Intelligent Interfaces (LCI)

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Intelligent Interfaces (LCI)

<u>Goal</u>: increase the effectiveness of interactive systems by:

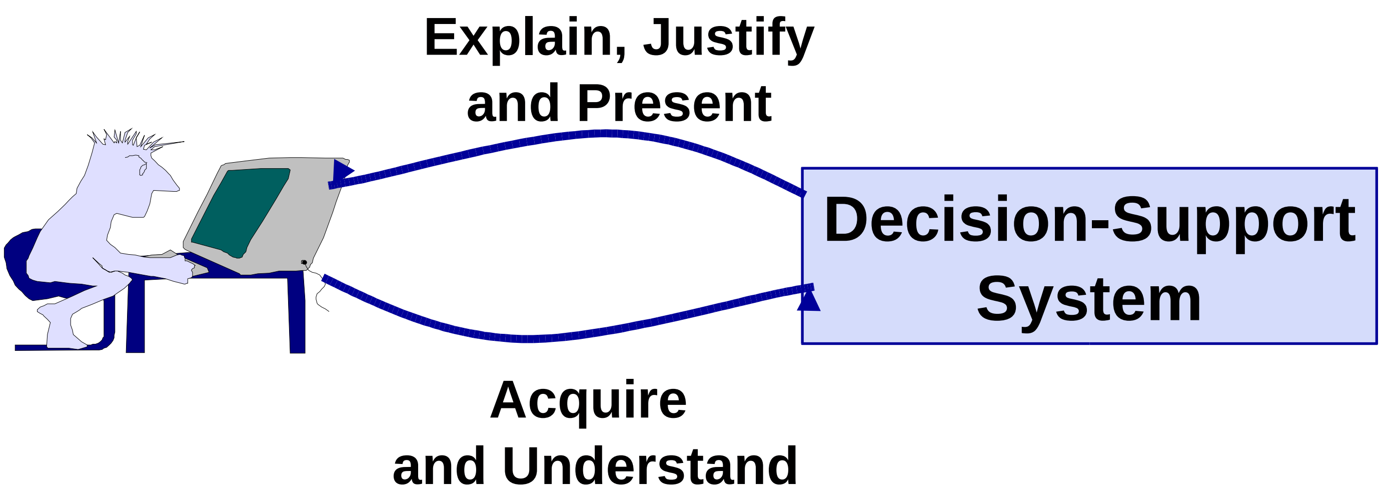
- enabling them to use *Natural Language* and *Information Visualization* **(Giuseppe Carenini)**
- enabling them to *understand* and *reason about* their users **(Cristina Conati)**
- providing them with *physical, multimodal interfaces* **(Karon MacLean)**

<u>Approach</u>: integrate AI, HCI , Cog Sci, Decision Theory, Comp. Linguistics and Perceptual Psy

Giuseppe Carenini

<u>Goal</u>: increase the effectiveness of interactive decision-support systems by enabling them to use Natural Language and Information Visualization

<u>Approach</u>: integrate Computational Linguistics, HCI and Decision Theory



Challenges

- **Support Construction and Inspection of Decision Models** (e.g., Elicit/Model User's Preferences)

- **Automatically generate understandable and convincing multimedia presentations** (explanations, arguments, summaries and narratives)

Approach

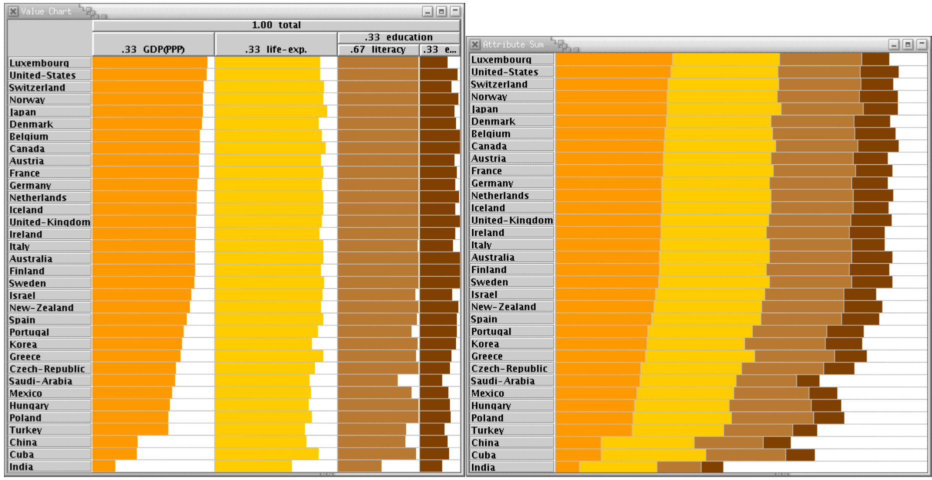
- **Formal methods for reasoning about decision-making:**
  - (Additive) *Multiattibute Utility Theory*
  - *Bayesian Networks*
- **Principled generation techniques:** Communicative goals => Linguistic/Graphic realization
- **Acquire linguistic knowledge from corpora**

Some Projects

- **ValueCharts:** Infoviz techniques to support user inspection of her preference model
- **Extacting Evaluative Information from Text** (i.e., judgments that something is good/bad, right/wrong)
- **… … … … ….**

ValueCharts

(Loyd, Bautista)



Support user in complex decisions:

House, University, Job …

Key conceptual points:

- All relevant information is conveniently displayed (*Global view*)
- User can interactively :
  - specify trade-offs and utility functions
  - perform sensitivity analysis of her preferences

Extracting Evaluative Information from Text

(Longton, Zwart)

- Extraction key sub-tasks
  - Is sentence/clause expressing an evaluation?
  - Polarity?
  - Strength?

- Generate NL summaries of the extracted information

Cristina Conati

<u>Goal</u>: increase the effectiveness of interactive systems by enabling them to *understand* and *reason about* the users' needs

<u>Approach</u>: integrate AI, HCI and Cog Sci to extend the range of user traits dynamically captured in a computational user model

From

User Model

Cognitive Skills
- Knowledge
- Goals,
- ……..

To

User Model

Cognitive Skills

Other Cognitive Traits
- Cognitive Load
- Attention
- Meta-cognitive skills……..

Affect
- Emotions
- Moods
- Motivation
- Engagement

Challenges

- **Very limited bandwidth:** it is hard to *unobtrusively* obtain information on these new traits from simple interaction with the system

- **High Level of Uncertainty**

Approach

- **Formal methods for probabilistic reasoning:**

  Bayesian networks

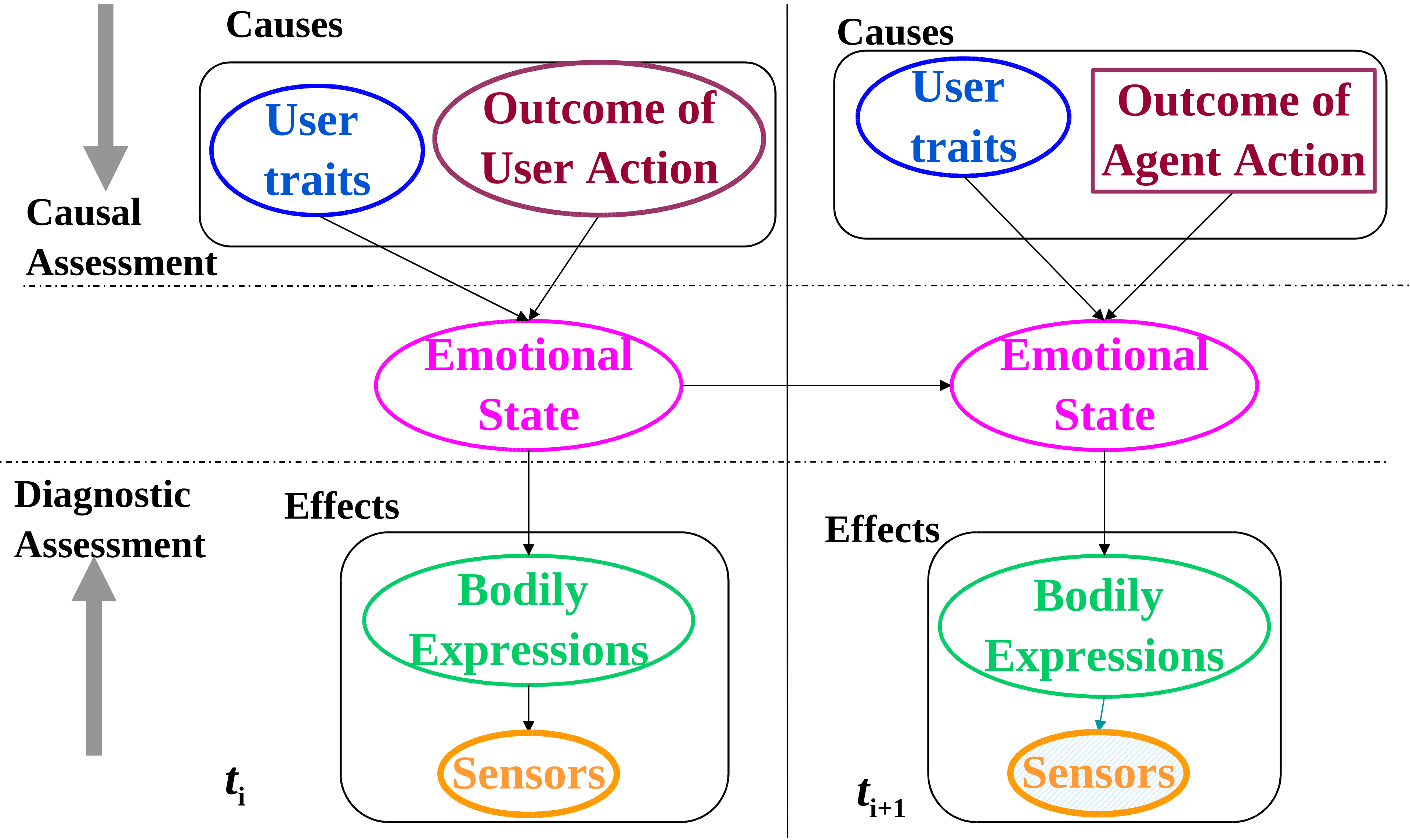
- **Increase the model bandwidth via innovative input devices**: e,g, eye-tracking and physiological sensors

Some Projects

- Modeling user emotions from causes and effects
  - Physiological sensors for diagnosis of affect
- Modeling exploratory behavior to support effective exploration.
  - Eye-tracking for real-time detection of relevant exploration patterns
- ....

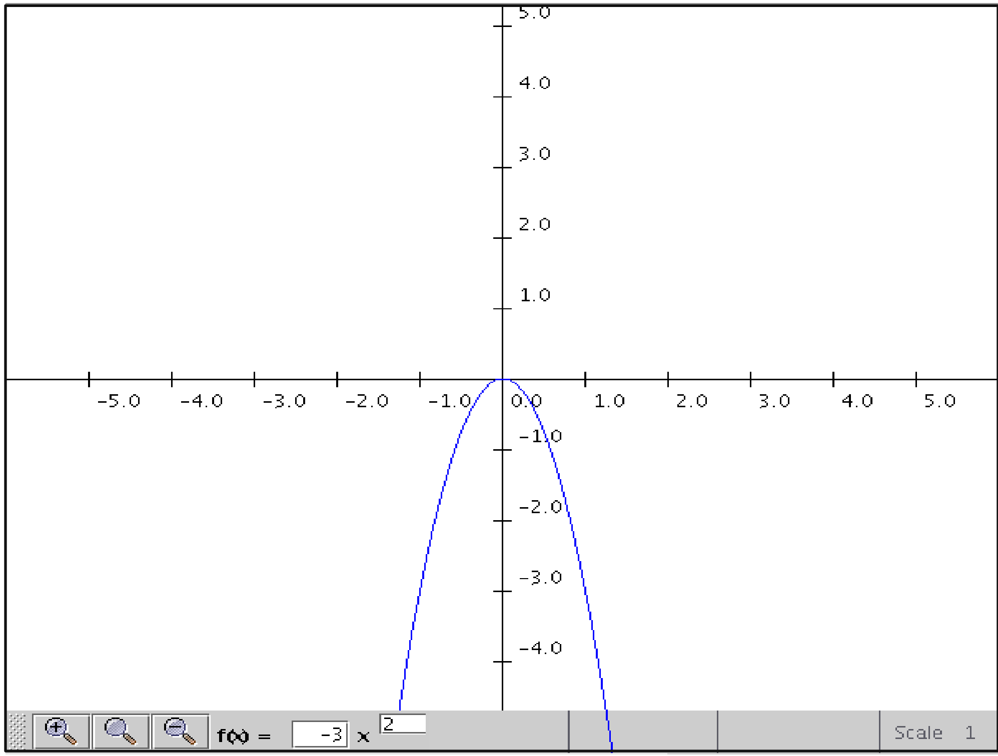
Probabilistic Assessment of User Emotions

(MacLaren, Manske)



ACE (Adaptive Coach for Exploration)

(Bunt, Hugget, Muldner)



- Support exploration of mathematical functions (e.g. input/ouput, equation/plot)
- Probabilistic model of student’s exploratory behavior
- Tutor generates tailored suggestions

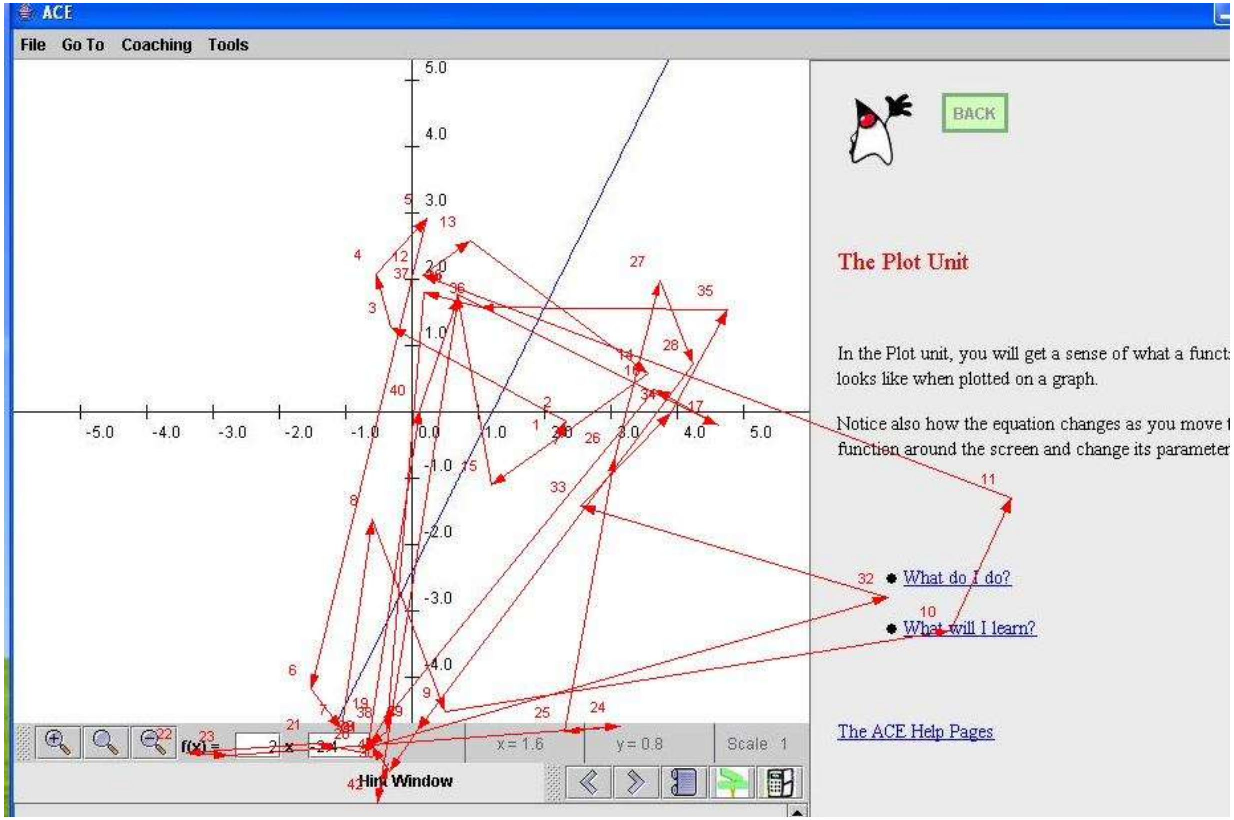
Tracking User Attention

(Merten)

- User can perform many actions, but how to know if they are really learning from them?
- Track User Attention

Feeding Eye-tracker Data to the Model

On line detection of relevant attention patterns (e.g. looking at equation after moving graph in ACE plot unit)

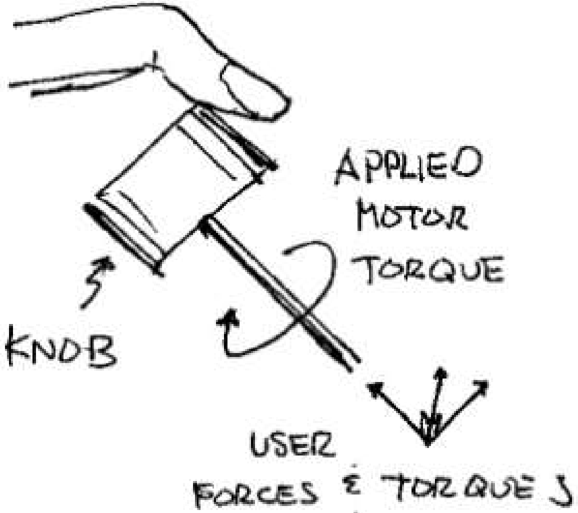


Clamp corresponding nodes in student model

Karon Maclean

<u>Goal</u>: increase the effectiveness of interactive systems providing them with *physical, transparent, multi-sensory interfaces*

<u>Approach</u>: integrate HCI, Cog Sci and Perceptual Psy



Haptic

Goals

- Enable people to “talk” to computers through their hands
- Support expressive control of art & streaming media
- Embedding interfaces in the world:
  cars, homes, portables

Approach

- Haptic force feedback as a small personal robot:
  - applies computer-controlled forces to user's hand
  - represents a virtual environment
  - acts as both an input and output device: user feels & controls at same time.
- Devise a tactile language $\rightarrow$ haptic feedback must represent abstract notions.

  e.g. "red" = urgent, pastel=calm;

Some Projects

- **Hapticons:** communicate info through the touch sense
- **D'Groove:** use haptic feedback to control digital audio
- **Collaboration w/ Immersion, Nissan:** Putting haptic feedback into cars……………
- …………

Hapticons

Def: brief snippets of info received through the touch sense

research questions:

- what will people ***notice, distinguish, associate, like***?
- what's the translation: how can messages be most **intuitive**?
- how can they be made **expressive**?

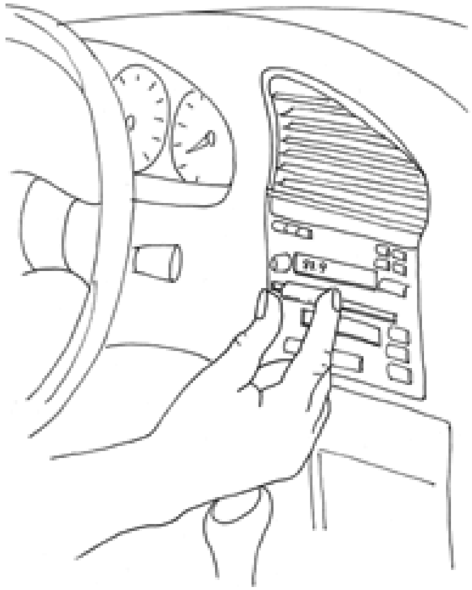
(Enriquez, Chita, Chan)

D’Groove (being used by expert DJ)

(Tim Beamish)

Use haptic feedback to control streaming media: digital audio

Collaborations w/ Immersion, Nissan



Putting haptic feedback into cars

- expand repertoire of what haptic feedback can communicate to drivers – *language!*
- perceptual studies: haptic change blindness?

Intelligent Interfaces related Grad Courses: (all in Term 2)

- CS503: Computational Linguistics – Carenini
- CS532b: Adaptive Interfaces – Conati
- CS543: Physical User Interface Design and Evaluation - MacLean