Memory Footprints in Human-Robot Interaction

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DIGICOSME – Research Days 2016

CONTEXT
Interactive Robotics WorkGroup - DATASENSE

Research themes of group members

- **Affective and social dimensions in spoken HRI; Dialogue; Emotions/Virtual agents; Virtual reality** (LIMSI-CNRS) **Robotics and vision** (ENSTA); **Audio, acoustics and wave** – Multimedia Group (LTCI-Telecom ParisTech) **Interactive robotics** (LISV-UVSQ); **Assistance and interaction** (LISV-UVSQ) **Robotics and health – Interactive robotics** (CEA-LIST); Intermedia (Telecom Sud-Paris) HANDS - HANDicap et Santé (IBISC/ Univ. Evry)
- **Sociology, Psychology and Ergonomy** (SPE-Institut Interdisciplinaire de l'Innovation (I3)) Equipe UCOTIC (Telecom Management); **Robot rights** – CERDI (Jean Monnet-UPSud)

CONTEXT
Interactive Robotics WorkGroup - DATASENSE

Objectives

• Create an Interactive Robotics community in Paris-Saclay :
Verbal/non-verbal/physical Human-Robot Interaction (HRI)

• Gather specialists (not exclusively roboticians):
  – Interaction modeling on corpora (AI, perception, pattern recognition, synthesis)
  – Theories in psychology, social and cognitive sciences, ergonomy, usages

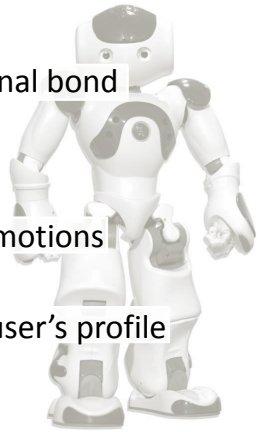
• Broach ethical aspects

LIMSI-CNRS: Example of Work

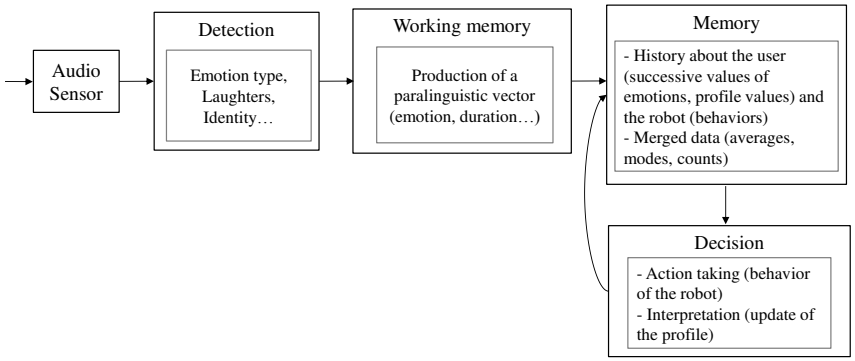
- Work in progress: user's emotional and interactional profile (user model)
(PhD and post-doc Agnes Delaborde)
  – for a better social strategy selection
  (Project BPI Romeo2)
  – to track the robot's decisions and work on legal responsability
  (Project ISN with the CERDI)
- What data can be tracked in the memory of an emotion-sensitive robot?

Social Human-Robot Interaction: Tracking the user's emotional tendencies

- What for?
  - Reinforce the Human-Robot emotional bond
  - Select adapted robotic behaviors
- How?
  - Automatic detection of the user's emotions (in speech)
  - Fuzzy system for the update of the user's profile
  - Emotional and interactional profile



Overview: Emotional Robotic Memory System



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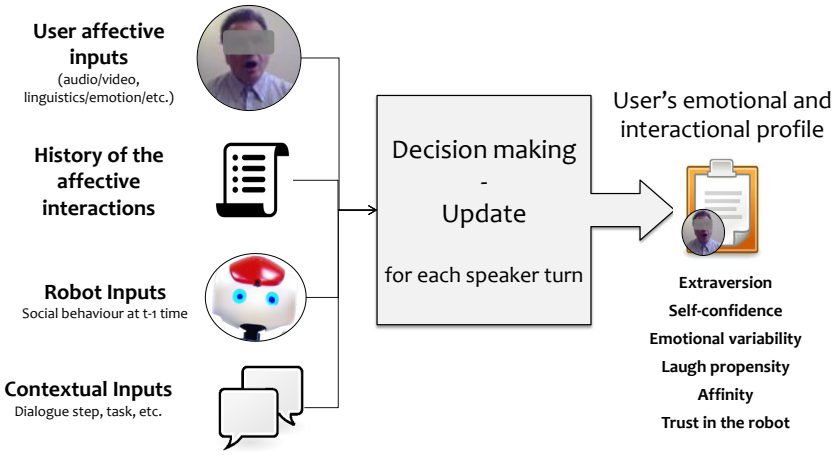
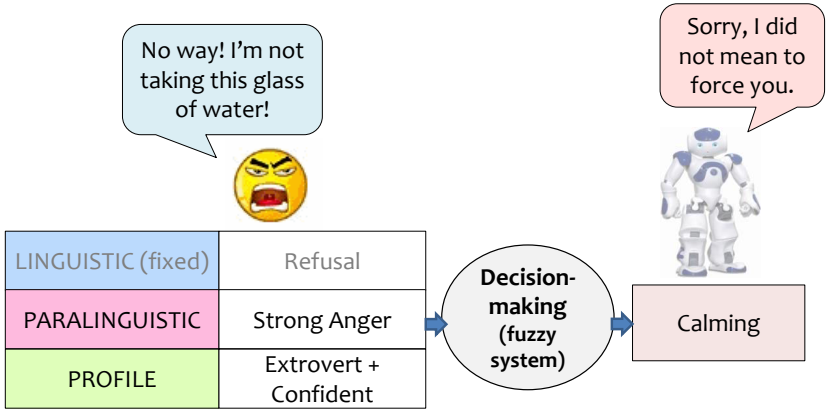
Emotional and Interactional Profile

- Emotional dimensions:
  - Sub-selection of the Five-Factor Model (personality model) (Hofstee et al., 1992; McCrae and John, 1992)
  - Extroversion, optimism, emotional stability, self-confidence
- Interactional dimensions:
  - Interpersonal circumplex (Leary, 1958)
  - Affinity, domination

Emotional and Interactional Profile

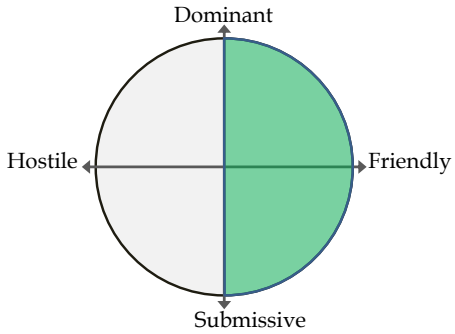


Robot Behavior Selection: Example



Robot Behavior Selection

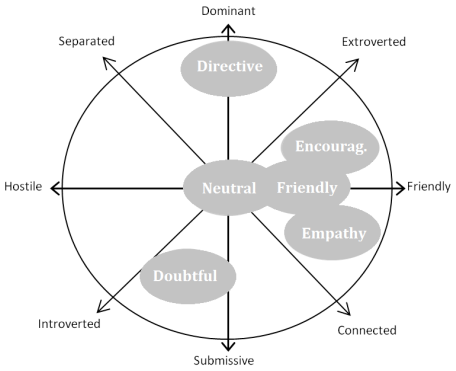
- On the Interpersonal Circumplex



Examples: encouraging, dominant, empathic, calming, cooperating...

Social acceptability assessment

- Preliminary delimitation of the behaviors
  - Desirable: encouraging, friendly, empathy
    Undesirable: neutral, doubtful, directive
  - Users more negative and more active when robot plays undesirable behaviors
    (22 subjects, expert annotation)



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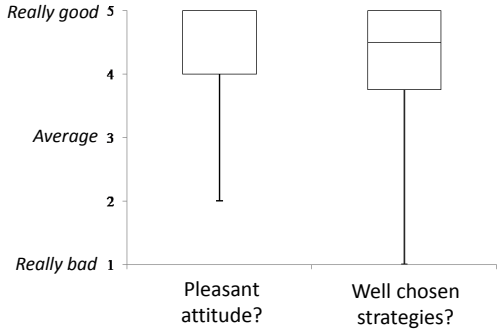
Social acceptability assessment

- Assessment with end-users (negotiation)
  - Good acceptability of the robot's automatic behaviors
    (12 subjects, self-report)



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Diffusion of memory footprints to increase acceptability

- Increase acceptability:
  - robot sensitive to the user's emotions
  - automatic adaptation to the user's tendencies
- Need for the user to understand the robot's decisions
- Transparency and user's information:
  - show what is stored
  - show how the data are processed
  - show the robot's decisions upon these data

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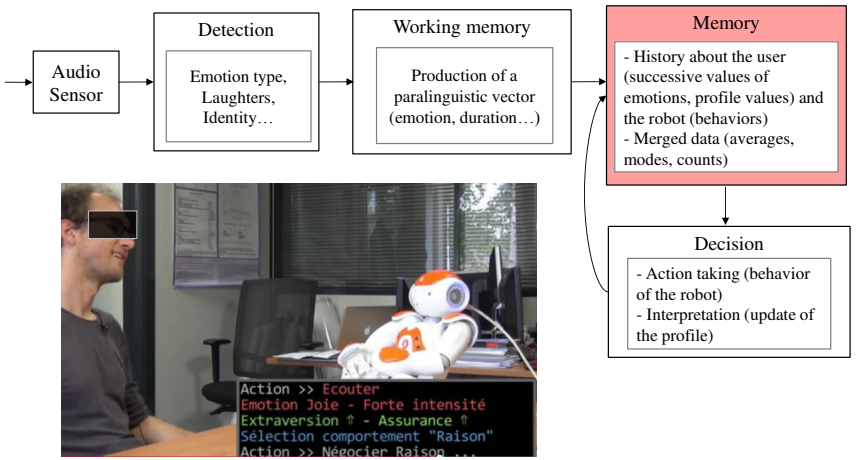
Selective diffusion of information



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Conclusion: Memory Footprints in HRI

- Memory footprints in an emotional HRI system: detection, interpretation, decision
- Diffusion of the memory data?
  - Data about the user, profile, decisions...
  - More transparency about the data recorded and processed
  - Traceability of the robot's decisions
  - Ethical HRI system

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Open Note: Legal Responsability for the Robot's actions

- Particular case: Diffusion for a search of legal responsability
- Faulty or contentious situations caused by the robot
- What data? (nature, secrecy, probative force…)
- Projet ISN TE2R "Traces, Explication et Responsabilités du Robot"

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References

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