IM-CLeVeR: Intrinsically Motivated Cumulative Learning Versatile Robots

www.im-clever.eu

Project Vision and Goals

To design truly intelligent robots we should understand and mimic monkeys, children and human adults which:

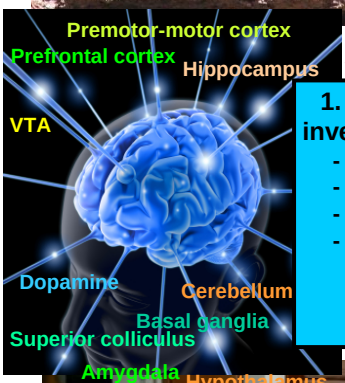
- Learn many skills
- in a cumulative fashion
- on the basis of intrinsic motivations,
- and so can achieve many goals
- in a robust and flexible way.

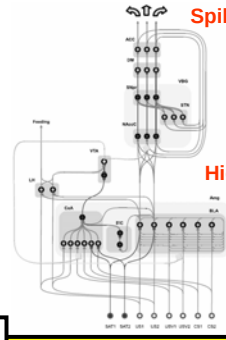
! ! ! Interdisciplinarity is paramount ! ! !

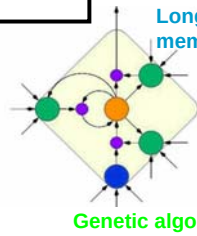
Project Partners

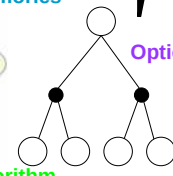
- **Consiglio Nazionale delle Ricerche, Istituto di Science e Tecnol. Cognizione**
- **University of Amherst, Autonomous Learning Laboratory**
- **Università Campus Biomedico, Biomedical Robotics & Biomicrosys. Lab., Laboratory of Developmental Neuroscience**
- **University of Sheffield, Department of Psychology**
- **Frankfurt Institute for Advanced Studies, Neuro Branch**
- **University of Ulster, Cognitive Robotics**
- **Aberystwyth University, Intelligent Robotics**
- **Istituto Dalle Molle Intelligenza Artificiale, Reinforcement Learning Research Group**

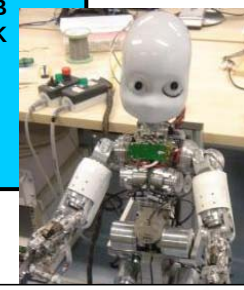
How?











Behavioural repertoire
Evolution
Exploration
Ecological niche
Trial-and-error learning
Adaptation
Response preconditioning
Homeostasis
Spiking neurons
Hebbian learning
Lift-Constraint Act Saturate
Growing neural networks
Leaky neurons
Hierarchical architectures
Error-back propagation
Actor-critic reinforcement learning
Self-organising map

Project Working Hypothesis

Science

1. Empirical investigations:
- Monkeys
- Children
- Adults
- Parkinson patients

WP4: Perceptual abstraction and attention

Suitable representations

WP5: Novelty detection

Focussing learning

WP6: Cumulative learning of hierarchical skills

2. Computational bio-constrained models: mechanisms underlying brain and behaviour

3. Machine-learning models: powerful algorithms and architectures

Technology

4. Two robotic demonstrators:
- CLEVER-B
- CLEVER-K

Decision trees
SIFT
Long-short term memories
Extrinsic motivations
Dynamic interaction
Circular reactions
Options
Policy iteraction
Gabor filters
Data compression
Categorisation
Entropy
Zone of proximal development
Genetic algorithm
Reinforcement learning

Project Details

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Objective: ICT-2007.2.2 Cognitive Systems, Interaction and Robotics

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Total Budget: 7.726.783 euros

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