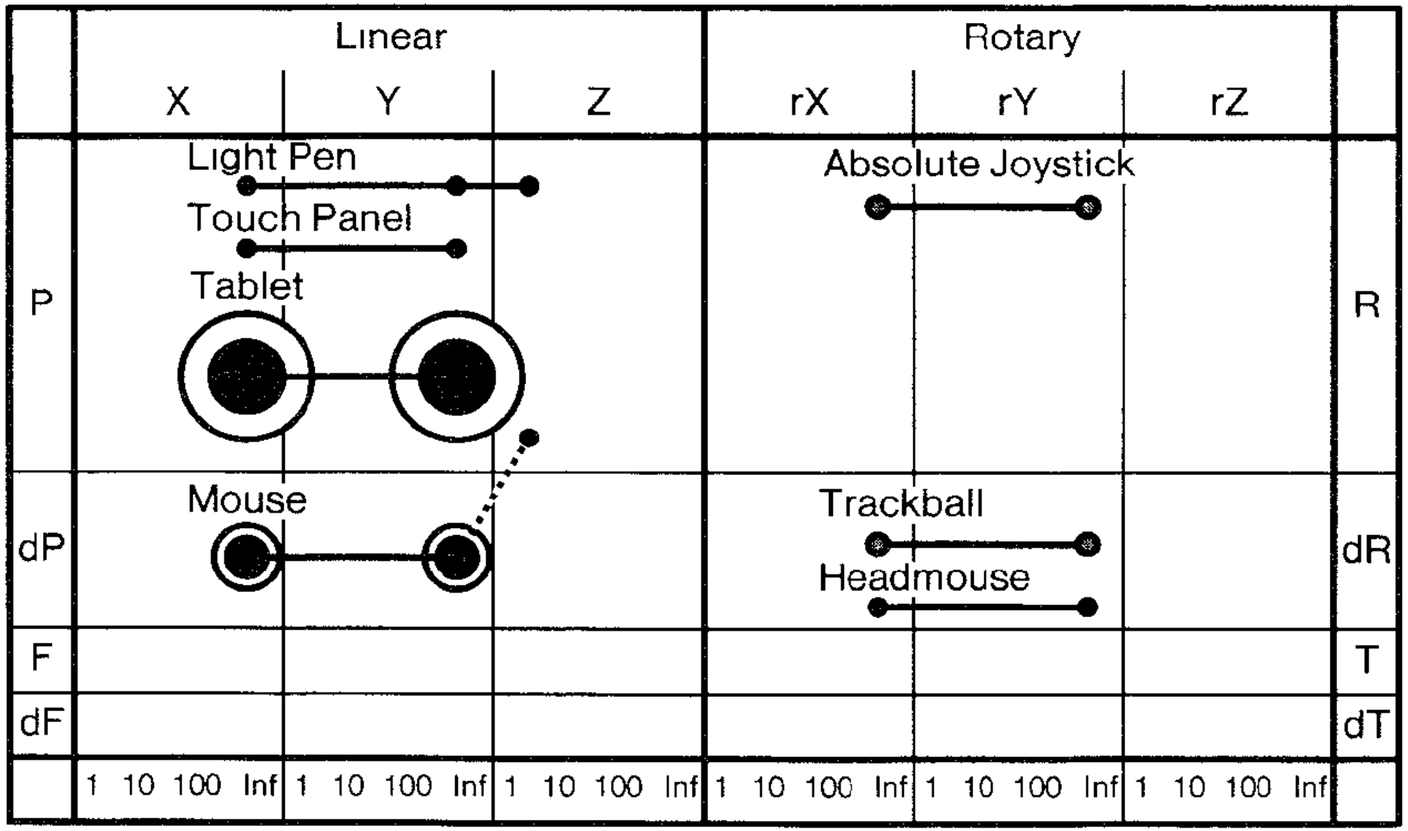
Testing Points

- **Expressiveness** describes how precisely the meaning is conveyed

- For input devices, expressiveness suffers if $|In| \neq |Out|$
  - $|In| < |Out|$: Cannot specify all legal values
  - $|In| > |Out|$: Can specify illegal values

Testing Points

- **Effectiveness** describes how well the intention can be communicated



CHAPTER 3

Window System Architecture

Window Systems: Basic Tasks

- **Input handling**
  Pass user input to appropriate application

- **Output handling**
  Visualize application output in windows

- **Window management**
  Manage and provide user controls for windows

Window Systems: Requirements

- **Independent** of hardware and operating system
- No noticeable **delays** (few ms) for basic operations,
  e.g. moving window, redrawing cursor
- **Customizable** look&feel for user preferences
- Input & Output in **parallel**
- **Multimedia** support: Graphics, audio, …
- Support for various **input devices** and modalities

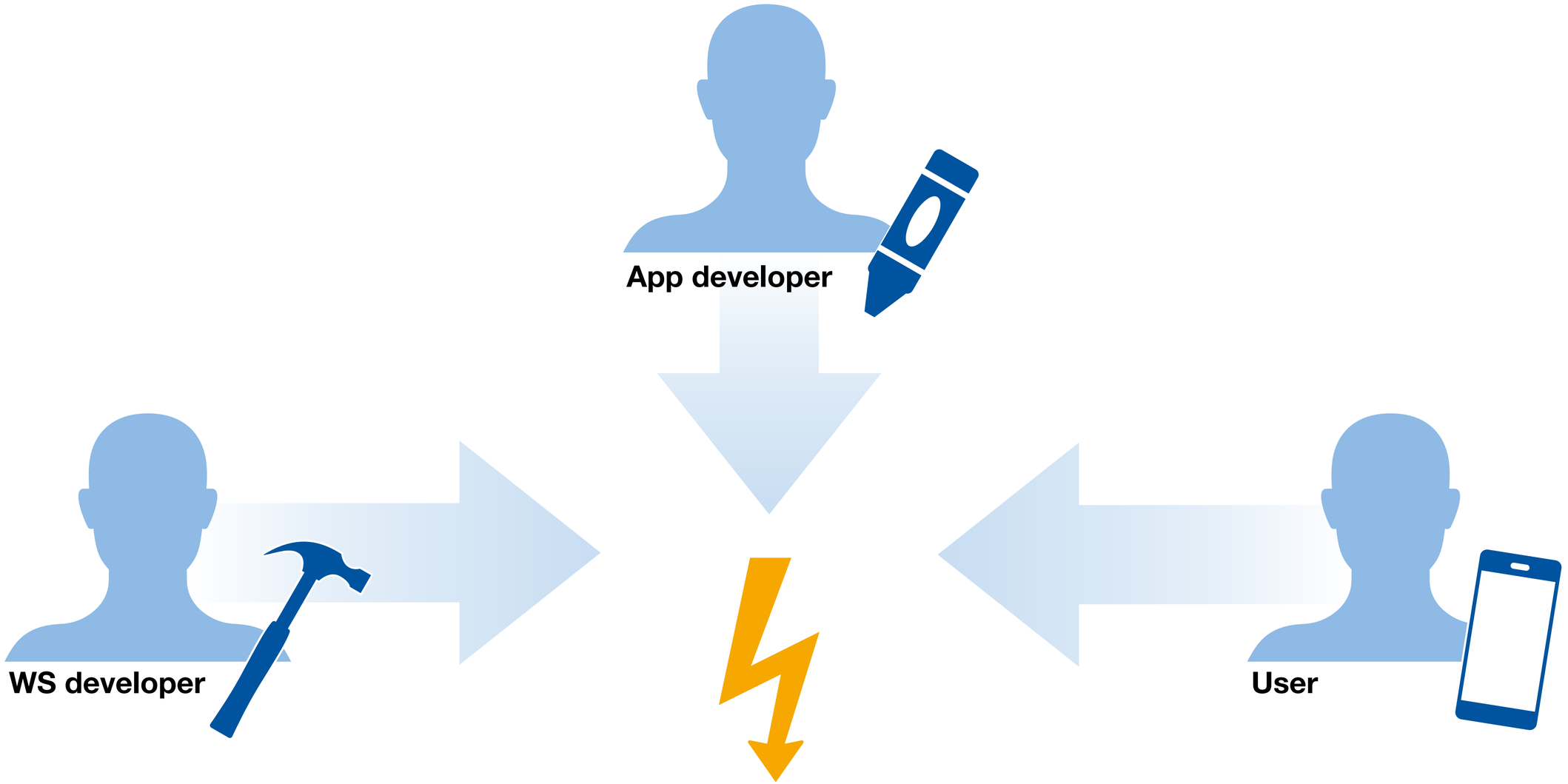
Window Systems: Evaluation Criteria

- **Availability**
  Platforms supported
- **Productivity**
  For application development
- **Parallelism**
  External and internal
- **Performance**
  Usage of resources and latency
- **Graphics model**
  RasterOp vs. vector
- **Appearance**
  Look & Feel, exchangeable?

Window Systems: Evaluation Criteria

- **Extensibility**
  In source code or at runtime
- **Adaptability**
  Localization and customization at runtime
- **Resource sharing**
  E.g., fonts
- **Distribution**
  Over network
- **API**
  Structure and comfort
- **Independence**
  Of application and interaction logic inside programs written for the WS
- **Inter-Application Communication**
  Copy & Paste, Drag & Drop

Window Systems: Conflict



Window System Architecture