

IA51

Artificial Intelligence

for Games and Serious Games

Final Exam P2021

June 25th, 2021 – 8:00 to 9:00

Online exam on the [UTBM Moodle platform](#)

Vous pouvez prévisualiser ce test, mais s'il s'agit d'une tentative réelle, vous serez bloqué en raison de :

Ce test n'est actuellement pas disponible

Question **1**

Pas encore répondu

Noté sur 2

Let consider the execution cycle of a agent-based simulator, as explained into the slides of the course. This execution cycle is an infinite loop of several steps that a simulator must follow to run a simulation properly.

The following elements are steps of a typical simulation loop.

Drag them on the screen in order to change the order of the steps for building a valid simulation loop.

Notification of the agent environment observer

Deliberative process of the agent

Computaton of a desire of action by the agent

Creation of an event containing agent perceptions and firing of it

Gathering of influences

Update of the environment data structure

Detection and solving of conflicts among the desires of actions

Reading of the agent environment data structure for computing agents' perceptions

Reading of perceptions by the agent

Increment of the simulated time

Computation of the endogenous processes of the agent environment

Question **2**

Pas encore répondu

Noté sur 1

In the definition provided by Cray Reynold, the agent motion behaviors are within one of two big families of behaviors: the kinematic behaviors or the steerings behaviors.

What is(are) the expected output(s) of a **kinematic** behavior?

Each of the possible answers below shows to you the name of the output, and the unit of its values.

Veillez choisir au moins une réponse :

- a. planar speed (m/s)
- b. planar acceleration (m/s²)
- c. planar distance (m)
- d. rotation acceleration (r/s²)
- e. rotation speed (r/s)
- f. direction angle (r)
- g. planar position (x,y)

Question **3**Pas encore
répondu

Noté sur 1

According to the definition of the concept of Agent given by Michael Wooldridge, select the 4 major properties that are defining an agent.

Veillez choisir au moins une réponse :

- a. Pro-activity
- b. Adaptability
- c. Autonomy
- d. Ability to react to the environment events
- e. Ability to interact with other agents
- f. Ability to interact with the environment
- g. Robustness
- h. Happiness

Question **4**Pas encore
répondu

Noté sur 1

You would like to create a serious game application for a car driver. In this case, the **real human user** is connected to the software system with a Virtual Reality helmet.

Select the component of the software simulator that must be connected to the helmet software in order to be sure that the real human user is included into the simulation process without breaking the rules of the virtual universe.

Veillez choisir une réponse :

- a. Avatar as a graphical representation of the human user
- b. Avatar as a object-oriented specialization of the agent body.
- c. The graphical user interface of the simulator
- d. The influence resolution module of the environment
- e. Agent that is representing the human being user into the simulation

Question **5**Pas encore
répondu

Noté sur 3

You have to write the behavior of a warrior within a First-Person Shooter Game. The warrior has the double goal to kill any other player on the map, whatever the type of environment (indoor, outdoor); and to stay alive as longer as possible.

A warrior is able to move on the ground (no jump, no vertical motion). A warrior has a gun that could be recharged with bullets, picked on the ground. A warrior has a life level that could be increased by picking up a medkit on the ground.

1. **Identify the motion behaviors** that must be used by an agent that is implementing the warrior's behavior. Each of these behaviors must have a running function named "run" (the list of arguments is defined by yourself according to your needs for writing the algorithm in the following point).
2. Assuming the agent's perception is a list of the positions of the other warriors around, **write the algorithm of the warrior** in order to invoke the run functions of the identified motion behaviors.

An algorithm is written with pseudo-code. You do not need to write an algorithm by using a specific syntax, such as one of the SARL, Java, C# languages.

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Question **6**Pas encore
répondu

Noté sur 1

You have to write the behavior of a car driver within a simulator. In this question, all the simulation modules were already implemented. You have a list of modules to execute.

Provide the list of the modules in the right order, for representing the execution of a single loop of the simulation life-cycle, that was presented in the IA51 lectures.

You have to drag and drop the boxes in order to put them in the right order.

Get the agent perceptions

Determine the valid actions to be applied to the bodies

Gather agents' accelerations

Detect conflict among the influences

Compute the sets of perceived objects for each agent

Compute the acceleration to apply to the vehicle

Apply the accelerations to the different bodies

Update the path to follow

Give the perception to the bodies

Increase simulation time

Give the acceleration to the body as an influence

Question **7**Pas encore
répondu

Noté sur 1

Is a video game a serious game application?

Sélectionnez une réponse :

 Vrai Faux

Question **8**Pas encore
répondu

Noté sur 2

Let O a set of obstacle objects, and (p_x, p_y) the position on the plane of the obstacle object $p \in O$.

The set O is composed by two sub-sets, $O = S \cup D$, where S is the set of static (immobile) objects, and D is the set of dynamic (mobile) objects.

Let (a_x, a_y) the current position of the agent a .

Let (t_x, t_y) the position that the agent a would like to reach as fast as possible.

Write the equation that enables to compute the safest direction (according to the social force model) for the motion of the agent a in order to avoid collision with all the obstacle objects within O .

You could use the equation editor (the icon that looks like a calculator) that is provided in the text area below for giving your answer.

If you add constant names into your equation, give a short explanation of its meaning below the equation.

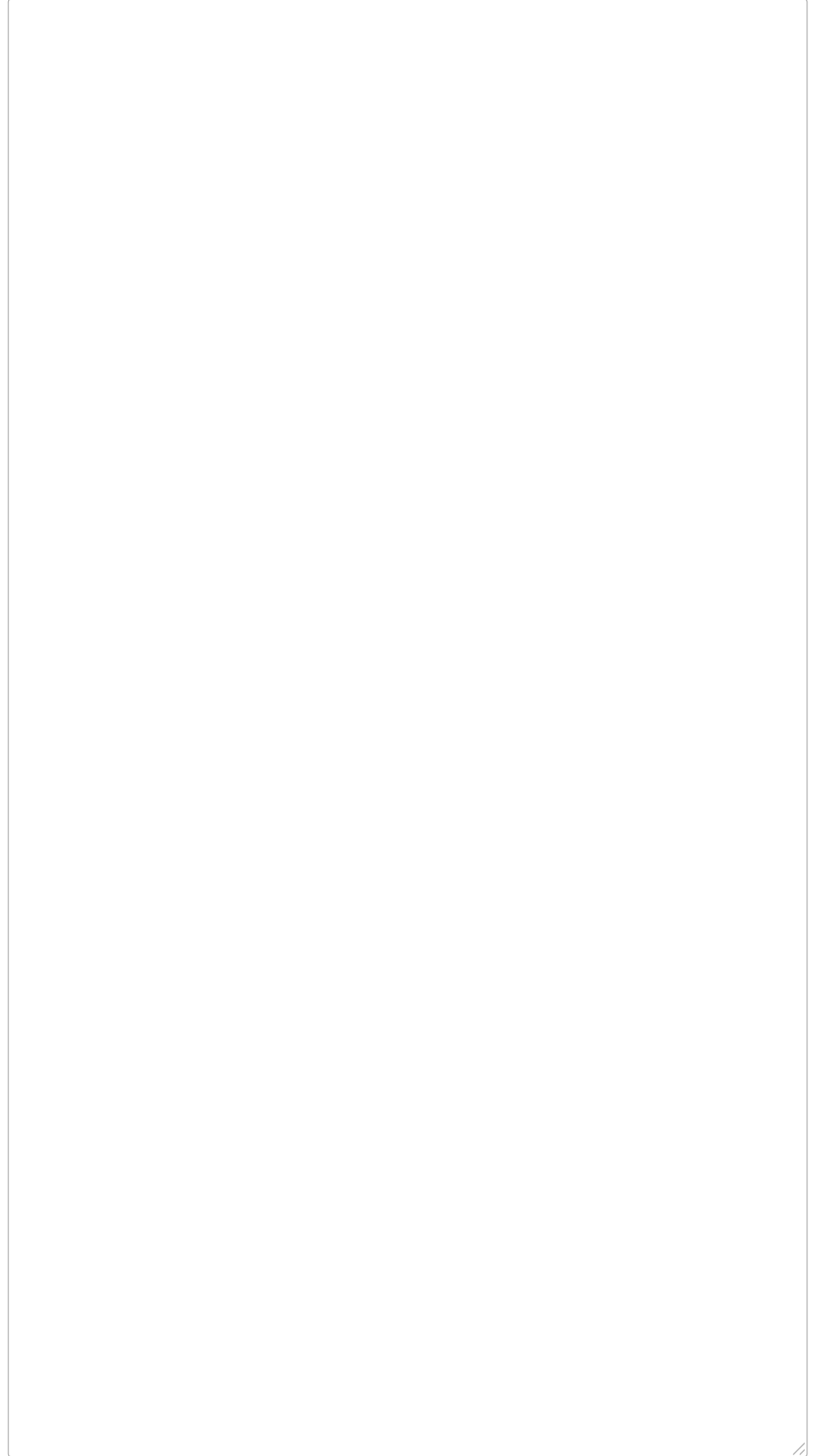
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Question **9**Pas encore
répondu

Noté sur 1

Excluding the agent's body and the environment, what are the three typical layers within the agent's architecture? Explain briefly each of them.



Question **10**Pas encore
répondu

Noté sur 1

The goal of this exercise is to write a motion algorithm for pursuing an agent.

Let the following input values:

- (px, py) the 2D floating-point position of the agent a_1 the agent environment
- (vx, vy) the 2D floating-point velocity of the agent a_1 , expressed in $\langle span \rangle m/s$
- (ax, ay) the 2D floating-point acceleration of the agent a_1 , expressed in $\langle span \rangle m/s^2$
- (tx, ty) the 2D floating-point position of the agent a_2 to pursue on the agent environment
- (ox, oy) the 2D floating-point position of the agent a_3 around the agent $\langle span \rangle a_1$
- s the speed in m/s of the agent a_1
- l the acceleration in m/s^2 of the agent a_1

Write the algorithm for the pursuing motion behavior when it is defined as a *steering behavior*.

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Question **11**Pas encore
répondu

Noté sur 3

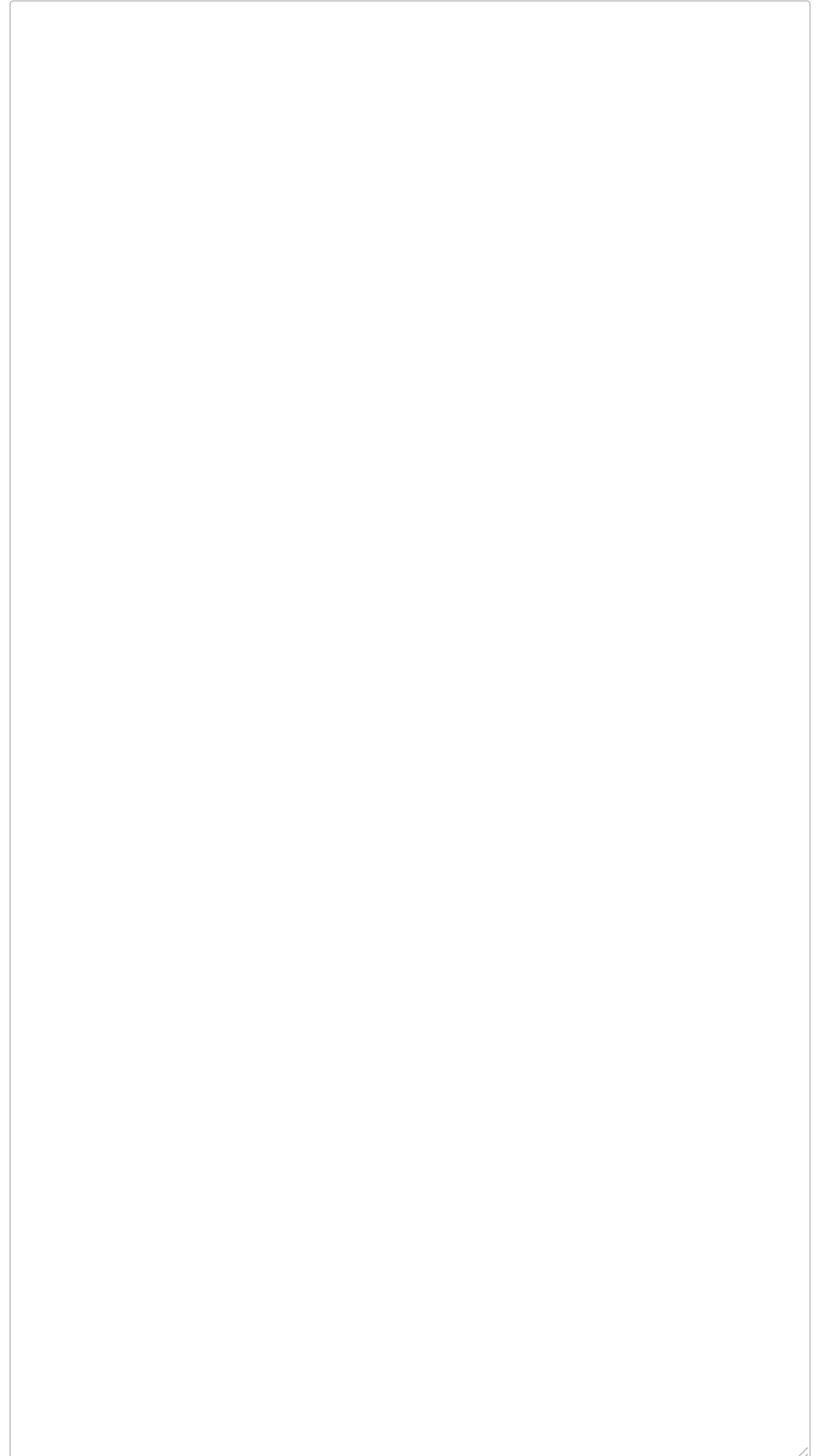
Consider a continuous environment for modeling the indoor of a building. A building is composed of rooms and corridors. Each door in the building is connecting a room and a corridor. Each room may contains objects (tables, chairs, etc.)

The purpose of this environment is to be used into evacuation simulation in case of fire in the building.

In this question, you have to focus on the design of the environment model for this type of simulator.

What is the best spatial dimension (1D, 2D, etc.) to be used for defining the environment model? Explain why the given dimension is the best.

According to your answer, **what is the best software data structure** to be implemented in order to store the whole set of objects in the building? Explain why this data structure is the best.



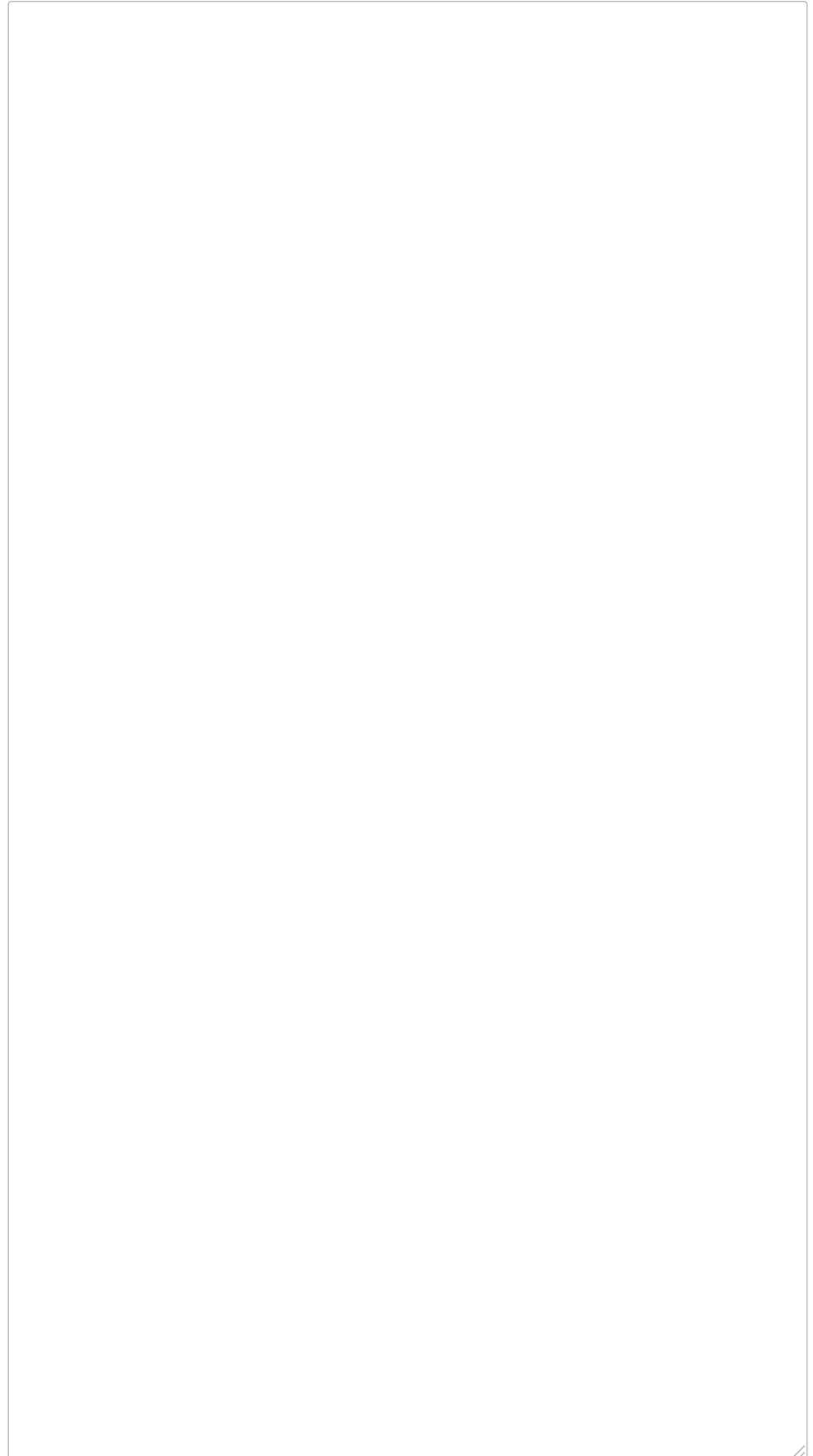
Question **12**Pas encore
répondu

Noté sur 1

Considering the part of the simulation process during which an agent is acting within the environment, the state of the environment should be changed according to the behavior of the different agents.

Within the environment module of the simulator, what is an agent influence? And, what is an agent action?

Explain briefly each of these two concepts, and their difference(s).



Question **13**Pas encore
répondu

Noté sur 1

Agent-Oriented Programming (AOP) and Object-Oriented Programming (OOP) are two paradigms that enable the developers to create their software.

In the following, several statements are provided. Complete each statement with the correct end of sentence in order to express the key differences between AOP and OOP.

Drag (with your mouse) an answer from the right list in order to attach in to the sentences on the left.

Agent's state is composed of	Faites glisser votre réponse ici	internal data structures
Regarding the features that are exhibited by an object in OOP, an object provides to the other objects	Faites glisser votre réponse ici	functions, fields and properties
Object's state of composed of	Faites glisser votre réponse ici	communication end-points
Regarding the features that are exhibited by an agent in AOP an	Faites glisser votre réponse ici	symbolic names
		Fields values
		access to public functions

Question **14**Pas encore
répondu

Noté sur 1

Agents may interact together by using the principles of Stigmergy. According to the definition given by Jean-Paul Grassé, Stigmergy is the "stimulation of workers by the work they perform."

Parunak has extended this definition in order to be applicable to multiagent systems. What is the stigmergy in multiagent system?

Give your answer with a brief text (in French or English).

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