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"?

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... and problems

- **1984**
  - WIMP model
  - desktop metaphor
  - Limited usability
  - Tablets not as versatile as expected

- **2007**
  - multitouch sensors

- **Nowadays**
  - small objects
  - smart home, cars...
  - virtual assistants
  - (Very) limited interaction capabilities
  - Not appropriate for many tasks (privacy, speed)

UI has not much changed could be better?
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, tattoos, digital jewelry...

Big user interfaces
- **Wall-sized** screen displays
- Interactive TV & **smart home**
1.1 Novel forms of interaction

Wearable Interfaces: Watch It

Watch It

Simple gestures for interacting with a watchstrap
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

Desktop Orbital Camera Motions using Rotational Head Movements
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 tattoos)
1.2 Physical Artifacts, Tangible Interaction, Design

Tangible interfaces: VersaPen
1.2 Physical Artifacts, Tangible Interaction, Design

Shape changing interfaces: LivingDesktop

Gilles Bailly¹, Sidharth Sahdev¹, Sylvain Malacria², Thomas Pietrzak³

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

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2.1 Data visualization and sense-making

**SchemeLens**: structural fisheye / topological zoom
2.2 Behavior models

Understand and model user behavior to improve user interfaces

• Fundamental study of \textbf{pointing} (Fitts’ law) using information theory
• Predictive \textbf{models of performance} for command selection and menu systems
• Optimization of \textbf{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

Impact of On-Body Interaction, Directional Gestures and Semantic Aids on Command Memorization
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

DIVA Team – LTCI Télécom ParisTech
Overview

- 42 Months
- 4 Partners, 308 men months

- T0: December 2017
- Kick Off: 18 Dec. 2017

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Fab Lab

Télécom Fab Lab
https://fablabtp.wp.mines-telecom.fr/

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**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
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