

Déroulement du cours

UE « IA et Cognition » (30h): Marie Lefevre

Module « IA Développementale » (12h) Olivier Georgeon

- Lundi 23 septembre: 3h
- Lundi 30 septembre: 3h
- Lundi 7 octobre: 3h
- **Lundi 14 octobre: 3h**

Contrôle des connaissances:

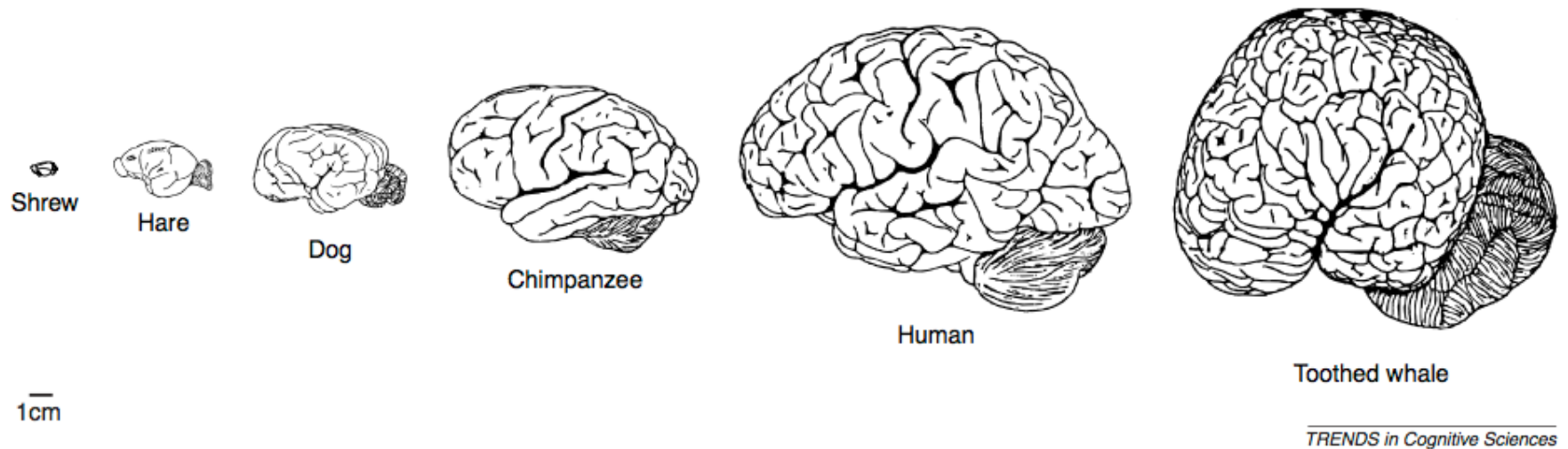
- TD par groupe de 2: 40% de la note de contrôle continu
- Rendu par mail le **samedi 26 octobre à minuit**
- Examen final: 7 points sur 20

Neurosciences

Quel est le poids du cerveau du cachalot?

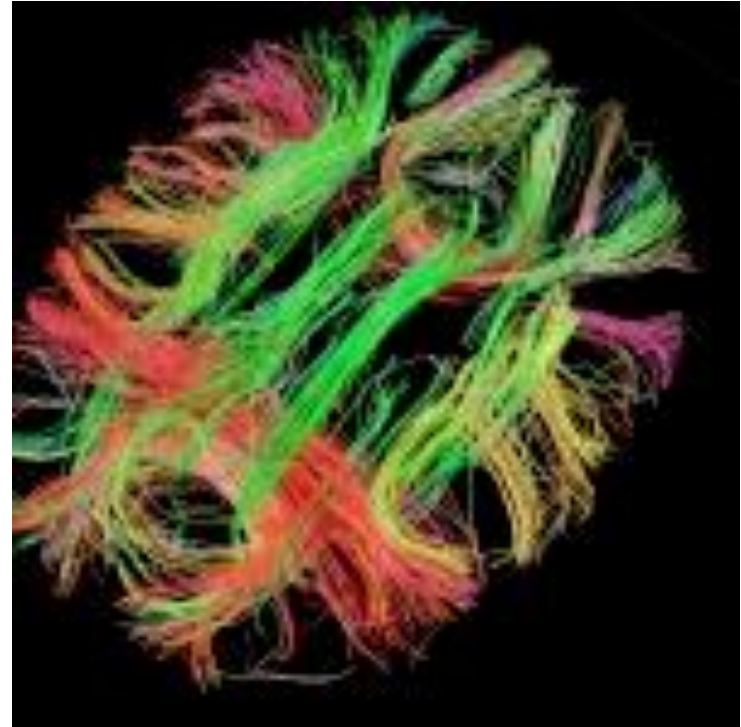
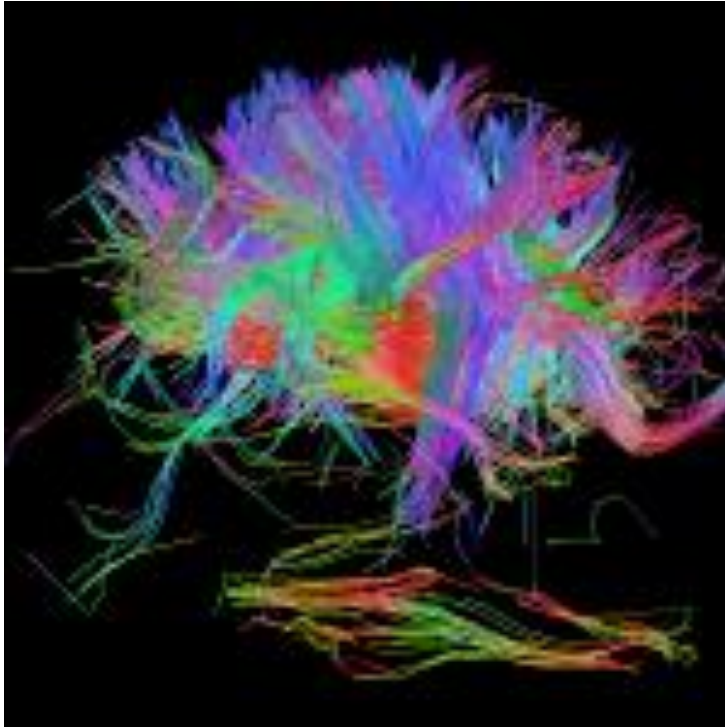
1. 0,9 kg
2. 1,4 kg
3. 2,5 kg
4. 4 kg
5. 7 kg

Autres cerveaux de mammifères



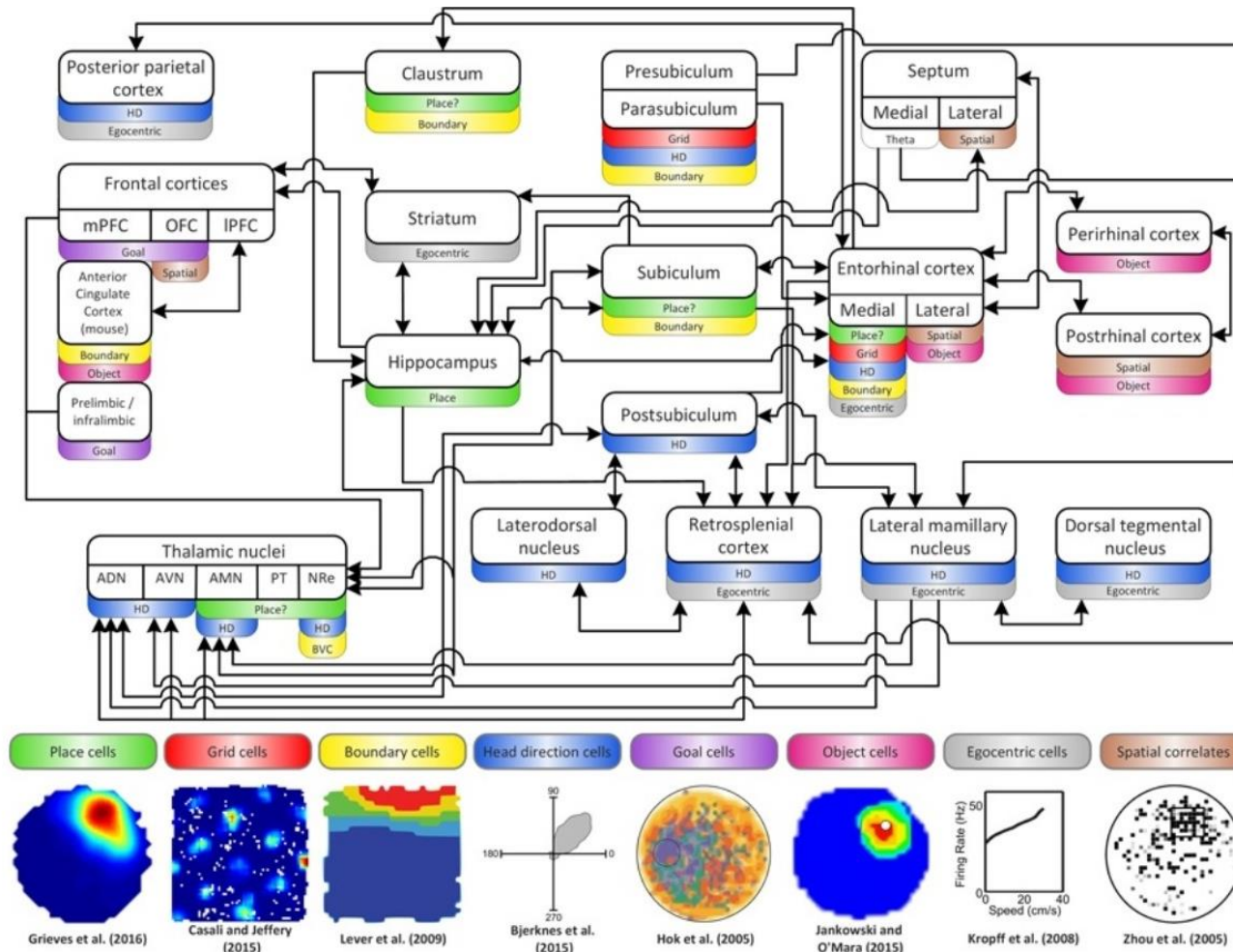
- Continuité? Tous les intermédiaires ont existés.
- Rupture? Il y a des différences innées.
- Les fonctions cognitives humaines (langage, raisonnement) sont basées sur des fonctions cognitives également existantes chez d'autres animaux.

Human connectome



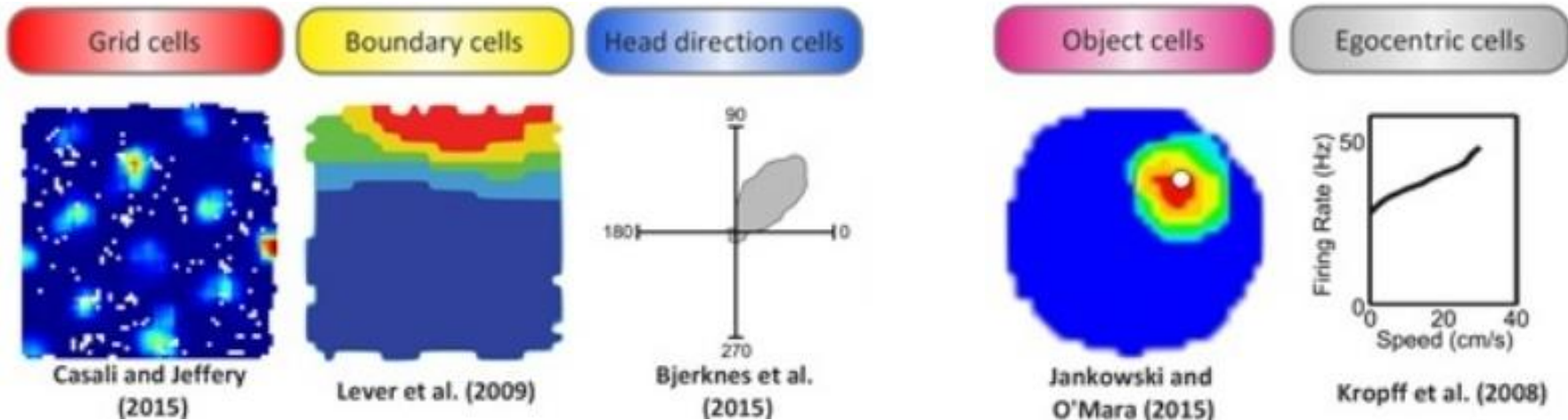
<http://www.humanconnectomeproject.org>

Representation of space in the brain



Grieves & jeffery (2017), *The representation of space in the brain*

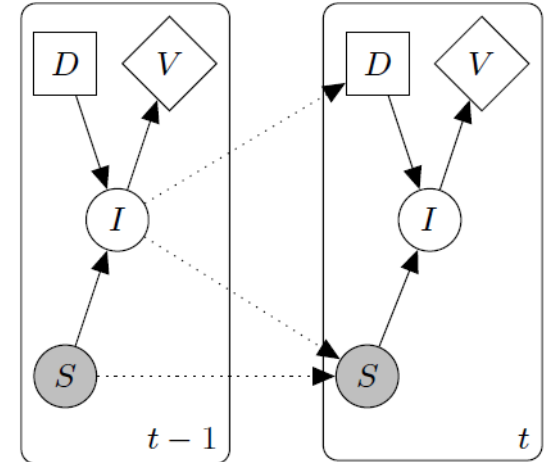
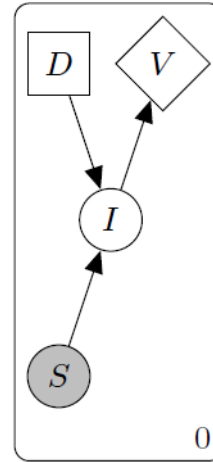
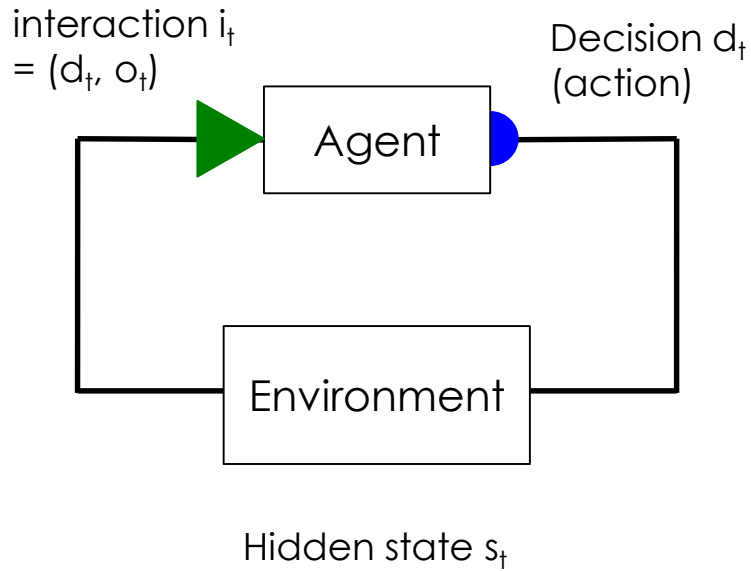
Sources of inspiration



Grieves & jeffery (2017), *The representation of space in the brain*

Apprentissage spatial et temporel

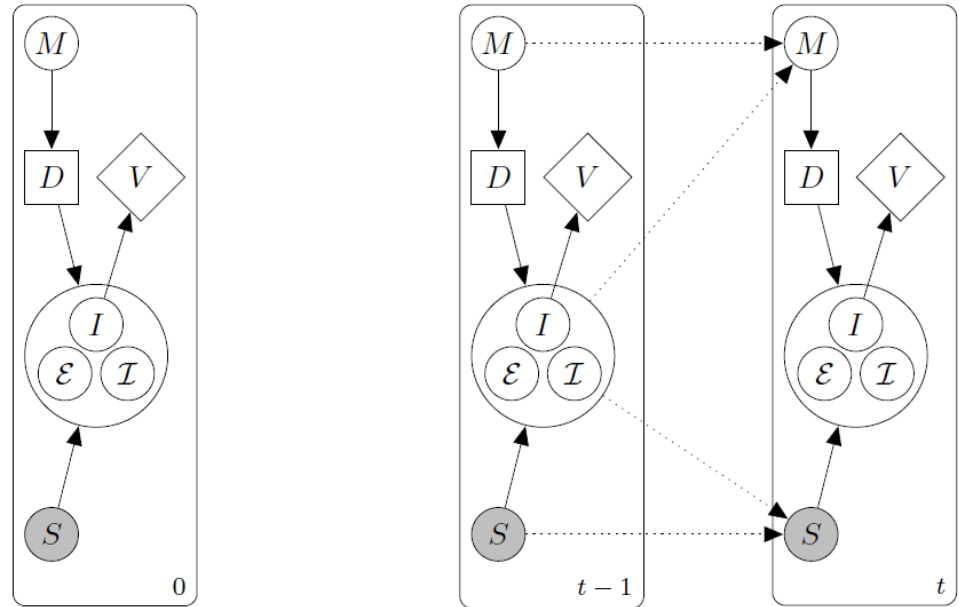
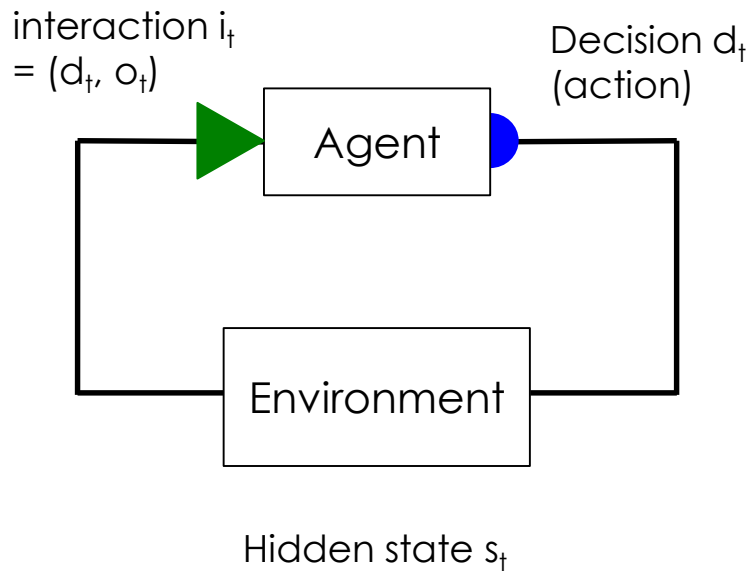
Enactive MDP



History at time t : $h_t = \{i_0, \dots, i_{t-1}\}$

Decision at time t : $d_t := \sigma(h_t)$

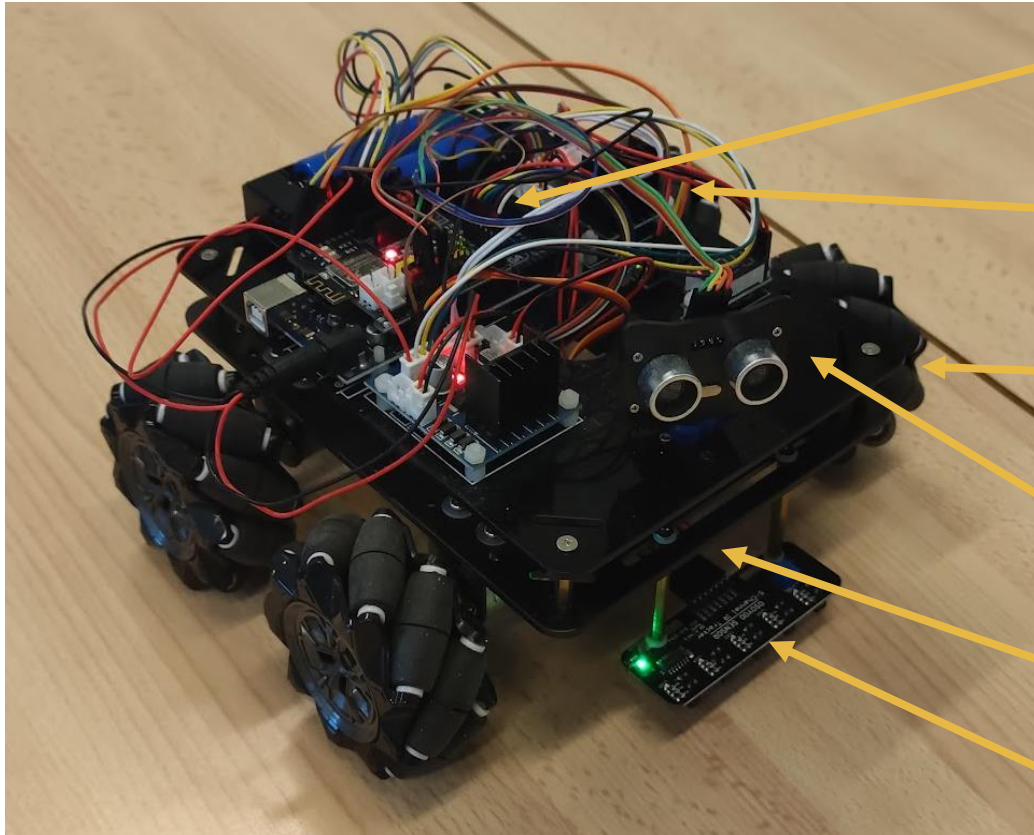
Spatial Enactive MDP



\mathcal{E} : position de l'interaction, \mathcal{I} : isométrie spatiale

History at time t : $h_t = \{i_0, \epsilon_0, l_0, \dots, i_{t-1}, \epsilon_{t-1}, l_{t-1}\}$
 Decision at time t : $d_t := \sigma(h_t)$

Osoyoo robot car



Arduino + wifi board

Inertial measurement unit +
compass

Omni directional wheels

Echo localization sensor
on pivoting head

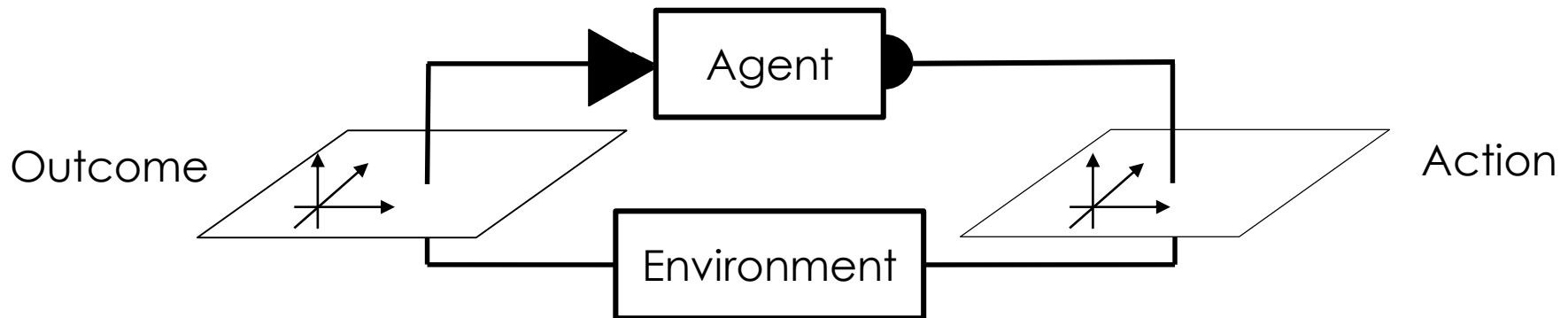
Floor color sensor

Floor luminosity sensor

<https://osoyoo.com/2019/11/08/omni-direction-mecanum-wheel-robotic-kit-v1/>

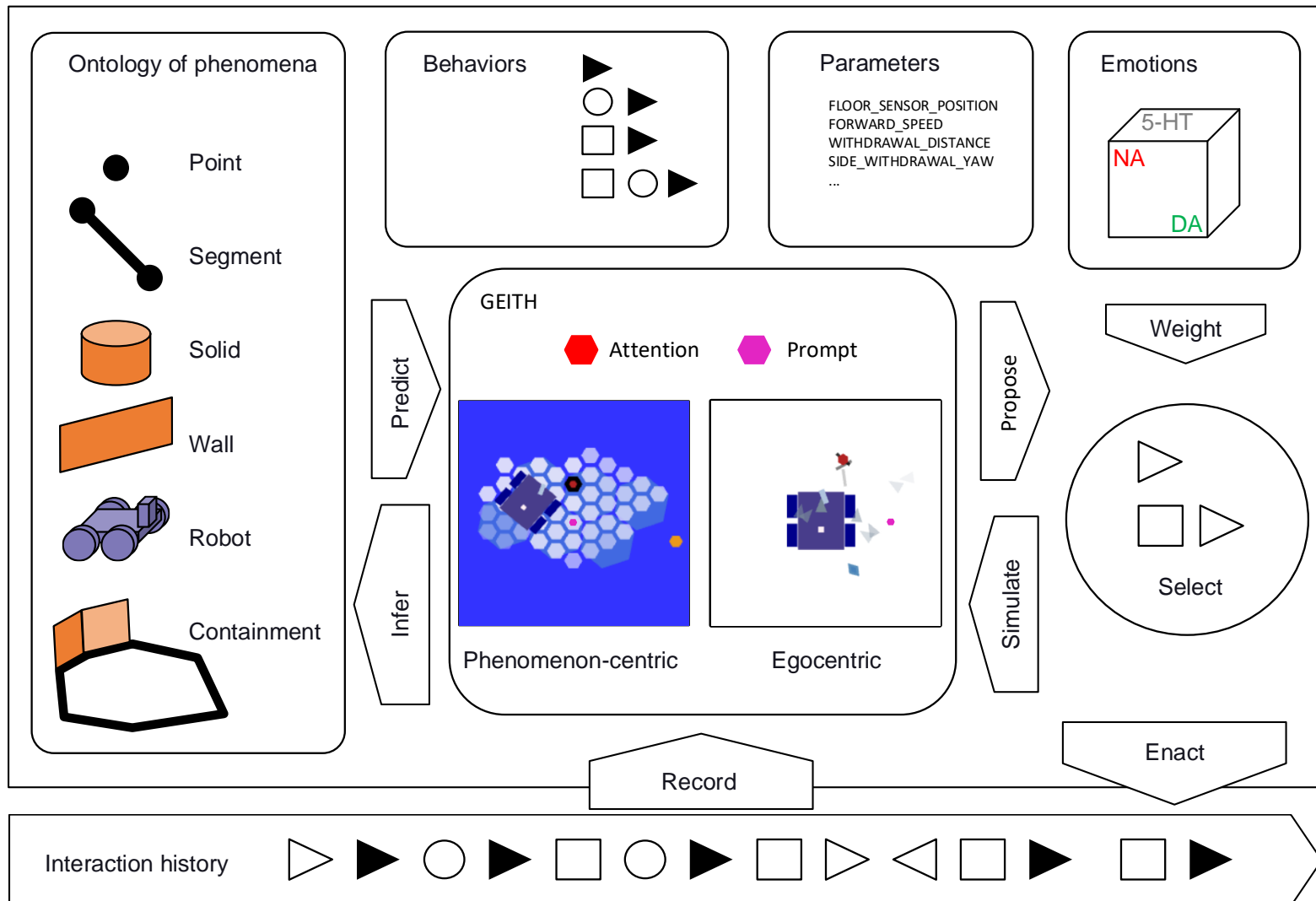
Control loops with spatial information

- Outcome is not representational but contains spatial data
 - Measure of displacement
 - Position of **points of interactions** between the robot and other objects

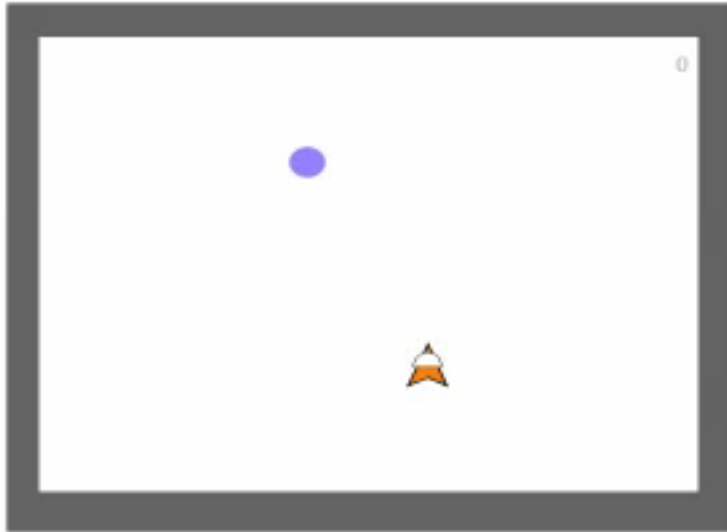


- Proposal:
 - Spatial data is processed by **predefined spatial cognitive structures**
 - The capacity to infer objects from spatially-localized interactions may open the way to more abstract learning
 - Friston & Buzsaki (2017) *The functional anatomy of time: What and when in the brain*

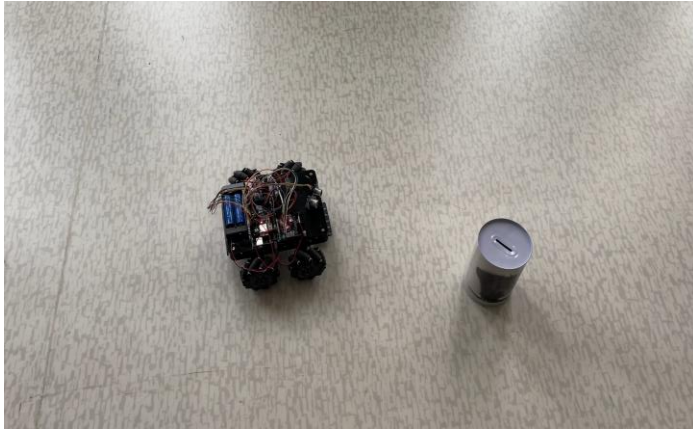
Cognitive architecture



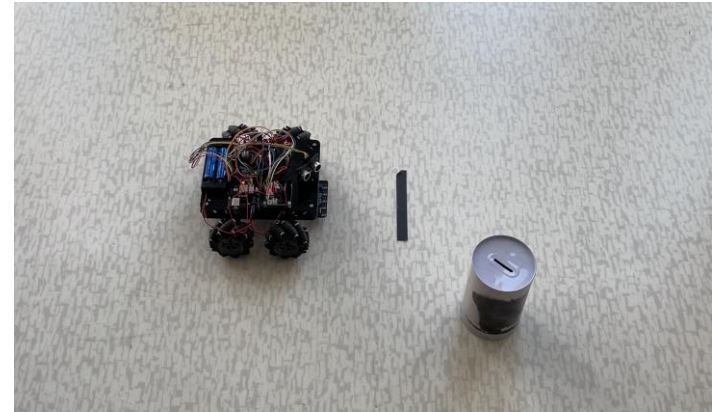
ECA agent exemple 2



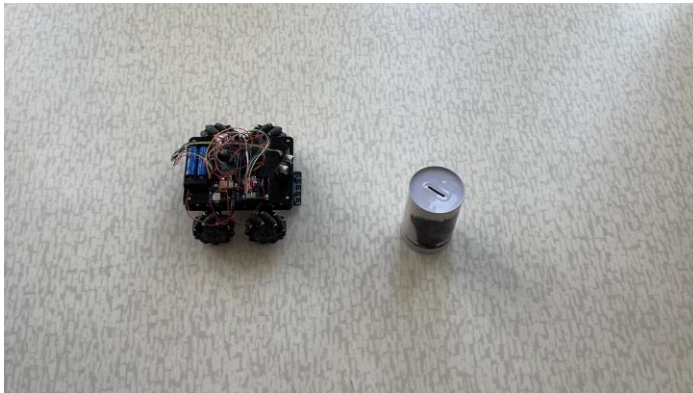
Primitive interactions



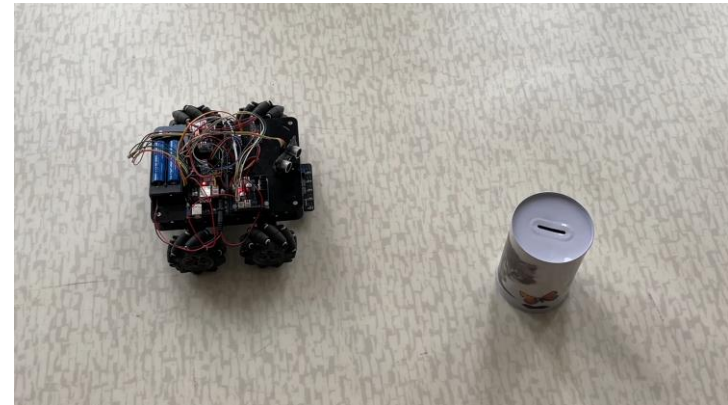
Move_forward with focus



Move forward – line_front

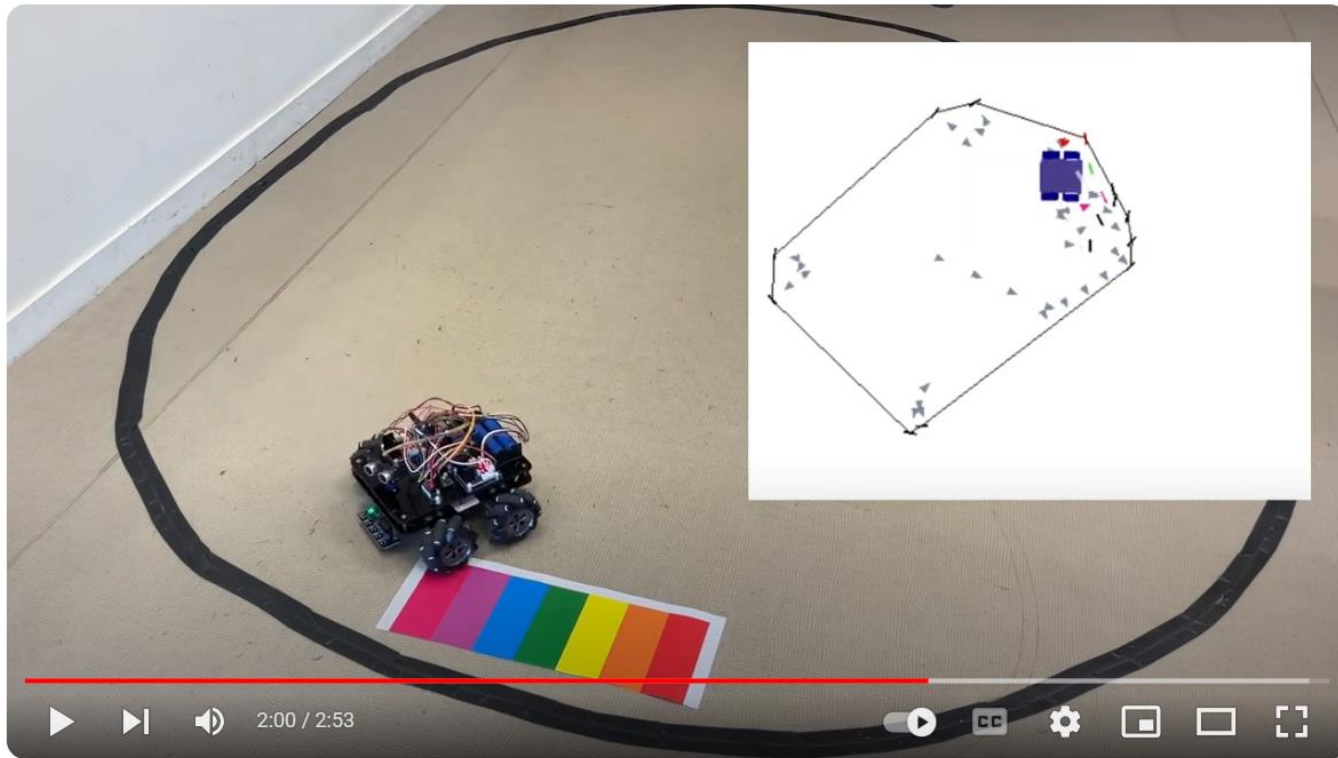


Sweep_right with focus



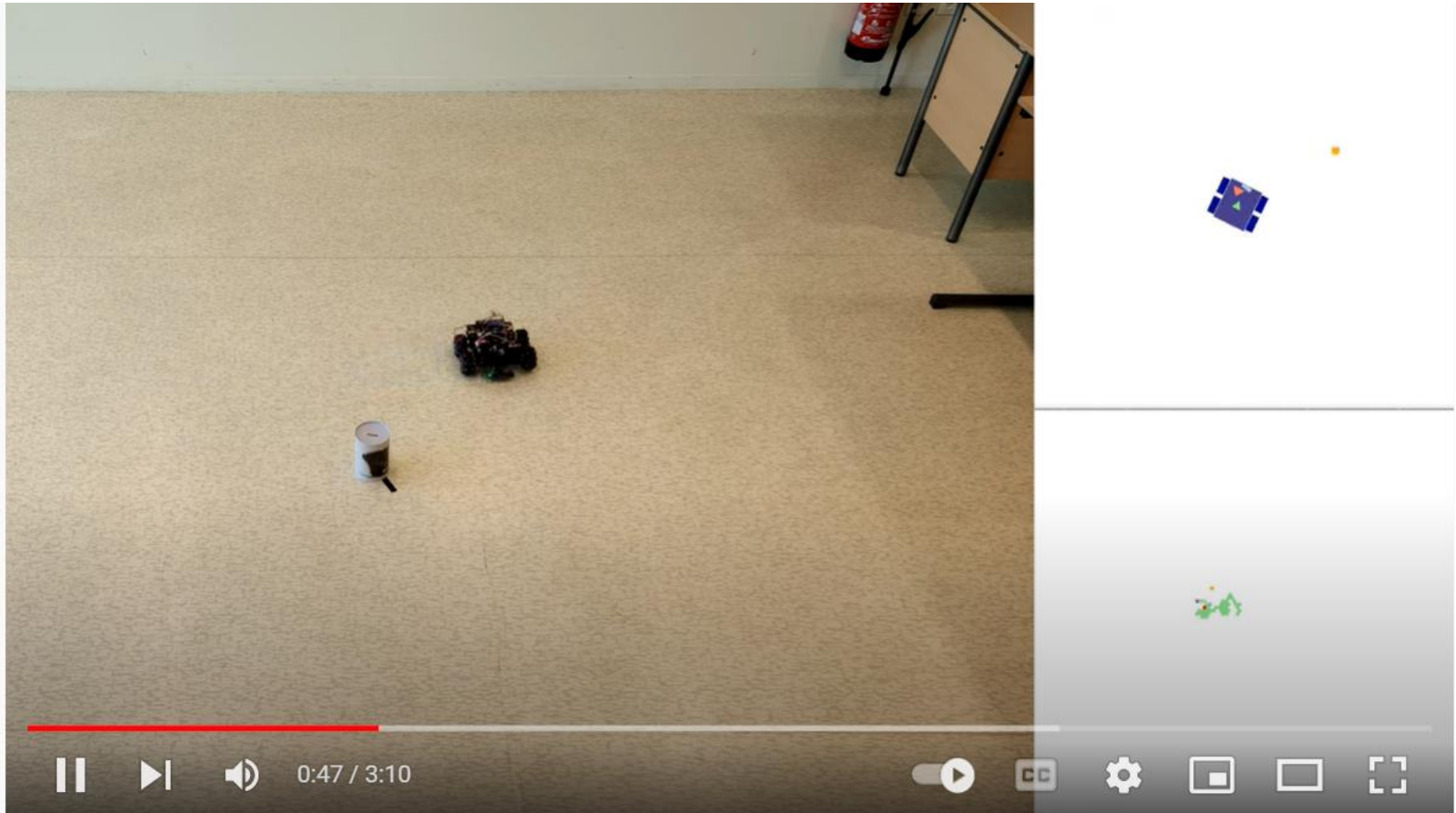
Scan

Exemple spatial



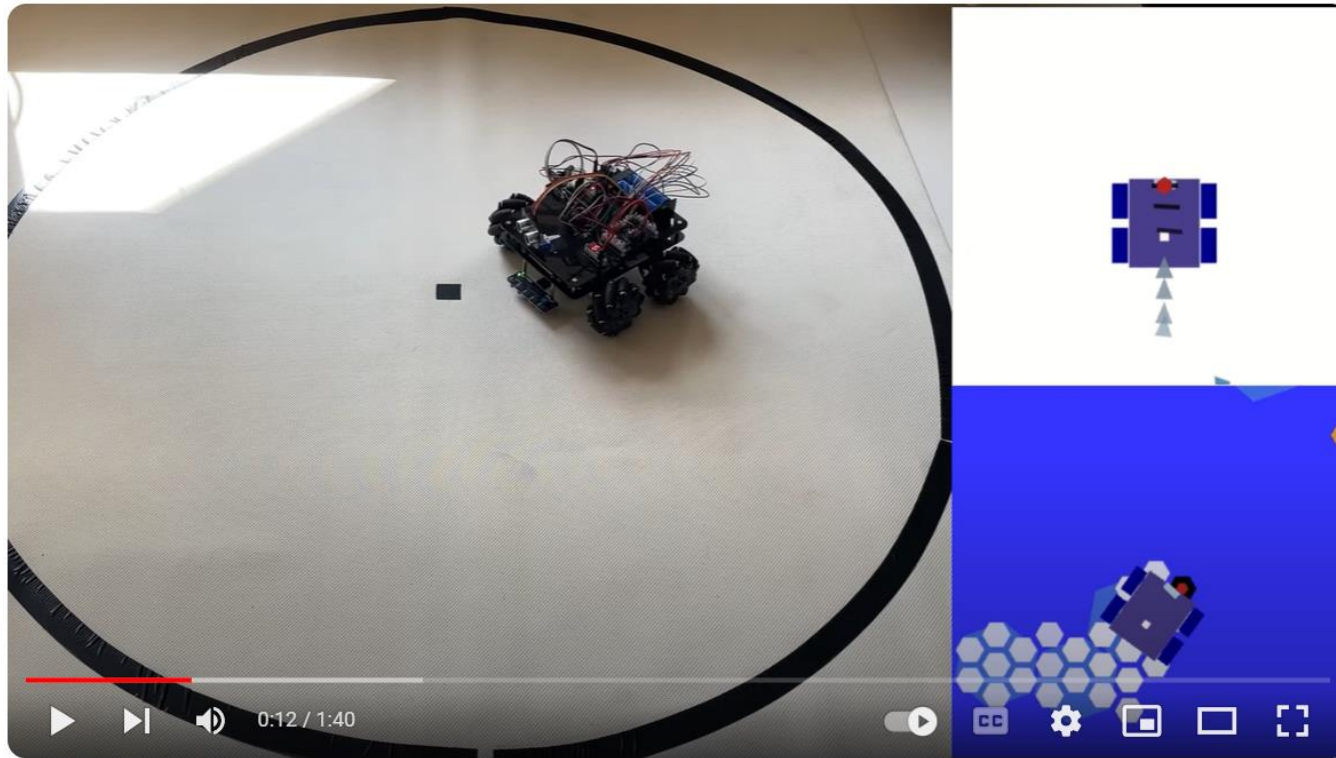
<https://youtu.be/rKYiXNGiyiE?si=9hY8MRxB771tnQ8J>

Demo 3



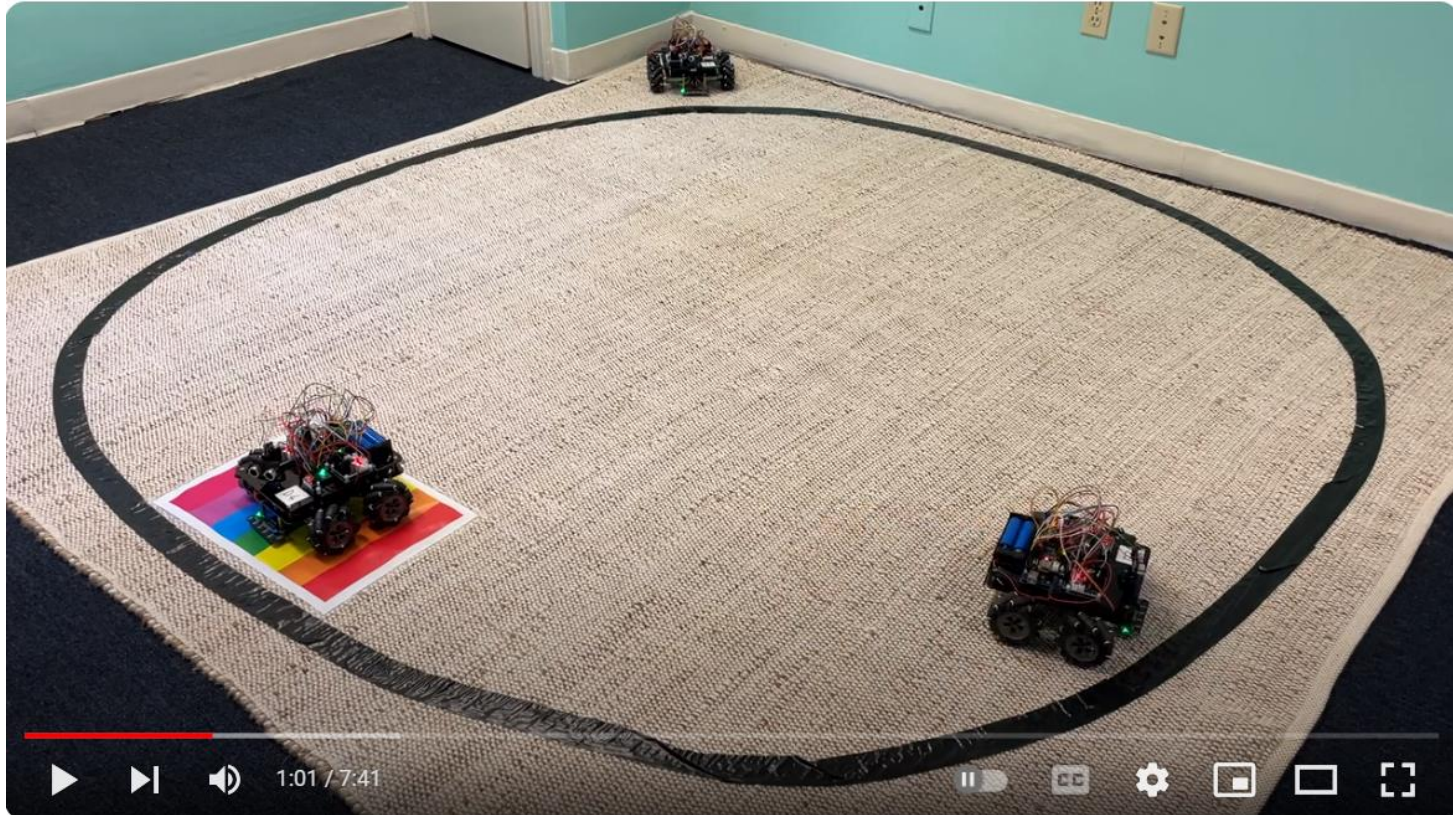
<https://youtu.be/W0X60Ami9Rc>
<https://youtu.be/Sue9yMDq0E8>

Demo



<https://youtu.be/1NpKXTZcqSo>

Comportements sociaux



<https://youtu.be/oOZ4SGSWYDs?si=e-LxyWgXgh5ehBIP>

Travaux dirigés

Séance 4

Setup

Suivre la procédure écrite dans README.md:

<https://github.com/OlivierGeorgeon/Developmental-AI-Lab>

Vous avez deux méthode possibles :

1. Cloner (ou downloader) le repository
2. Ouvrir les notebook avec Google.colab ou un autre outil

Méthode 1: Exécuter world.py et vérifiez que vous obtenez la trace d'interaction montrées dans les consignes

Dans les deux cas: Rendre un seul fichier PDF le **26 octobre**

olivier.georgeon@gmail.com

Agent 4 / Agent 5

