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Bhargav Teja Nallapu, Frédéric Alexandre

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# The relational and informational organisation in the orbital and medial prefrontal cortex

A study using virtual experimentation  
 Bhargav Teja Nallapu, Frederic Alexandre  
 bhargav.teja-nallapu@inria.fr

INRIA, Institute of Neurodegenerative Diseases, LaBRI Bordeaux

**Prediction learning**  
 Value of Stimuli (Primary/Learned goals and sub-goals)

**Decision Making**  
 Value of Actions (motor decision, options, planning)

- Interoception
- Motivational and emotional evaluation
- Exteroception
- Sensorimotor relations

**Behavior and Cognition:**  
 A matter of loops ...

**Model-free Model-based Reinforcement learning**

- Model-free (MF): long to learn, compact
- Model-based (MB): use **forward models**, more flexible but heavy to compute
- With forward models, goal-driven strategies more tractable than
- MF controls the behavior
- MB trains MF by replays (retrospective memory) and simulations (prospective memory)

**Autonomous learning**

We define our goals by ourselves :

- detection of primary reinforcers
- learning of secondary reinforcers
- attentional processes

We have a motivation to act :

- Fundamental needs
- intrinsic motivation
- goal-driven behavior

and...

- We self-evaluate our performances
- We associate different kinds of learning and information representation
- We cumulate and re-exploit previously learnt knowledge and strategies in different context

**Role of the limbic loops :** Foraging or decision between several targets ?

IOFC: learns values of stimuli (pavlov); menu dependent; sensory representation of rewards, consummatory behavior, Model Based; select the best two options  
 mOFC: reward representation for preparatory behavior (operant, Model Free), integrate levels of need; value difference signal; decide for the goal  
 ACC: integrate cost of effort to decide for the action; inverse value difference signal; if strong signal of conflict, ask for a switch

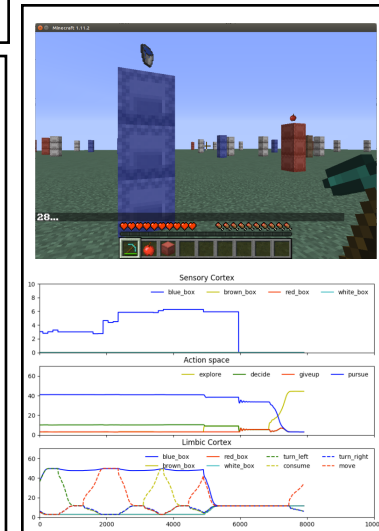
**Defining executive control for a cognitive agent in ecological conditions by autonomous learning**

- Role of the loops between the **frontal cortex** and the basal ganglia for **predicting values, decision making and planning**
- The **limbic loops** decide for the goal and the action
- The **associative loops** bias the default behavior
- The **motor loops** execute the behavior
- **Forward models** associated with limbic and associative loops

**Main circuits for value prediction, decision making and planning**

(a) Motor circuit  
 (b) Associative circuit  
 (c) Limbic circuit

**limbic and motor loops interactions**



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