

The relational and informational organisation in the orbital and medial prefrontal cortex A study using virtual experimentation

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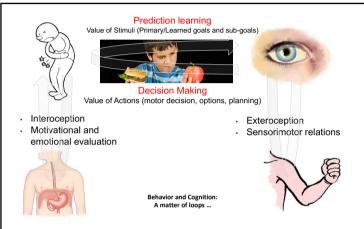
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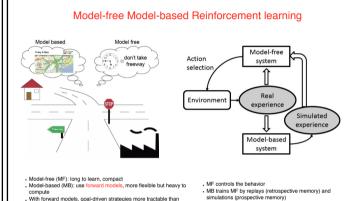
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The relational and informational organisation in the orbital and medial prefrontal cortex

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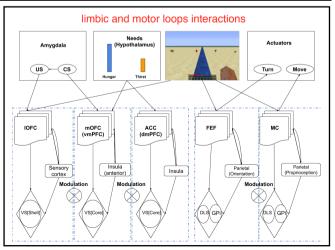
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Role of the limbic loops: Foraging or decision between several targets?

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



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

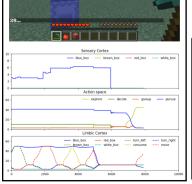
and

- 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

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

20... Sensory Cortex



References

[Alexander et al., 1986] Alexander, G., DeLong, M., and Strick, P. (1986). Parallel organization of functionally segregated circuits linking basal ganglia and cortex. Ann. Rev. Neurosci., 9:357–381. [Johnson et al., 2016] Johnson, M., Hofmann, K., Hutton,

T., and Bignell, D. (2016). The malmo platform for artificial intelligence experimentation [Krack et al., 2010] "Deep brain stimulation: from neurology

[Krack et al., 2010] "Deep brain stimulation: from neuro to psychiatry?." Trends in neurosciences 33.10 (2010): 474-484.

[Rushworth MFS, et al.. 2012] Valuation and decisionmaking in frontal cortex: one or many serial or parallel systems?, Curr Opin Neurobiol (2012)

