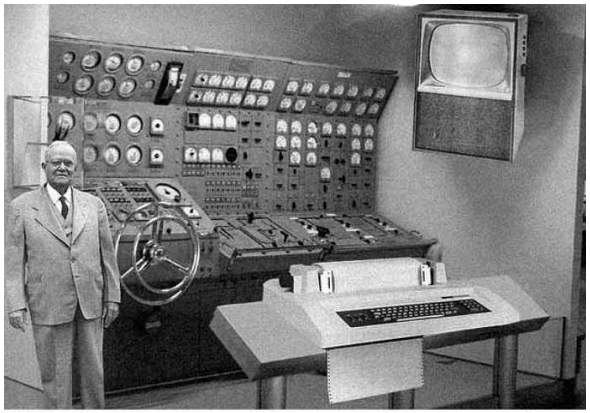
HCI Research at Télécom ParisTech

DIVA Team (Design, Interaction, Visualization & Applications)

LTCI – Télécom ParisTech

https://diva.telecom-paristech.fr/

Evolutions...



1954
teletype

1984
WIMP model
desktop metaphor

2007
multitouch
sensors

Nowadays
small objects
smart home, cars...
virtual assistants

- **Smaller, more mobile, closer to the body**
- **More adaptive, more "intelligent"**
- **Will eventually "vanish"?**

… and problems

(Very) limited
interaction capabilities

UI has not
much changed
could be better?

1984
WIMP model
desktop metaphor

2007
multitouch
sensors

Nowadays
small objects
smart home, cars…
virtual assistants

Limited usability
Tablets not as versatile
as expected

Not appropriate
for many tasks
(privacy, speed)

Evolutions and problems (2)

Lots of data,
applications,
services,
usages...

New devices:
very large screens
virtual/augmented/mixed reality
tangible interfaces, etc.

Research Topics

Axis 1: Novel interactions:
Techniques, physical artifacts and software paradigms

- Novel forms of interaction
- Physical artifacts, tangible interaction, Design
- Novel interaction and design paradigms

Axis 2: "Homo numericus":
Visualization, "sense-making" and behavior models

- Data visualization and sense-making
- Behavior models
- Memorization and novice/expert transition

New topics

- Social Touch
- Computer science education

1.1 Novel forms of interaction

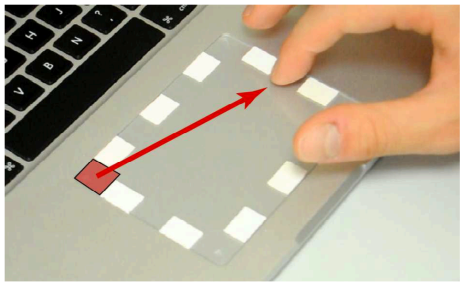
Increase interaction bandwidth
(speed + expressivity) btw. users & devices

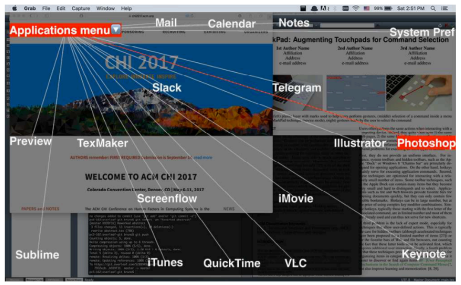
- Shortcuts & micro-interactions
- Eyes-free interfaces

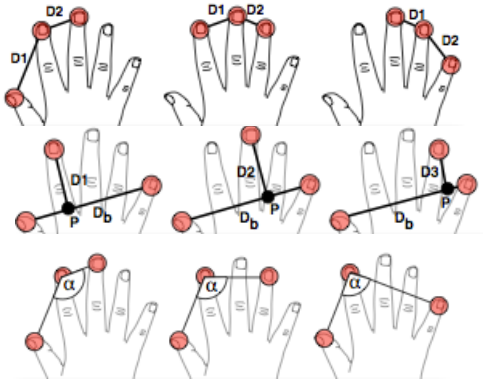
- **Gestural** interaction
- **Alternate** modalities
- Augmented & virtual reality

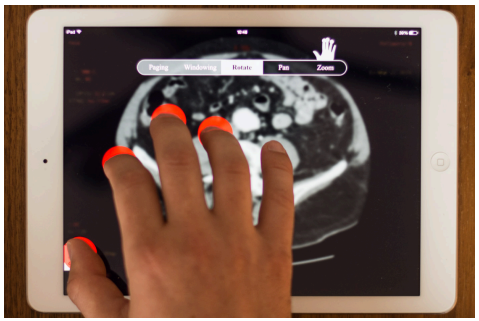
Novel interactions:

- **New forms of interaction**
- Physical Artifacts, Tangible Interaction, Design
- Novel interaction and design paradigms









1.1 Novel forms of interaction

Small user interfaces

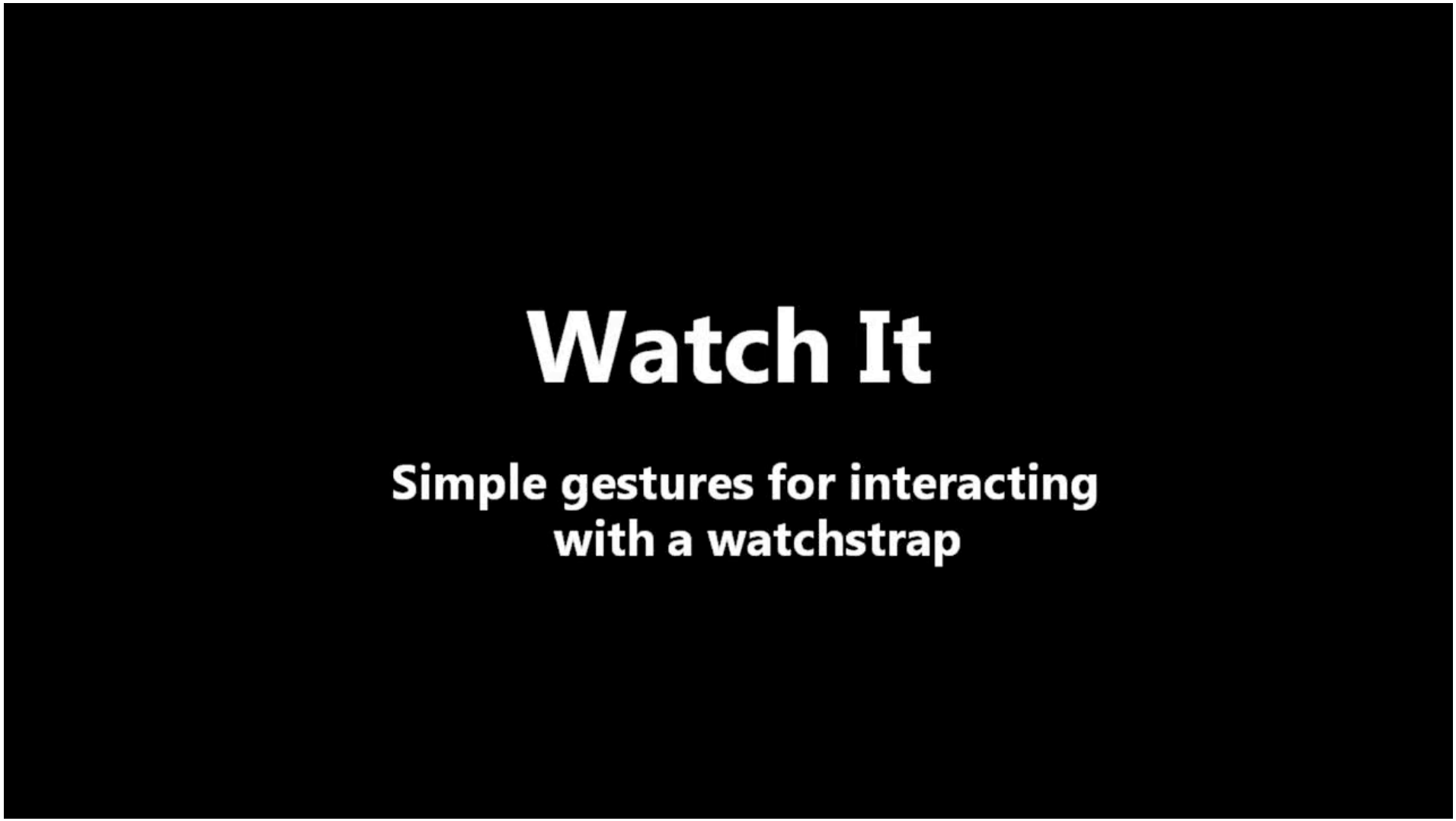
- **Mobile** and **wearable** interfaces
  - smartwatches, tatoos, digital jewelry...

Big user interfaces

- **Wall-sized** screen displays
- Interactive TV & **smart home**

1.1 Novel forms of interaction

Wearable Interfaces: Watch It

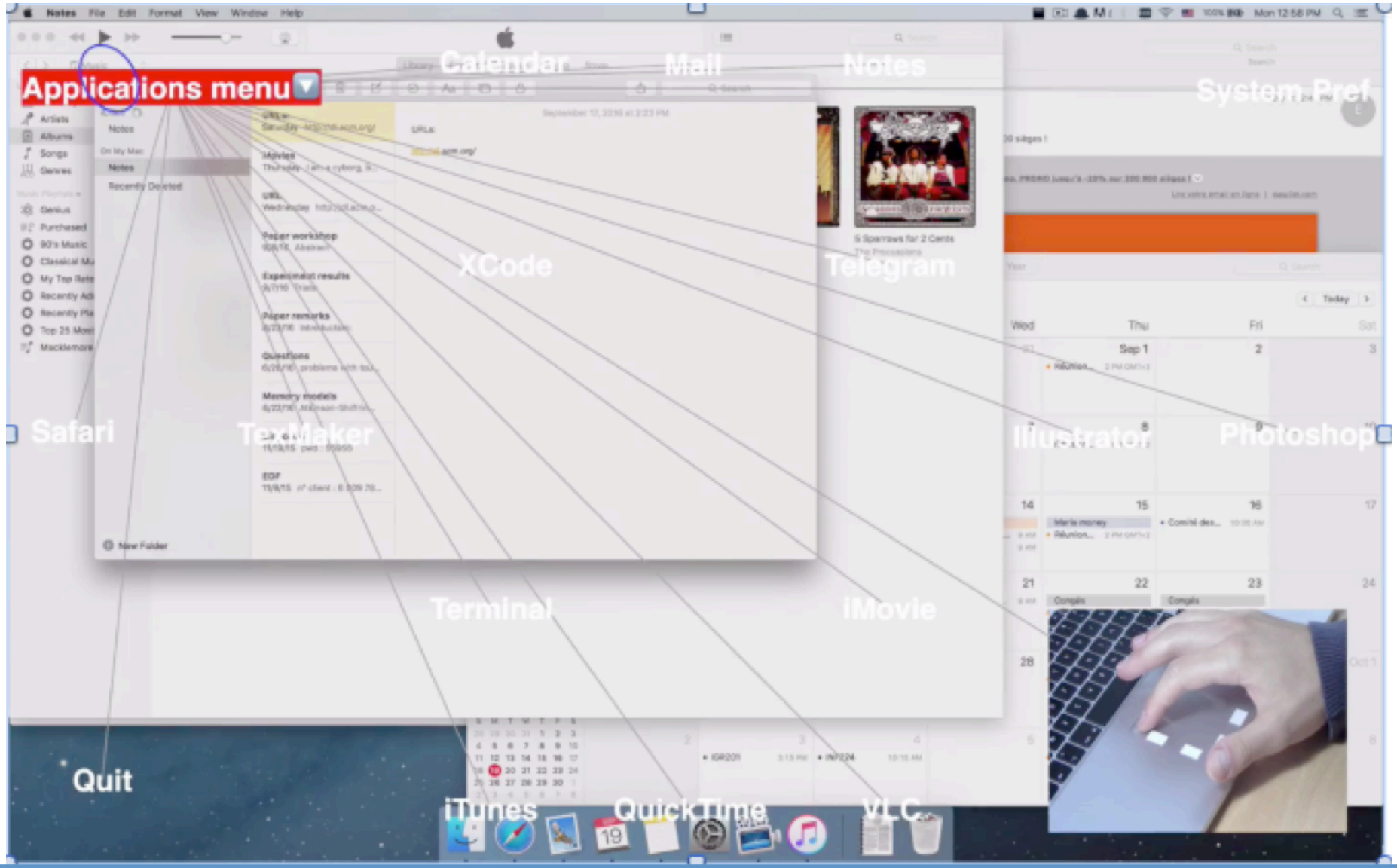


1.1 Novel forms of interaction

CoReach : cooperative gestures on wall-sized displays

1.1 Novel forms of interaction

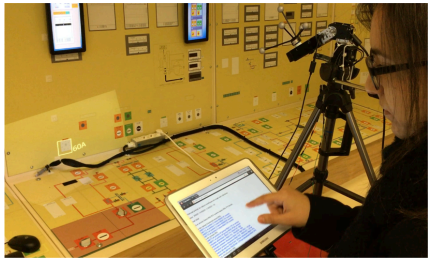
Gestural expressivity : MarkPad (more than 600 commands)



1.1 Novel forms of interaction

Alternate modalities: Orbital Desktop

1.1 Novel forms of interaction



Augmented Reality :

PAA: Projection Augmented Robotic Arm

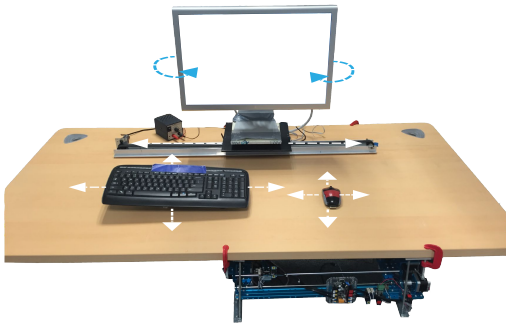
1.2 Physical Artifacts, Tangible Interaction, Design

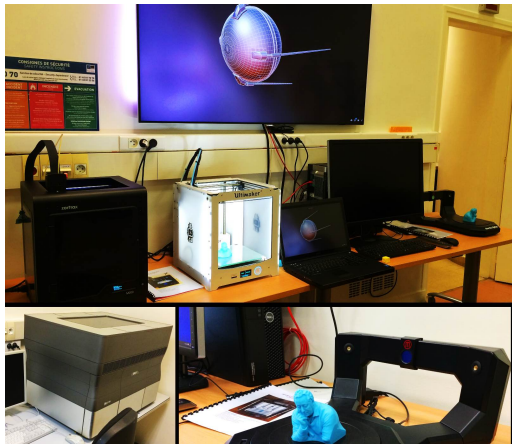
Physical objects making interaction more fluid and more intuitive

- On-body interaction
- Tangible objects (e.g. for the visually impaired)
- Shape-changing interfaces

Novel interactions:

- New forms of interaction
- **Physical Artifacts, Tangible Interaction, Design**
- Novel interaction and design paradigms





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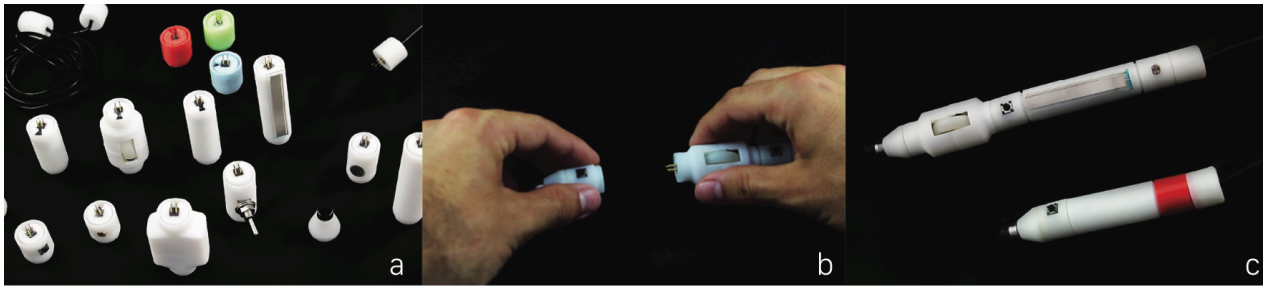
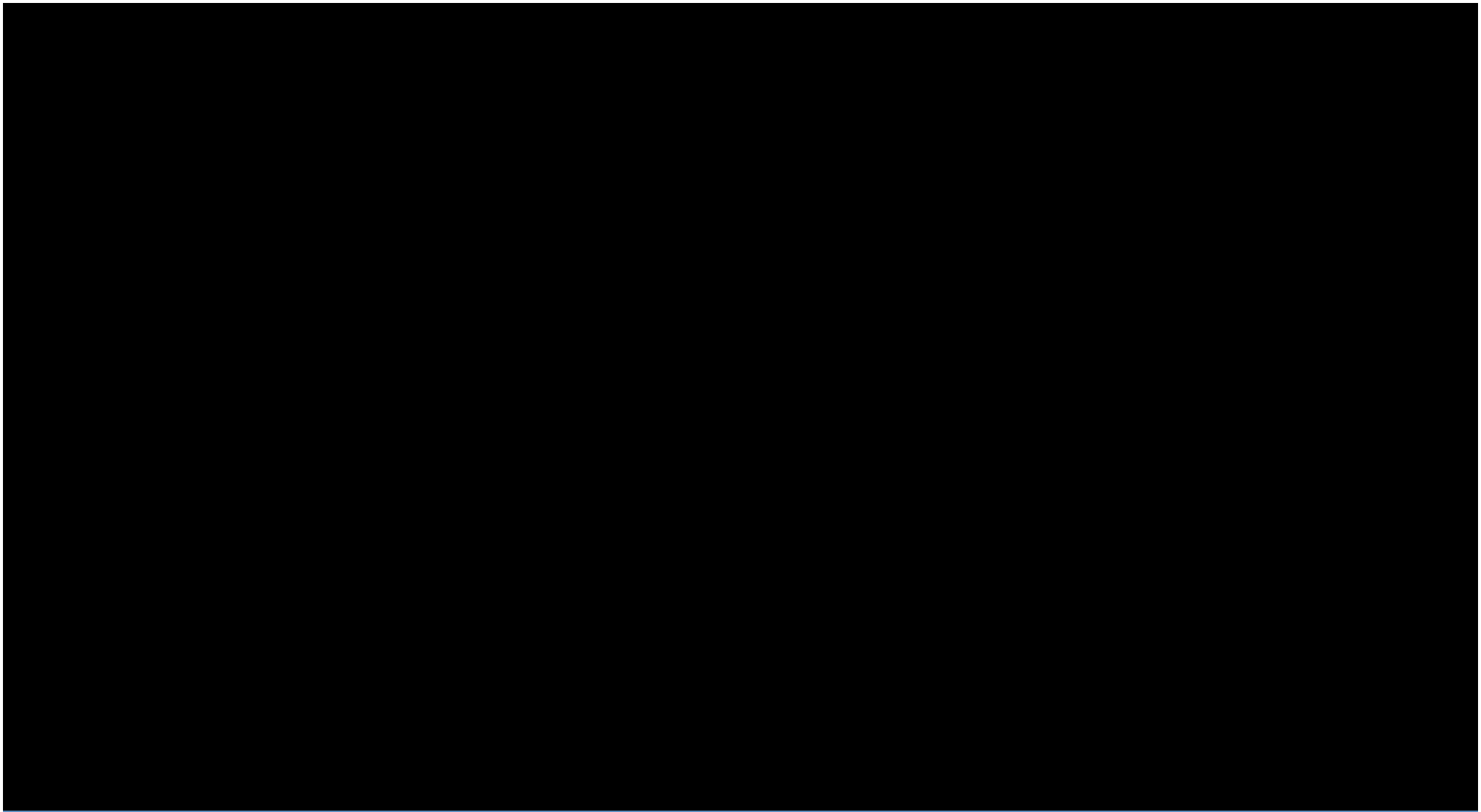


1.2 Physical Artifacts, Tangible Interaction, Design

On-body interaction: iSkin (interactive tatoos)

1.2 Physical Artifacts, Tangible Interaction, Design

Tangible interfaces: VersaPen



1.2 Physical Artifacts, Tangible Interaction, Design

Shape changing interfaces: LivingDesktop

Gilles Bailly[1], Sidharth Sahdev[1], Sylvain Malacria[2], Thomas Pietrzak[3]

Living Desktop:

Augmenting Desktop Workstation with Actuated Devices

[1] LTCI, CNRS, Telecom ParisTech, University Paris Saclay
[2] Inria
[3] University of Lille

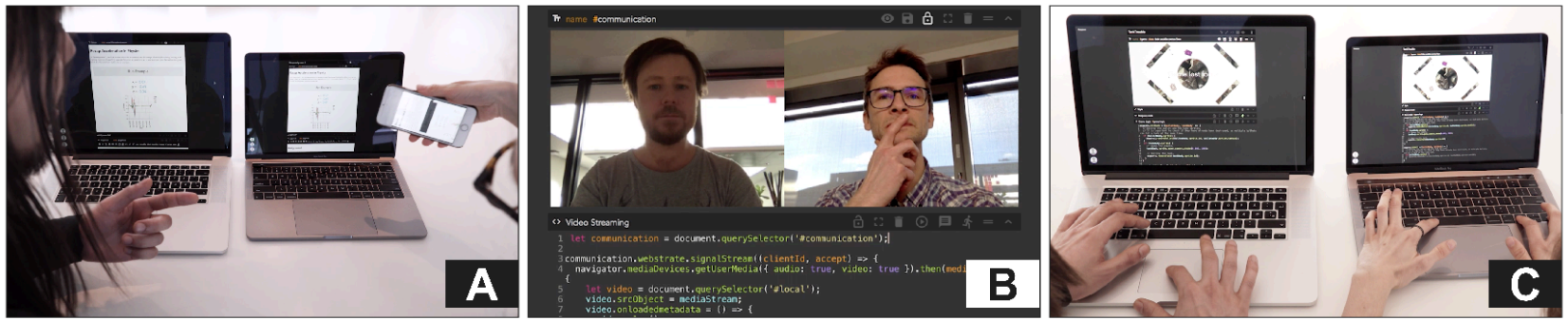
1.3 Novel interaction and design paradigms

New software architectures and interaction paradigms

- Multi-**device**, multi-**surface** interaction
- **Collaborative** work
- Make interactive software "**malleable**"
- Computer science **education**

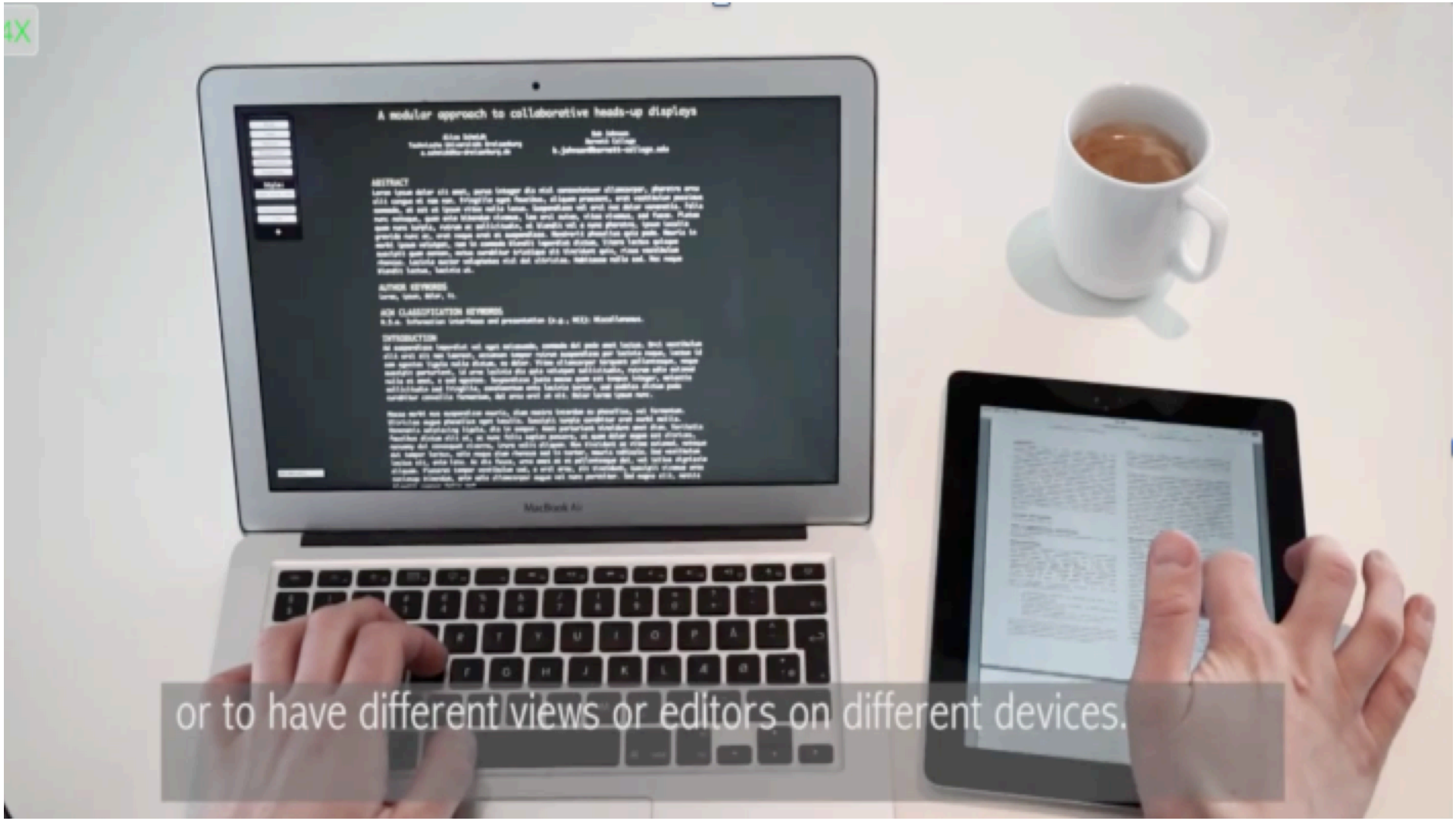
Novel interactions:

- New forms of interaction
- Physical Artifacts, Tangible Interaction, Design
- **Novel interaction and design paradigms**



1.3 Novel interaction and design paradigms

Shareable Dynamic Media: Webstrates



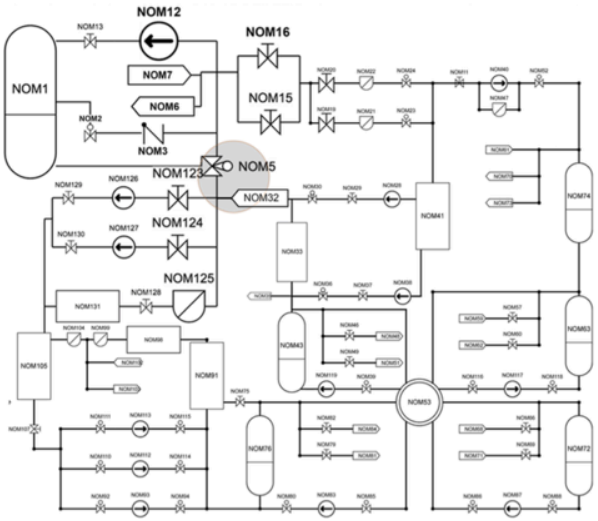
2.1 Data visualization and sense-making

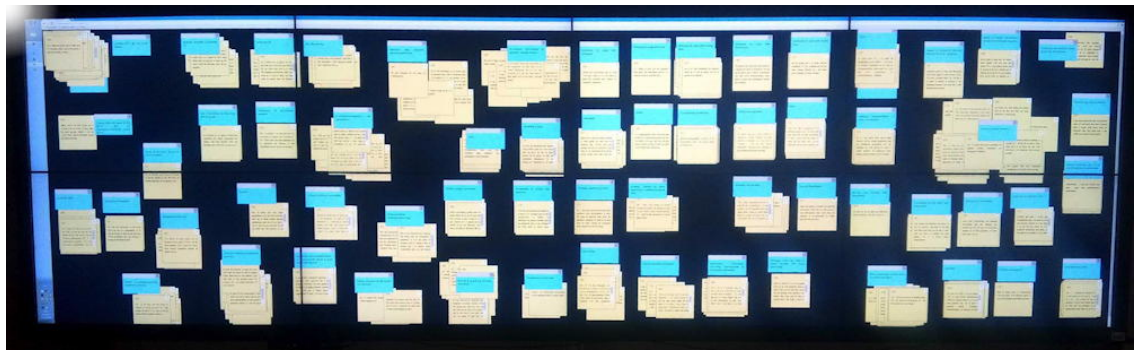
Manipulate, analyze, and understand masses of data

- **Design** and **understand** new graphical representation systems
- **Physical** representation of data
- Production of **meaning**

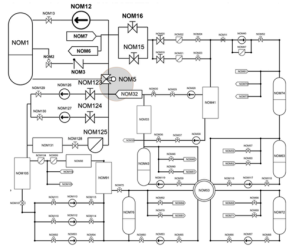
Homo numericus:

- **Data visualization and sense-making**
- Behavior models
- Novice / Expert Transition





2.1 Data visualization and sense-making



SchemeLens: structural fisheye / topological zoom

SchemeLens

A Structural Fisheye Technique for Large Network Diagrams Preserving Topology and Legibility

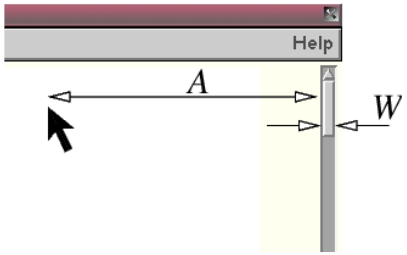
InfoVis 2015 Papers
Submission # 111

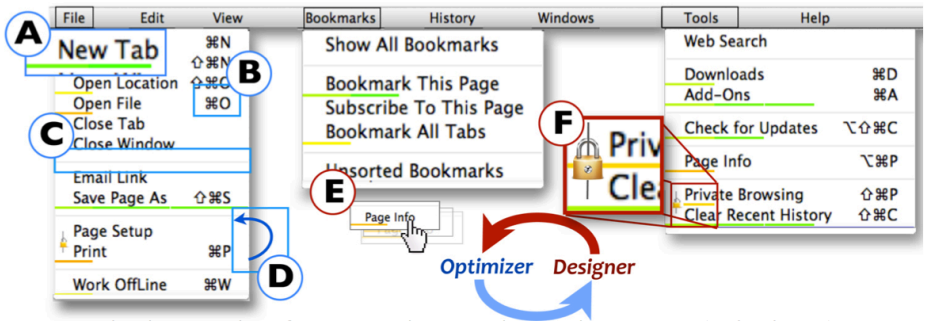
2.2 Behavior models

Homo numericus:
- Data visualization and sense-making
- **Behavior models**
- Novice / Expert Transition

Understand and model user behavior to improve user interfaces

- Fundamental study of **pointing** (Fitts' law) using information theory
- Predictive **models of performance** for command selection and menu systems
- Optimization of **navigation** in multiscale interfaces (Bayesian modeling)





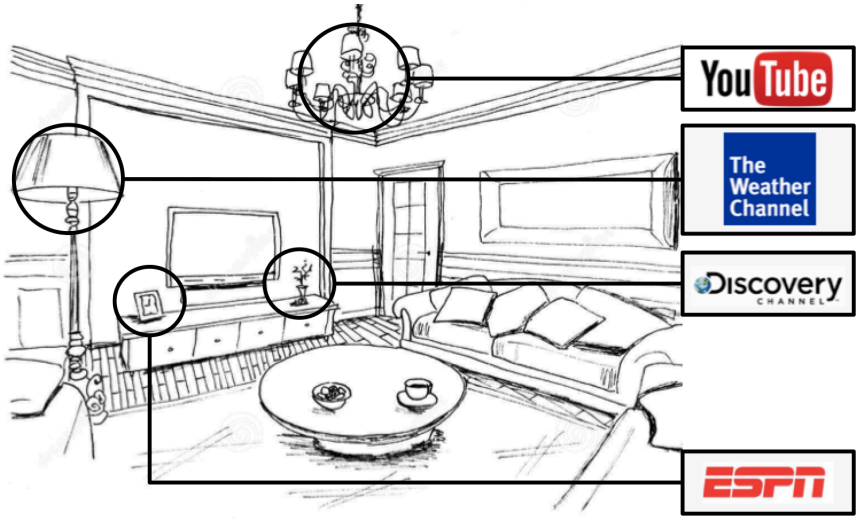
2.3 Memorization & Novice/Expert Transition

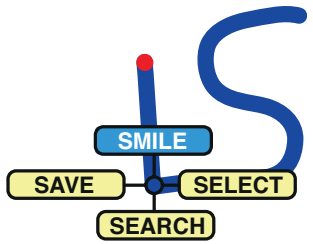
Discovery, learning & memorization of commands

- **Recall** rather than **recognition**
- Transition from **novice to expert use**
- Study users' behaviors and **cognitive abilities**:
  - spatial, image, semantic memory

Homo numericus:

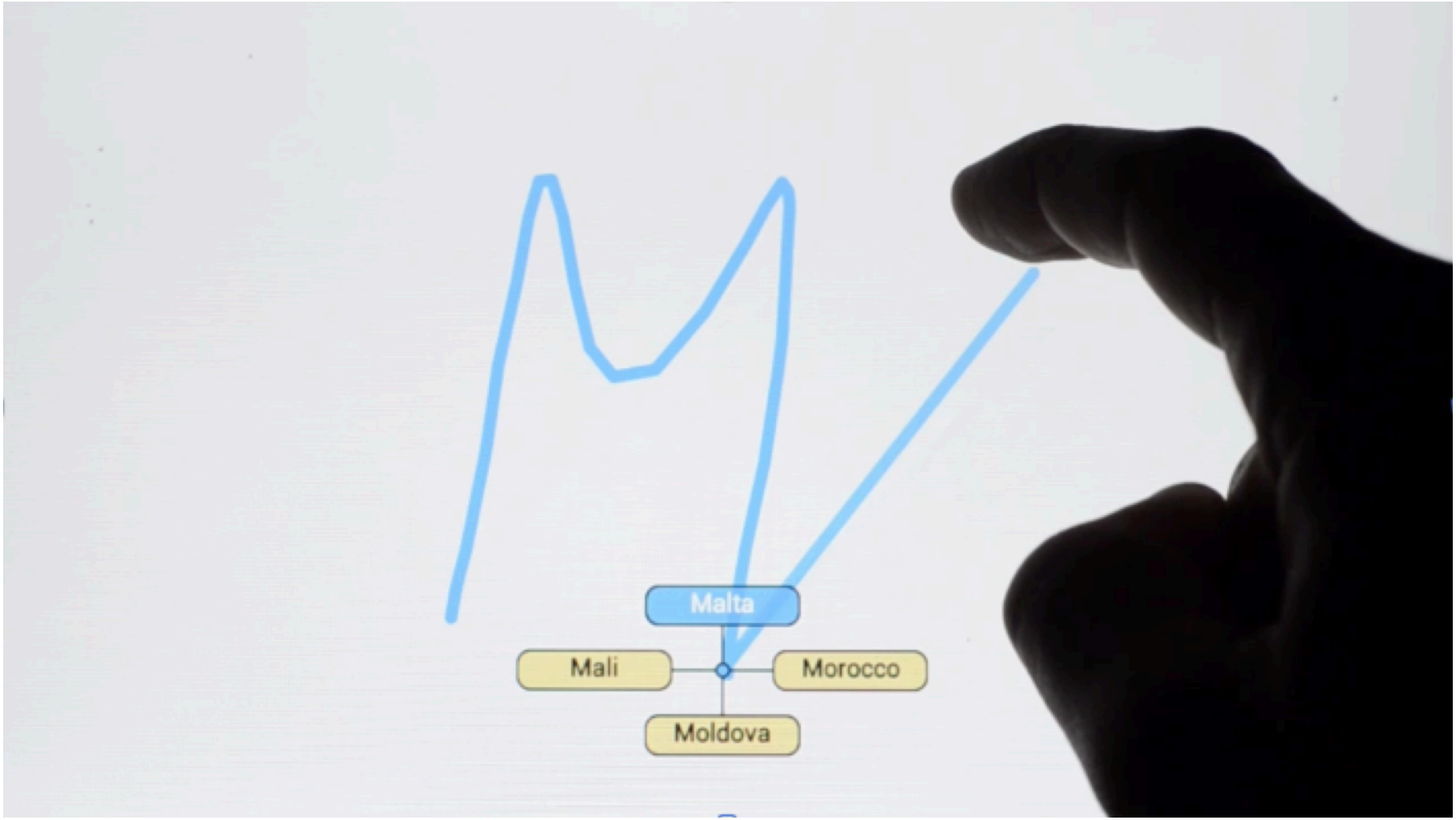
- Data visualization and sense-making
- Behavior models
- **Novice / Expert Transition**





2.3 Memorization & Novice/Expert Transition

Novice to expert use: Augmented Letters

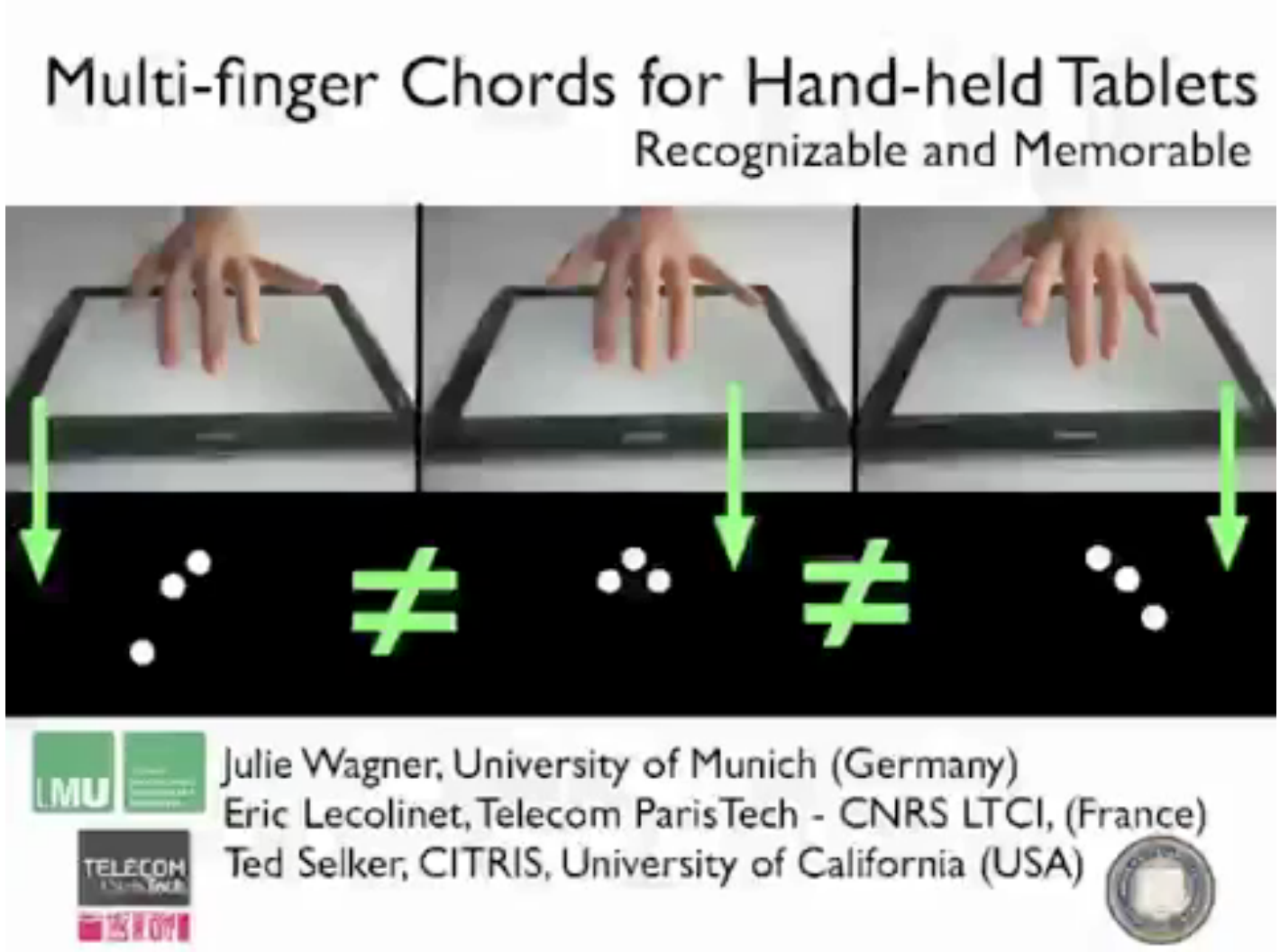


2.3 Memorization & Novice/Expert Transition

On-body interaction & semantic aids: Body Loci

2.3 Memorization & Novice/Expert Transition

Categories and Mapping: MultiFinger Chords



2.3 Memorization & Novice/Expert Transition

Facilitate transition to expert use: IconHK

IconHK

Using Toolbar Button Icons to Communicate Keyboard Shortcuts

Emmanouil Giannisakis, Gilles Bailly, Sylvain Malacria, Fanny Chevalier

SocialTouch

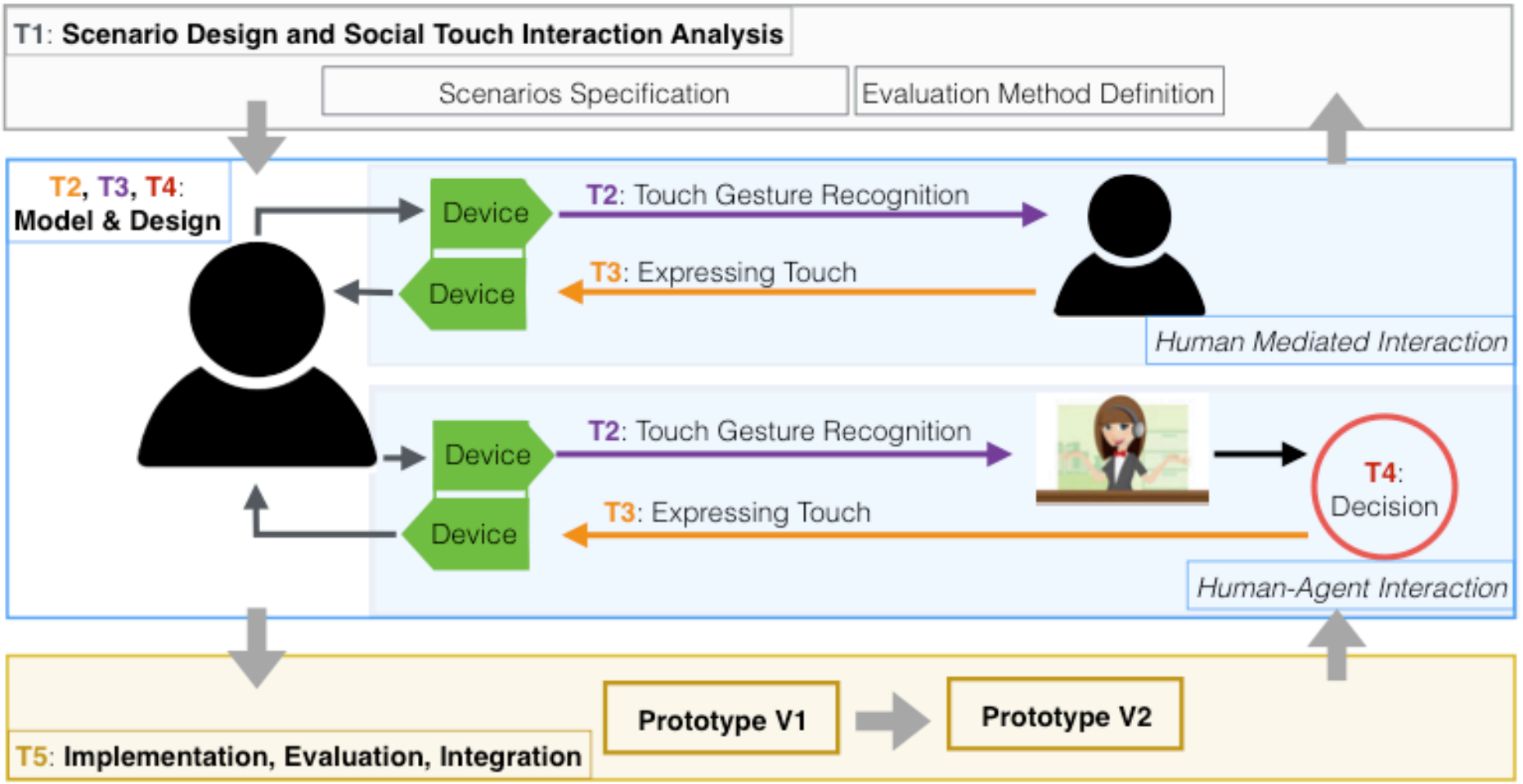
Understanding, modeling and evaluating social touch in human-machine interaction

- At the crossroad of **HMI** and **Emotional Design**
- Studies how the **sense of touch** can leverage **communicative** and **emotional** channels:
  - Between **humans *via* machines**: mediated communication
  - Between **humans *and* machines**: ECAs in a VR environment

Objectives

- Understand the **principles** and **functions** of touch as an **emotional** way to communicate
- Design novel human-machine **interaction techniques** and **devices**
- Evaluate the **efficiency** and the **acceptability** of social touch

Overview



- **42 Months**
- **4 Partners, 308 men months**
- **T0: December 2017**
- **Kick Off: 18 Dec. 2017**

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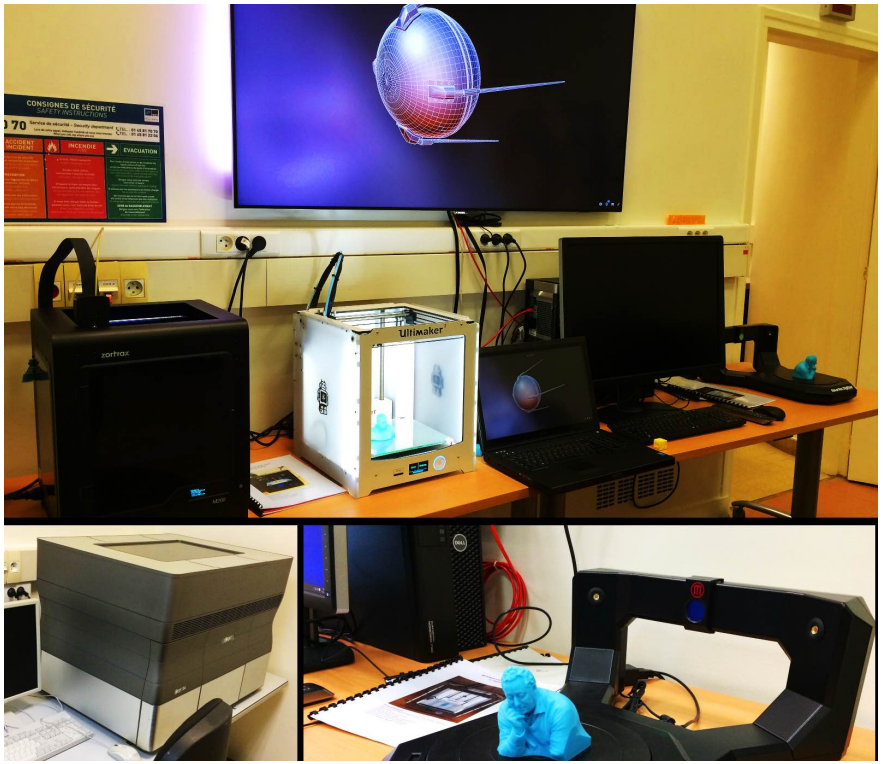

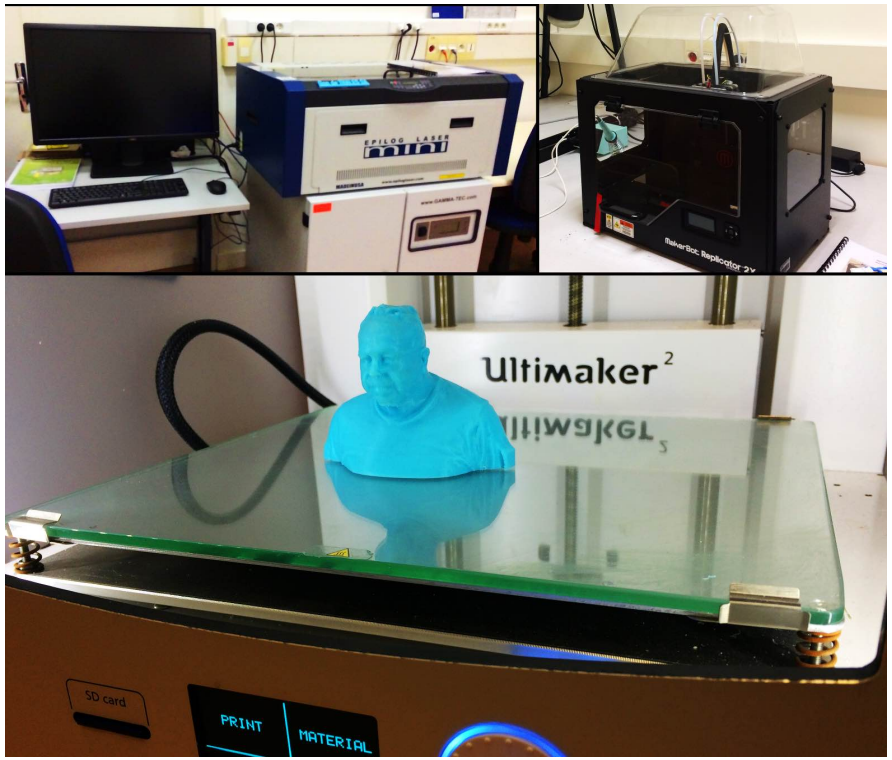

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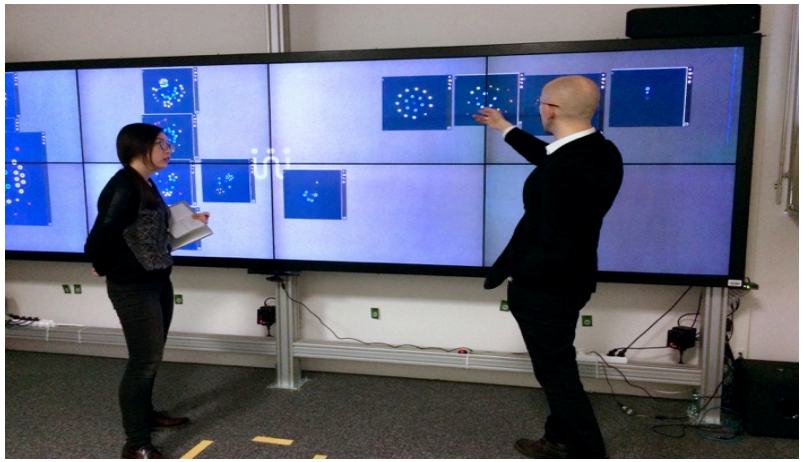
https://fablabtp.wp.mines-telecom.fr/

DIGISCOPE

PIXLS

http://www.digiscope.fr/en

PIXLS au CNDR Barrault **:**
4 x 1,15 m, 7680 x 2160 pixels, capture de mouvements 3D



IRIS à Italie :
2,43 m x 1,37 m, 3840 x 2160 pixels, technologie tactile avancée

DIVA Team

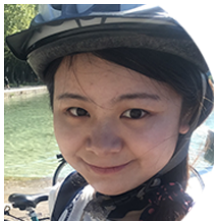
Eric Lecolinet

James Eagan

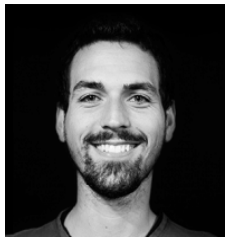
Rémi Sharock

Gérard Mouret
(resp. technique)

Yves Guiard
(DR émérite)

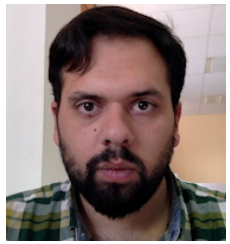


Jiali Liu



Marc Teyssier

Bruno Fruchard



Emmanouil Giannisakis

Wanyu Liu

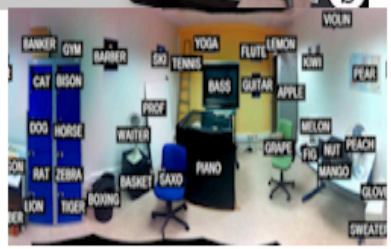
Bastien Liutkus

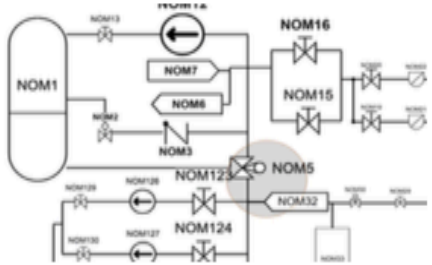
associate members of CoDesign Lab

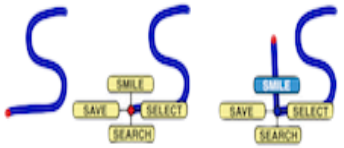
Annie Gentes

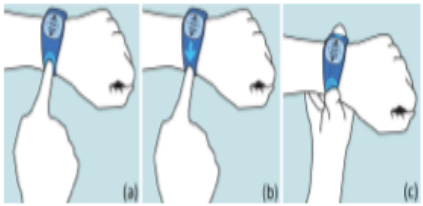
Samuel Huron

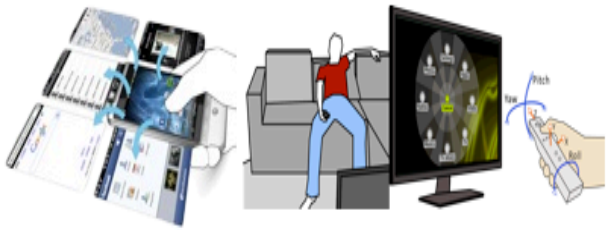
Emeline Brulé











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