Mobile and Context-aware Interactive Systems

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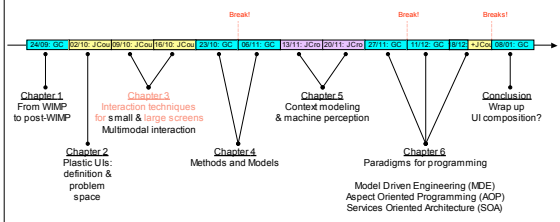
Outline and schedule



GC: Gaëlle Calvary
JCou: Joëlle Coutaz
JCro: James Crowley

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Outline of Chapter 3- part 2 (large surfaces)

1. Introduction: evolution and trends
2. Interaction techniques (that are specific to large screens)

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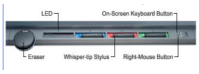
Evolution and trends

- Surfaces with one single point of contact
  - Tactile surfaces: Smart Board
  - Surfaces augmented with laser telemetry: Mimio
  - Surfaces augmented with piezzo-electric sensors (window-panes)



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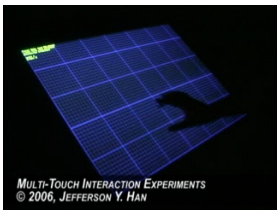
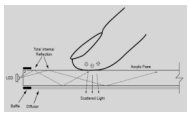
Evolution and trends

- Multi-touch surfaces
  - FTIR (Frustrated Total Internal Reflection) tracking





FTIR principles

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Evolution and trends

- Multi-touch surfaces
  - Tracking using computer vision
  - Magic table [F. Bérard]

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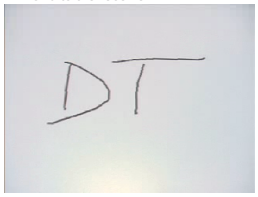
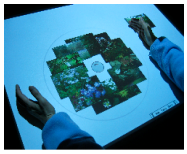
Evolution and trends

- Multi-touch surfaces: the DiamondTouch (MERL)
  - Detection by capacity variation: DiamondTouch is front-projected and uses an array of antennas embedded in the touch surface. Each antenna transmits a unique signal. Each user has a separate receiver, connected to the user capacitively, typically through the user's chair. When a user touches the surface, antennas near the touch point couple an extremely small amount of signal through the user's body and to the receiver.





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Evolution and trends

- Multi-touch surfaces: Thre Microsoft Surface
  - Tactile surface
  - Dynamic coupling with digital devices: mobile phone, camera, via RFID or Wifi
  - Finger-based Interaction

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Evolution and trends

- Multi-touch surfaces: Philips Entertaintable
  - LCD screen
  - Detection of object position and shape

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Evolution and trends

- Multiple surfaces with different orientation (non co-planar): Built-It (seminal work)

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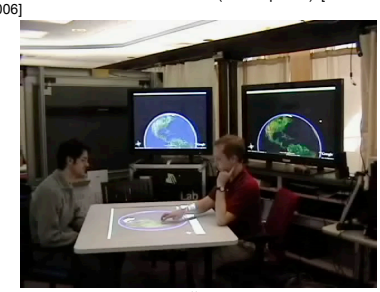
Evolution and trends

- Multiple surfaces with different orientation (non co-planar): [Forlines UIST2006]



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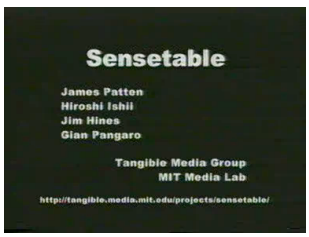
Evolution and trends

- Multiple surfaces and tangible UI: Sense Table (Ishii)



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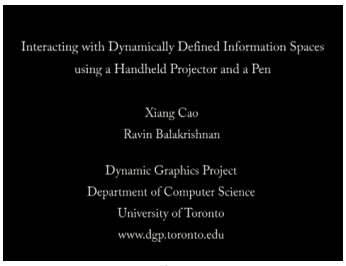
Evolution and trends

- Any surface can become interactive: a video-projector as an input device



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Evolution and trends

- Any surface can become interactive: PDS [PRIMA]

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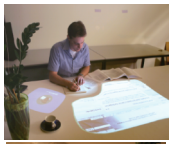
Evolution and trends

- Any surface can become interactive:
  - Display bubbles (Cotting 2006, ETH)
  - The bubbles are not rectangular any more but shape themselves to fit the physical environment



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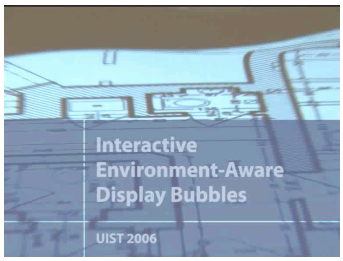
Evolution and trends

- Display bubbles (Cotting 2006, ETH) in action



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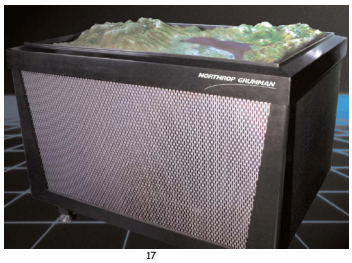
Evolution and trends

- Surfaces en relief : modèles topographiques
  - Tableau d'aiguilles verticales sous une "peau" en silicone (jusqu'à 6 inches de hauteur)
  - Projection vidéo



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Les grandes surfaces d'interaction : diversité

- Dispositifs de sortie
  - Surfaces dédiées : écrans LCD
  - Surfaces naturelles instrumentées (capteur piézo-électrique, diff. capacité, etc.)
  - Surfaces naturelles couplées à des systèmes de projection et de suivi externes
- Orientation
  - Surfaces horizontales
  - Surfaces verticales
- Mobilité
  - Surfaces statiques
  - Surfaces transportables
- Usages
  - Mono/multi-utilisateur
  - Espaces publics (annonces, pub., etc.) et privés (ambiance, jeux, etc.)
  - Mono/multi-surfaces
  - Peripheral displays

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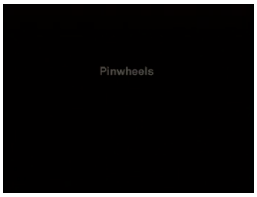
Peripheral displays

- Pour alléger la charge cognitive (nombreuses tâches en //)
  - En particulier, tâche de monitoring (tendances de la bourse, mouvement du vent, etc.)
- Affichage en périphérie de la perception humaine : source d'information ambiante
- Pinwheels (MIT Media Lab - Ishii)



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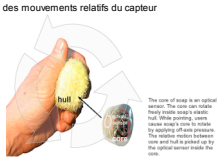
Les grandes surfaces d'interaction : diversité

- Dispositifs d'entrée
  - Stylos dédiés
  - Feutres instrumentés
  - Pointeur laser
  - Doigt(s)
  - Objets quelconques (y compris le tel. mobile, cf. spotc
  - Instruments dédiés
    - Contrôleurs de console de jeu (accéléromètre, gyroscope, magnétomètre)
    - SOAP (Baudisch UIST 2006)
      - fondé sur le capteur optique de la souris
      - emporte son tapis de souris avec elle (détection des mouvements relatifs du capteur optique par rapport à l'enveloppe)



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Les grandes surfaces d'interaction : diversité

- SOAP

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plan du chapitre 3 - partie 2

1. Introduction : évolution et tendances
2. Techniques d'interaction

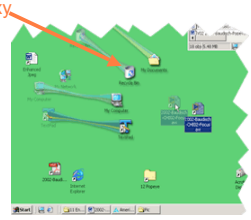
Problèmes spécifiques (au-delà de la diversité)

- Désigner et déplacer : loi de Fitts
  - il faut (pouvoir) atteindre la cible
  - il faut déplacer la cible sur de grandes distances
  - Il faut parfois franchir des surfaces qui ne sont pas nécessairement coplanaires

Atteindre la cible

- Drag-and-Pop
  - Exige une connaissance sémantique

Proxy



Atteindre la cible

- Vacuum (CHI2005, Balakrishnan]

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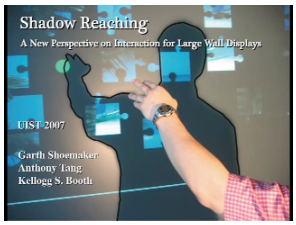
Atteindre la cible

- Son ombre comme technique d'entrée [Shoemaker, UIST07]



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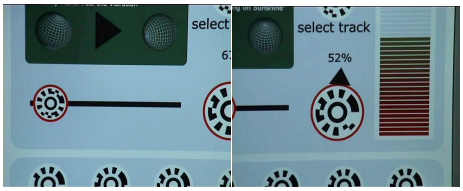
Atteindre la cible

- Désignation avec dispositif mobile
  - Spotcode sur les objets désignables
  - Objets numériques distants (scroll bar, roue)



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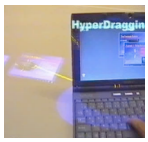
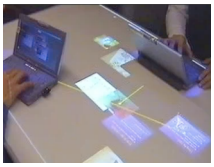
Surfaces non coplanaires

- HyperDragging et HyperCurseur (Rekimoto)





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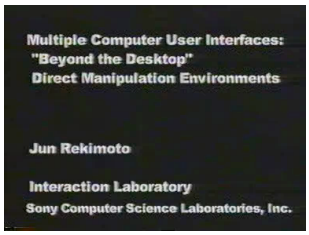
Surfaces non coplanaires

- HyperDragging et HyperCurseur (Rekimoto) en action



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Les effets de transition

- High-density cursor

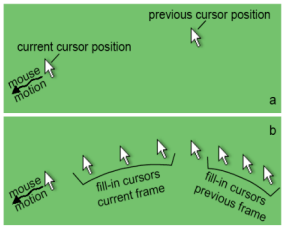

Figure 1: (a) The problem: at high mouse speeds, the mouse cursor seems to jump from one position to the next. (b) *High-density cursor* makes the mouse cursor appear more continuous by inserting additional cursor images between actual cursor positions.

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Les effets de transition

L'animation ne laisse pas de trace, peut être trop rapide, trop lente

Phosphor : Le cheminement est dessiné et persiste pdt un temps [Baudisch 06]

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Exemple emprunté à Baudisch 2006 (uist06 présentation)

initial animation [chang 93]

adding vertical motion

resulting phosphor transition

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Outline of Chapter 3 - part 1 (mobile devices)

1. Introduction
2. Inputs
3. Screen output
4. Novel interaction techniques

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Handhelds: diversity, but in common …

- Small screens
- Limited input capabilities
- No standards yet
- Recommandation
  - Apply the foundations of HCI - e.g., the method
  - Create without re-inventing the wheel: draw your design on existing solutions (in order to support consistency across applications/brands) and invent new design solutions to overcome current limitations

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