L I G

Equipe IIHM :
Ingénierie de l'Interaction Homme-Machine

EHCI group:
Engineering for Human-Computer Interaction

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EHCI group

- **"EHCI" for Engineering for Human-Computer Interaction**
  - Created in 1990
  - 9 professors and assistant professors
  - 1 CNRS researcher
  - 1 CNRS research engineer part time
  - 14 PhD students
  - 5 project engineers
  - 1 visiting researcher
  - 10 master students

EHCI group

- **EHCI group belongs to LIG (Computer Science Laboratory of Grenoble)**
  - 188 academic researchers
  - 367 doctoral / post-doctoral students, visitors, engineers
  - 45 technical and administrative staff
  - 23 autonomous research teams
  - Principal themes
    - Infrastructure (networks and data)
    - Software (foundations and design models)
    - Interaction (perception, action and dialog)
    - Knowledge (learning, agent models and web-ontologies)

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Outline

- **Scientific overview**
  - Scientific themes
  - Scientific approach
- **Research themes and results**

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Scientific themes

- **Software Engineering for HCI**

Computer science contribution — Interaction — Supported by Human sciences

- **Understanding the human-computer phenomena**
- **Establishing links between psychology-ergonomics and software engineering**
- **Designing, developing and evaluating interaction techniques**
- **Developing conceptual and technical tools based on HCI principles: Utility, Usability, Context**

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Scientific themes

- **Software Engineering for HCI in the context of "Ambient Intelligence"**
  - a seamless computing environment
  - unobtrusive, everywhere
  - often invisible and yet in our consciousness

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Scientific themes

- **Software Engineering for HCI in the context of "Ambient Intelligence"**
- **Unprecedented challenges for interaction design**
  - **Combining the real and virtual worlds**
  - **Multiple interaction devices/modalities**
    - **Small and large interaction surfaces**
  - **Dynamic contexts of use**
  - **Interaction adaptation – plasticity**

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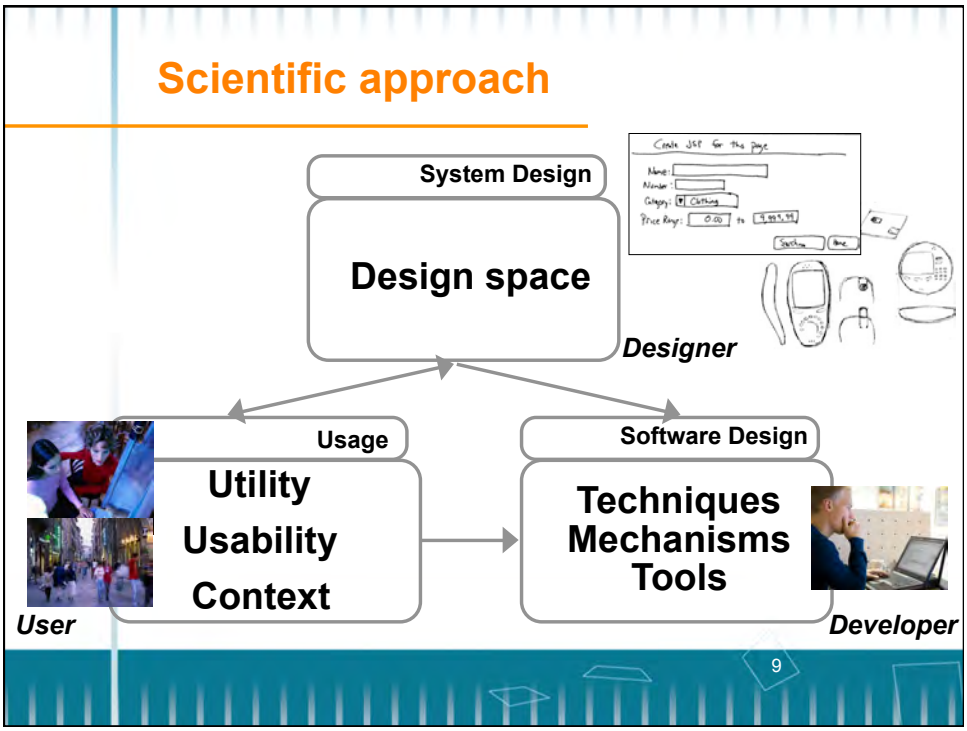
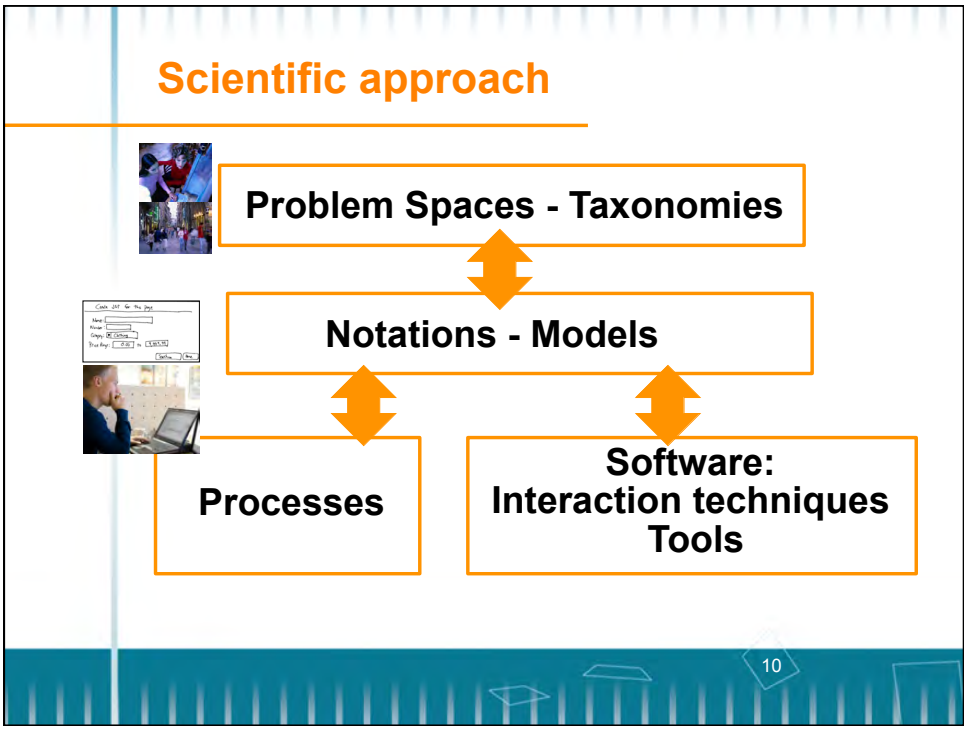
Scientific approach

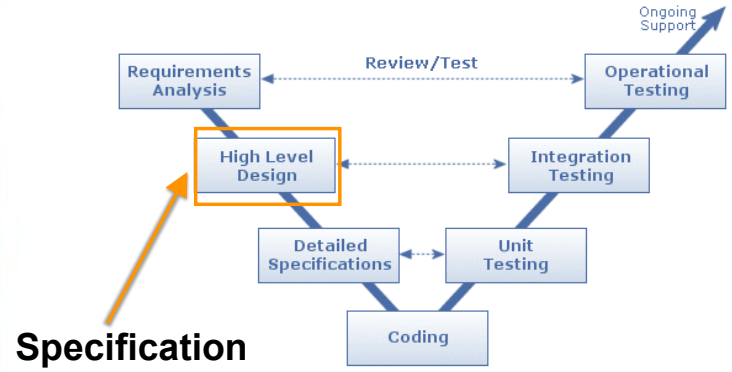


Scientific approach



Scientific approach: Example

- COMM notation for specifying collaborative and multimodal systems



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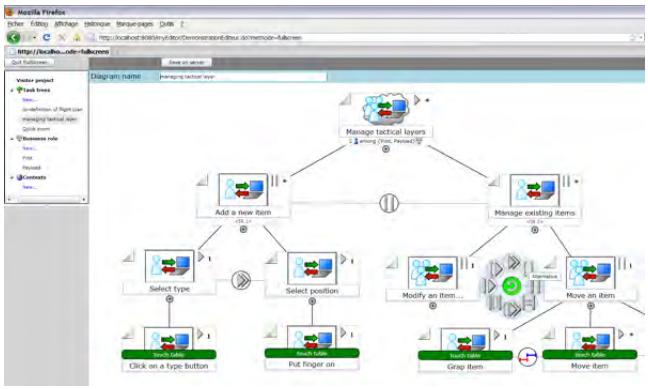
Scientific approach: Example

- http://e-comm.liglab.fr/



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Research themes

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Multimodality

- **Modality <device, language>** <  , *gesture*>
- **A vast world of atomic and combined modalities**
  - any physical object can be involved in interaction as a device
- **Multimodality is an integrating vector for several recent interaction paradigms that include:**
  - perceptual user interfaces
  - tangible interfaces
  - augmented reality, etc.

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Multimodality

- **Facing the vast set of atomic and combined modalities**

Tools for the rapid development

- Developing multimodal interaction: a difficult task (ad-hoc development)
- Exploring the vast set of possibilities

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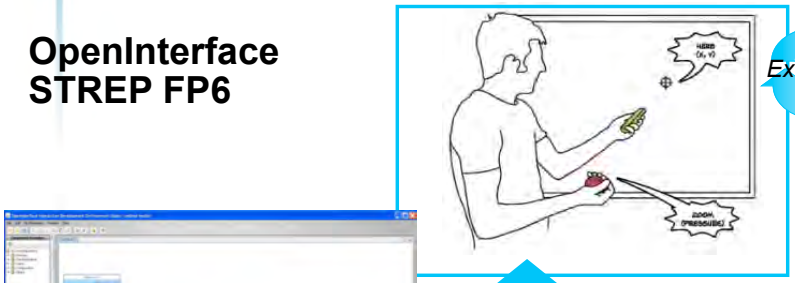
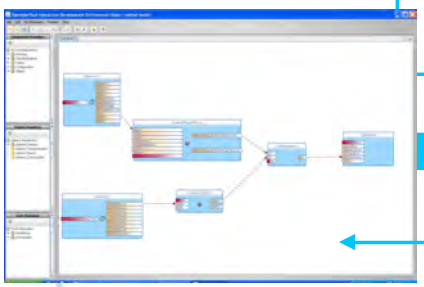
Multimodality: Focus

OpenInterface
STREP FP6





Execution pipeline

Set of modalities

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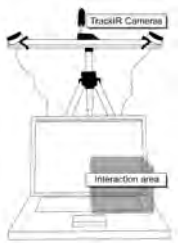
Multimodality: Focus

OpenInterface

82 components
including 30 devices



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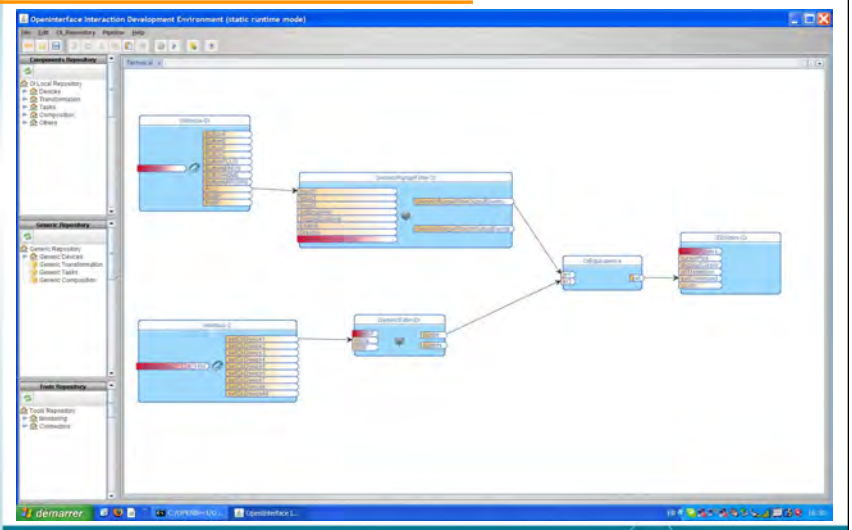
Multimodality: Focus



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Research themes

- Multimodal interaction
- **Interaction with small handheld devices**
- Mixed reality interaction
- User interface plasticity
- New interaction techniques

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Mobility

- **Key issues: Transparency/Usability of mobile devices**
- **Challenges for HCI**
  - Limited interactional resources

  - Interaction in mobility

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Mobility

- **Lack of input/output bandwidth**
- **New forms of interaction**
- **Toolkit**
- **Interaction techniques**

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Mobility: Focus

- **Wavelet menu**

- **Problem space**
  - Space on screen
  - No keyboard for shortcuts
  - One-hand interaction
  - Eye-free interaction

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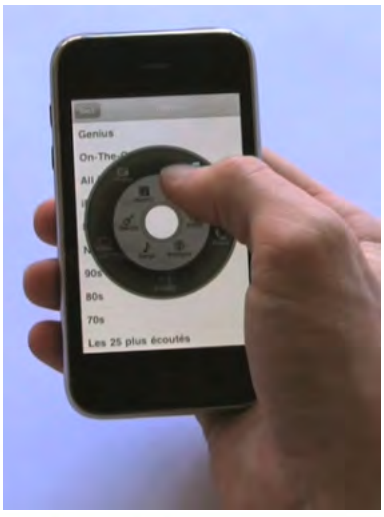
Mobility: Focus



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Research themes

- Multimodal interaction
- Interaction with small handheld
- **Mixed reality interaction**
- User interface plasticity
- New interaction techniques

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Mixed Reality

- **Merging the physical and the digital worlds so that users can take advantage of the two worlds in a smooth and seamless manner**

- **Augmented object: Conceptual model and prototyping tool**
- **Augmented surface: Interaction techniques and toolkit**
- **SE method**
- **Mobile AR**

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Mixed Reality: Focus

- **Bringing Digital Services to the Physical Workspace**

Adding single-user dual-finger interaction to the MERL DiamondTouch

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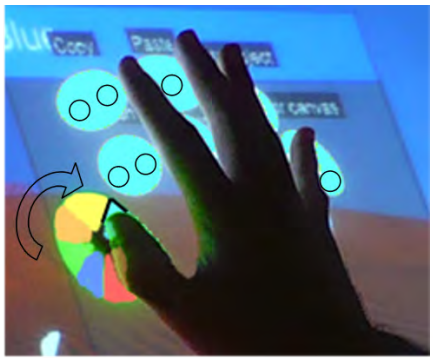
Mixed Reality: Focus

- **Multitouch menu: MTM**



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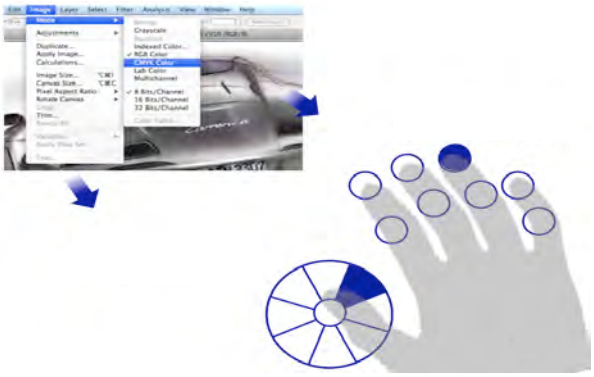
Mixed Reality: Focus

- **Multitouch menu: MTM**



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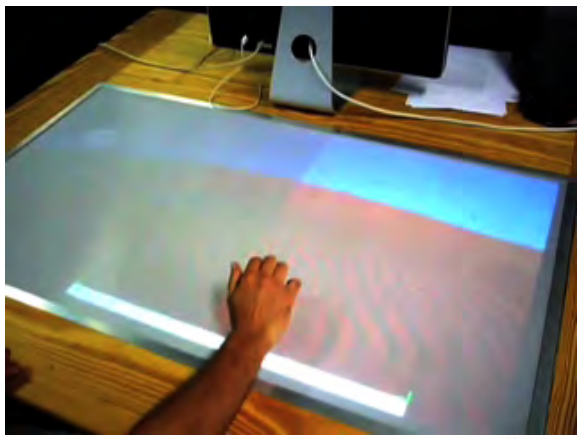
Mixed Reality: Focus

- **Multitouch menu: MTM**



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Plasticity

- **UI adaptation to the context of use while preserving human-centered values**

- **Reference framework (W3C)**
- **Models at runtime**
- **Processes**
- **MDE, Plastic widgets, Component model/middleware**

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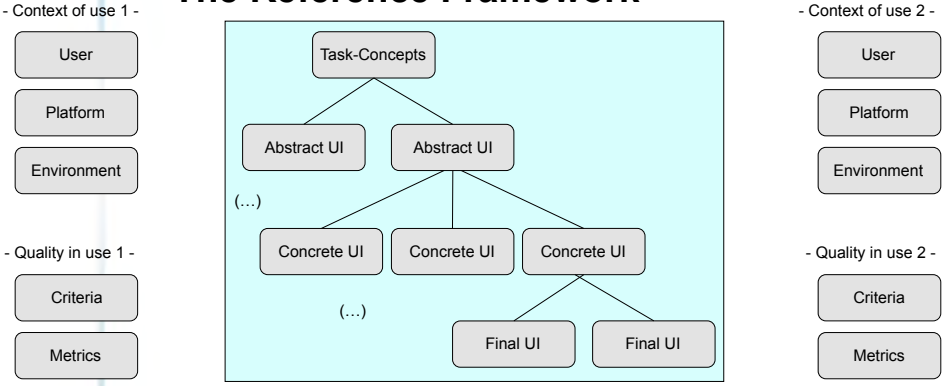
Plasticity: Focus

- **The Reference Framework**



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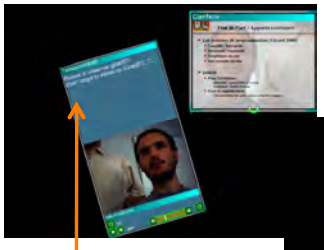
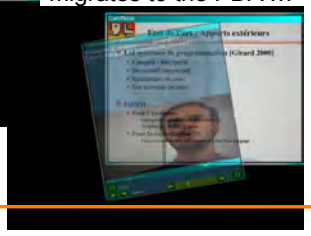
Plasticity: Focus

- **Example**

When a PDA arrives …

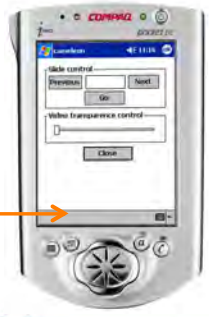


… the remote controller migrates to the PDA …



While migrating, the remote controller is remolded at the task level: it is no more possible to take notes on the PDA

… so that the user is mobile !



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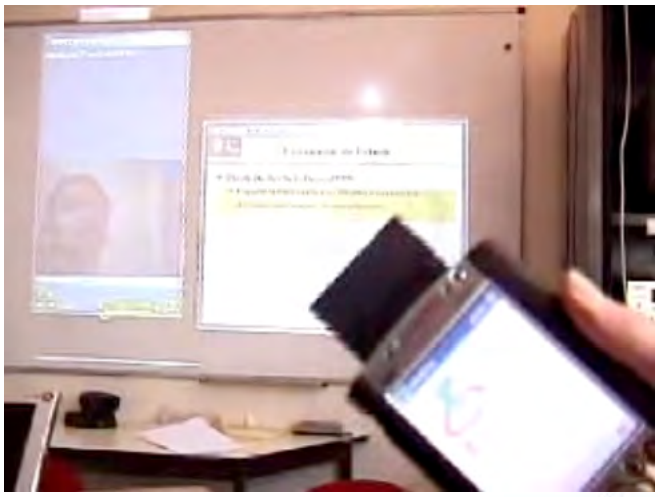
Plasticity: Focus



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Research themes

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New Interaction Techniques

- **Novel GUI-based interaction techniques to improve efficiency, comfort, and pleasure for generic HCI tasks**
- **Interactive visualization**
- **Pointing techniques**
- **Menu techniques**
- **3D interaction**

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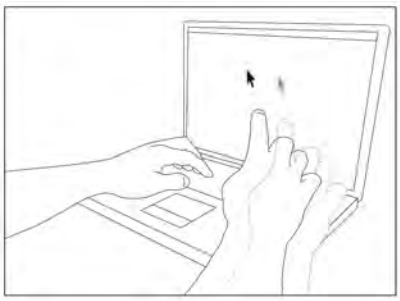
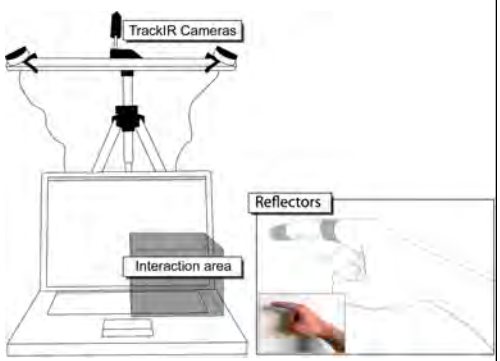
New Interaction Techniques: Focus

- **Pointing techniques: 3D**
- AirMouse





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New Interaction Techniques: Focus

- AirMouse

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Conclusion

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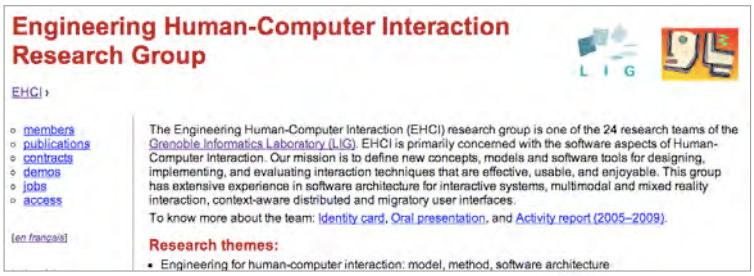
- **Thank you for your attention**

… http://iihm.imag.fr/en/



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