



From Imprinting to Adaptation

Building a History of Affective Interaction

Arnaud J. Blanchard

A.J.Blanchard@herts.ac.uk

Lola Cañamero

L.Canamero@herts.ac.uk

Adaptive System Research Group

School of Computer Science

University of Hertfordshire

Hatfield, United Kingdom

“Emotional contagion” E. Hatfield (1994)

- Affective bonds increase interaction
- Interactions increase affective bonds
- Clue to emotional contagion

Problems

- How to manage the affective bonds ?
- When to lead interaction ?



Approach



Approach

- Bottom-up: as simple as possible
- Per-Ac: no explicit world representation
- Biologically plausible
- Developmental

Consequences

- Perception and action at the same level Gaussier Prinz
- The goal is not to do an action but to obtain a perception
- We will use “Goal Perception”

Affectivity between new born and care-taker



1930's Lorenz :

- Birds follow the first thing they saw
- Usually the mother but also humans or objects
- The birds try to keep the first perception
- This phenomena can be a clue to create affective bonds in robots

Goal Perception

- Average of the first perceptions
- The learning rate decreases after the “hatching”
- We apply it to distance perception
- The robot tries to keep the first perceived distance

Video

Observations

- Interesting as it reproduces natural behavior
- But not very useful for daily interaction with agents

Bateson(2002)

- Imprinting is not an “instantaneous, irreversible process”

Notion of comfort

- Distance to the ideal values of the agent
- Relativity of comfort
- Learning faster when comfort is high
- We use different time scales - “Desired Perceptions” :
 - Long terms : very slow changes
 - Short terms : very fast changes
 - We use several time scales in between

Selecting time scale

- High comfort: using short time “Desired Perception”
- Low comfort: using long time “Desired Perception”

To learn, the robot has to accept new perceptions

- When the comfort is very high (no risk)
- When the comfort is very low (waiting for help)

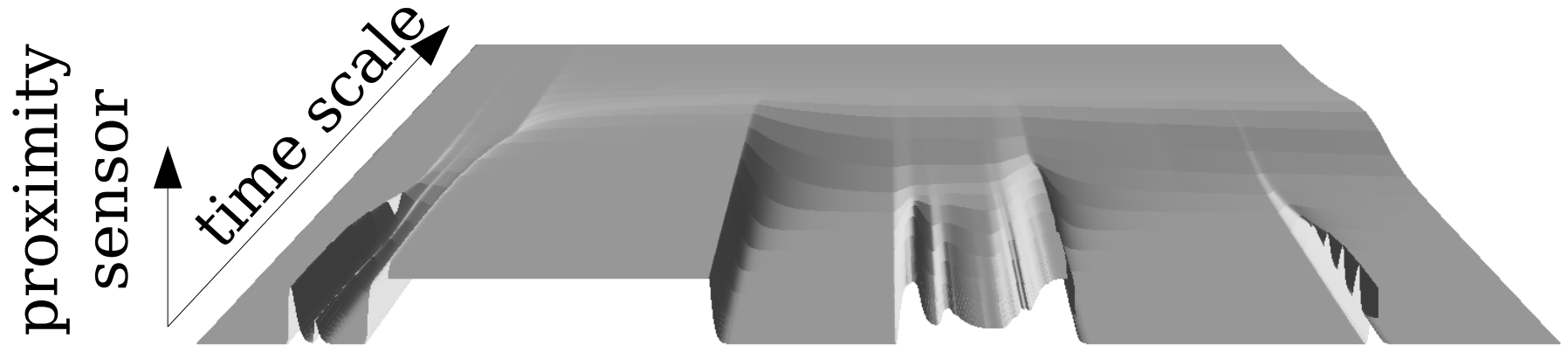
→ **Varying openness to the world**

Comfort management

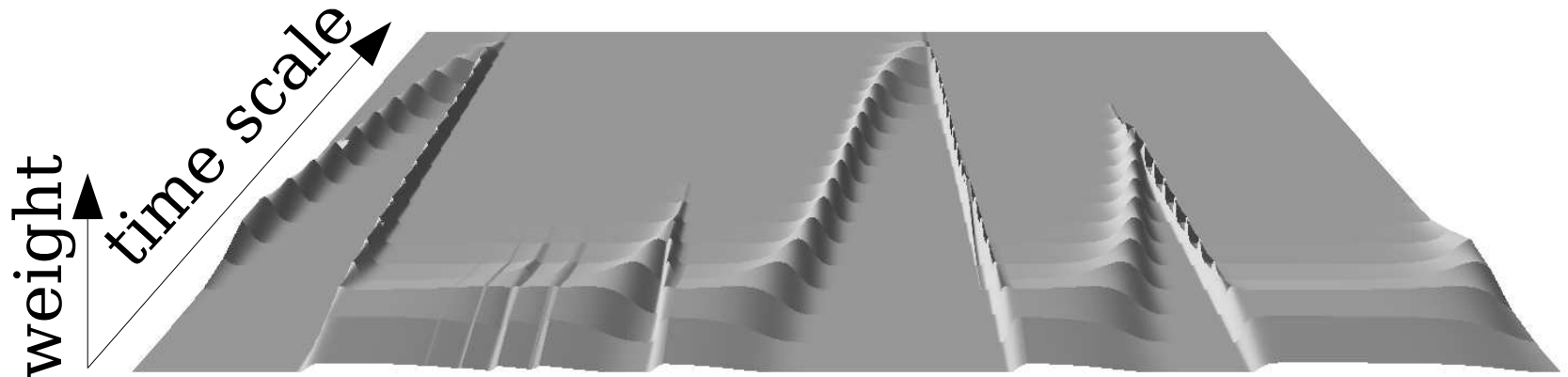
- Homeostatic control
- The comfort increases by touching a side sensor
- The comfort decreases with the time
- The robot tries to keep a high level of contact
- The frequency of beeps reflex the level of comfort

Video

desired perceptions



filter



Affective bonds without symbolic representation

- Similarity with biology
- Learning and acting simultaneous
- Continuity with reinforcement learning
- Capacity to decide when leading the interaction

Further works

- Notion of fear or avoidance
- Active exploration
- Notion of pleasure
- Low level imitation depending on the affective bonds



Thank you for your attention

