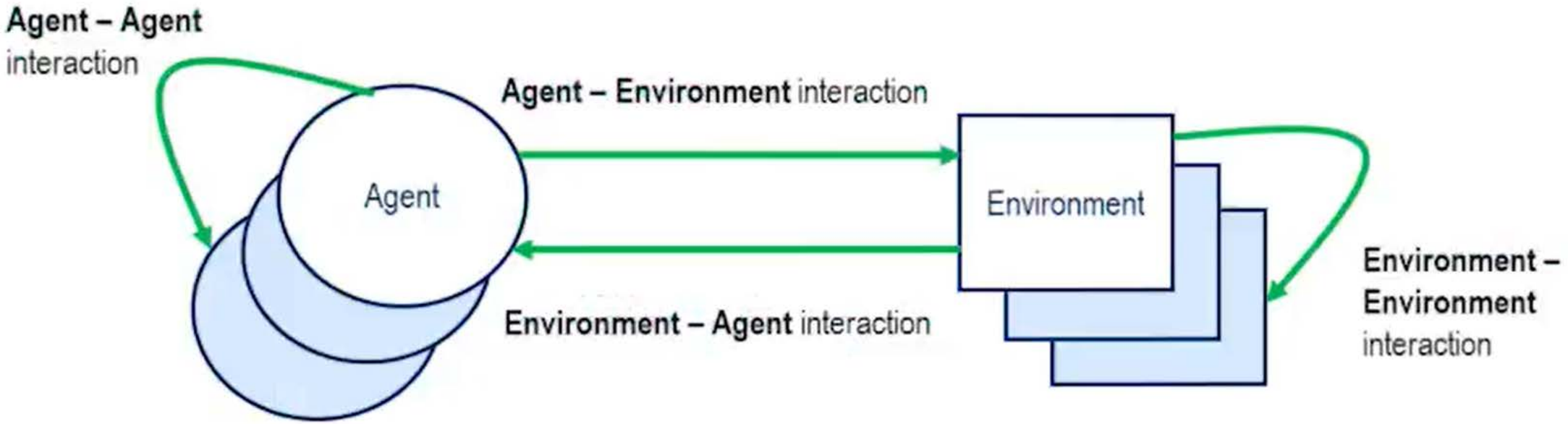
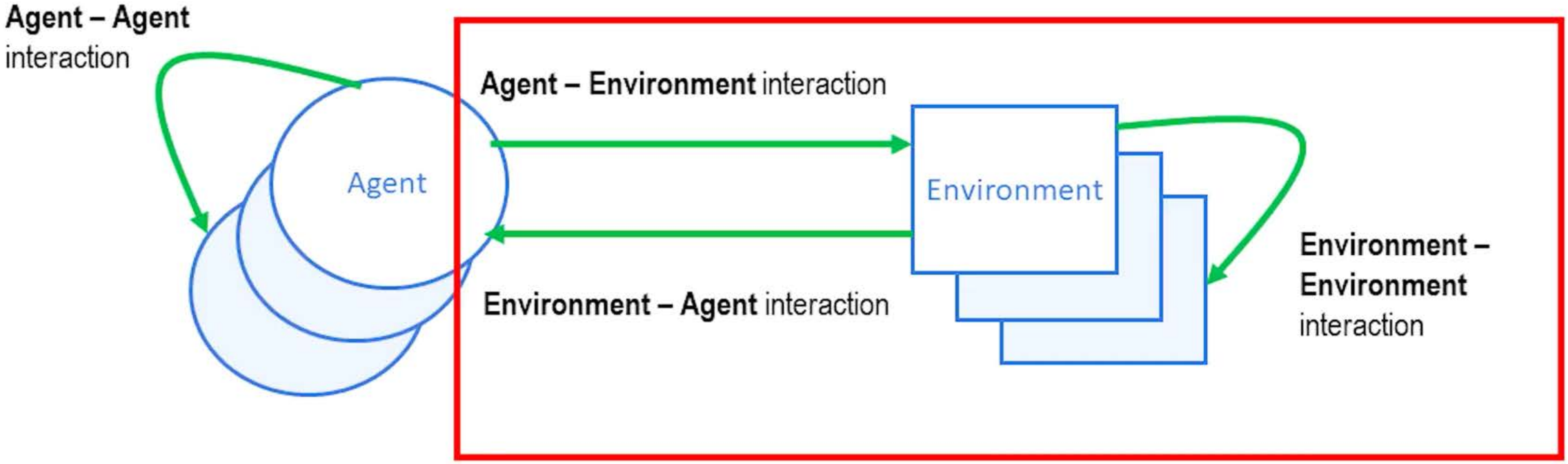
VARIOUS TYPES OF INTERACTIONS



Adapted from Batty (2005)

VARIOUS TYPES OF INTERACTIONS

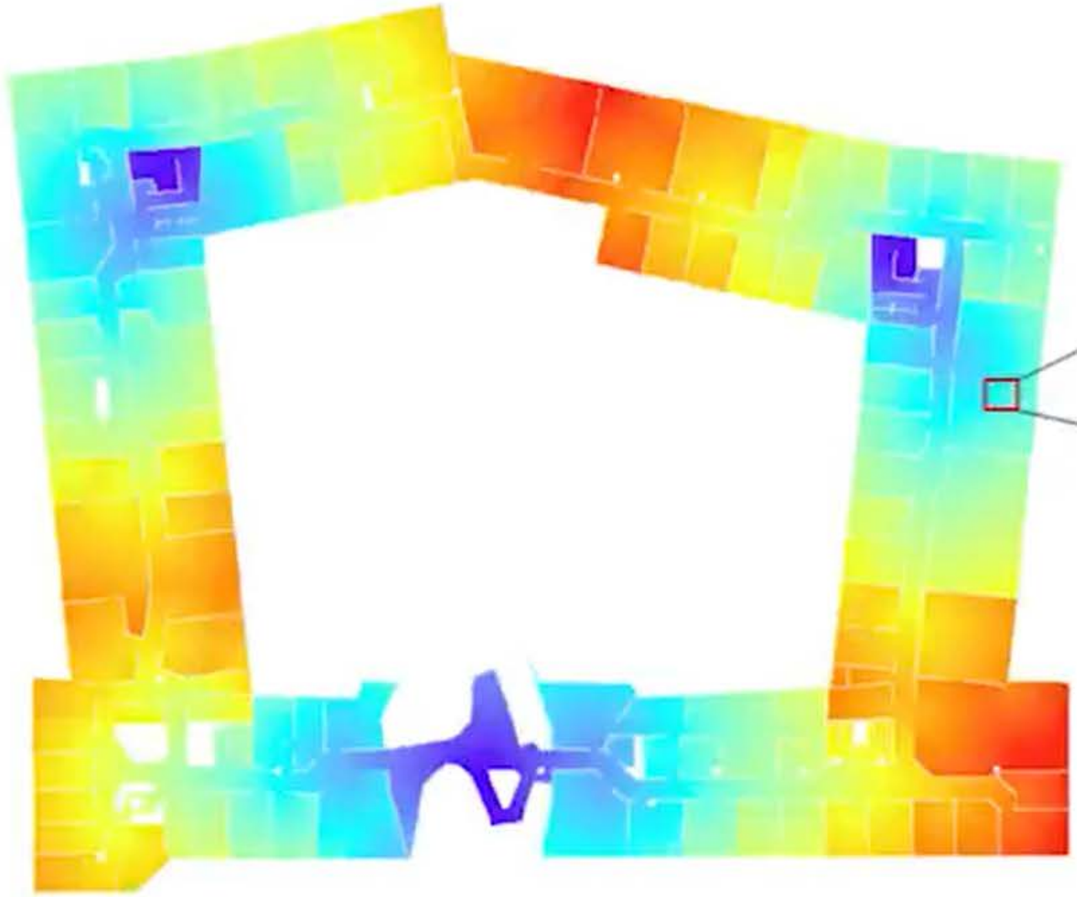


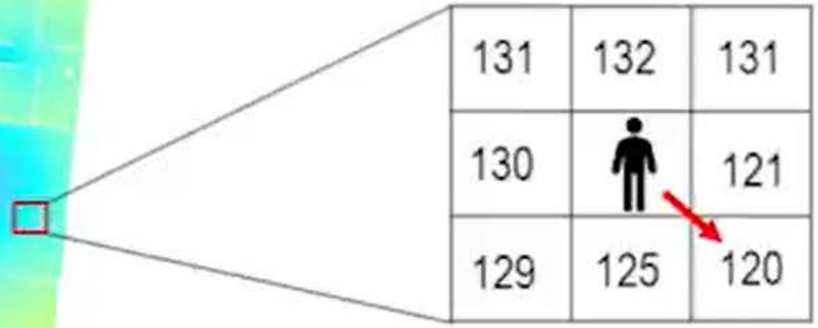
Adapted from Batty (2005)

HOW CAN ENVIRONMENTS CHANGE?

- Because of an action of an agent
- On their own
- Because of a change in another environment

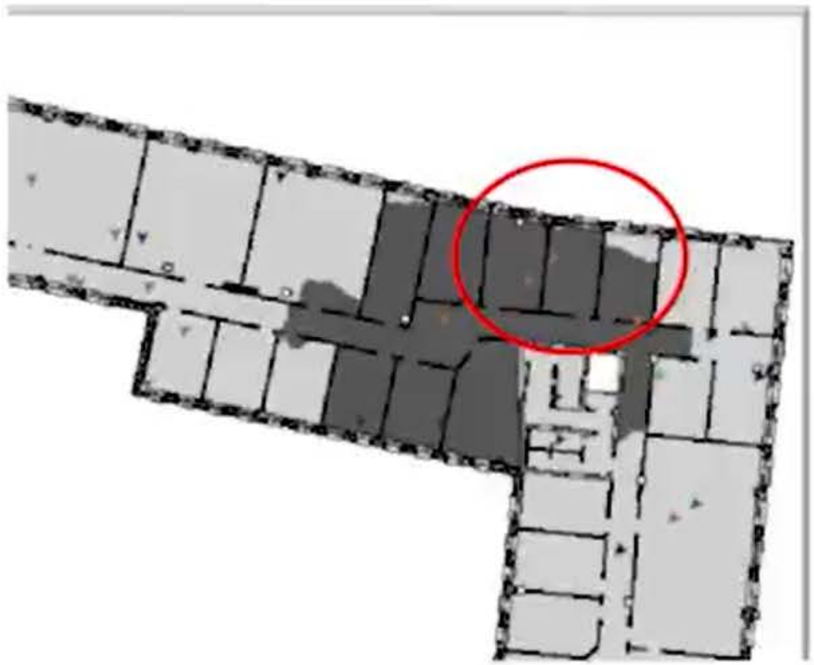
EXAMPLE EVACUATION MODEL

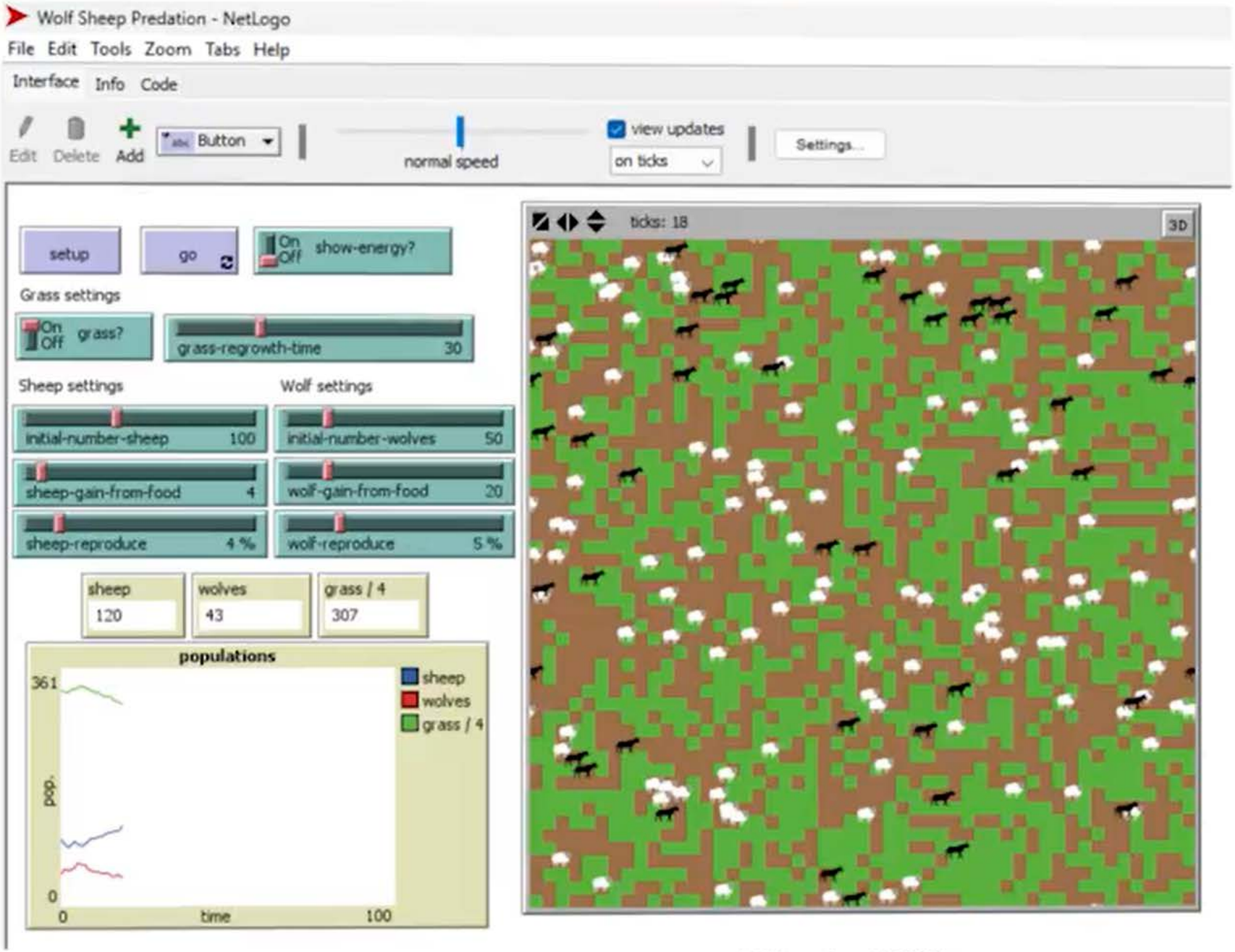




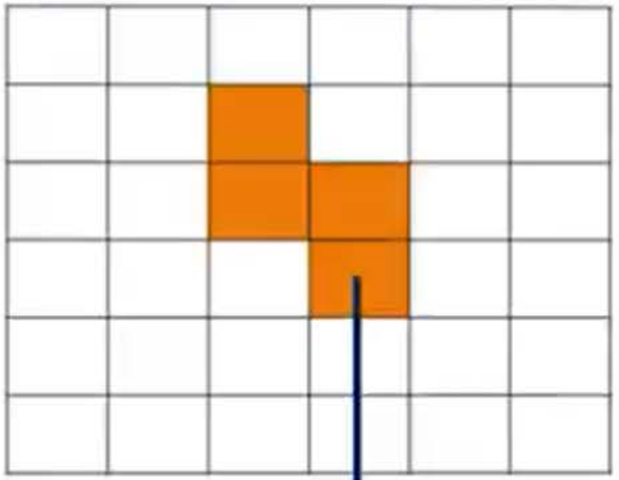
Nearest Exit

SMOKE DEVELOPING

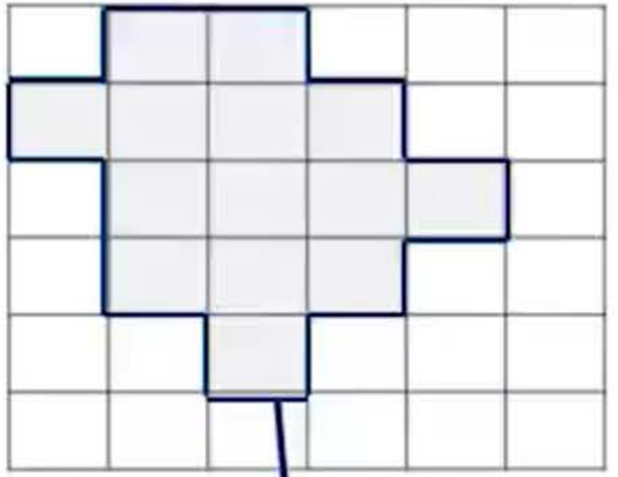




Wilensky (1997)

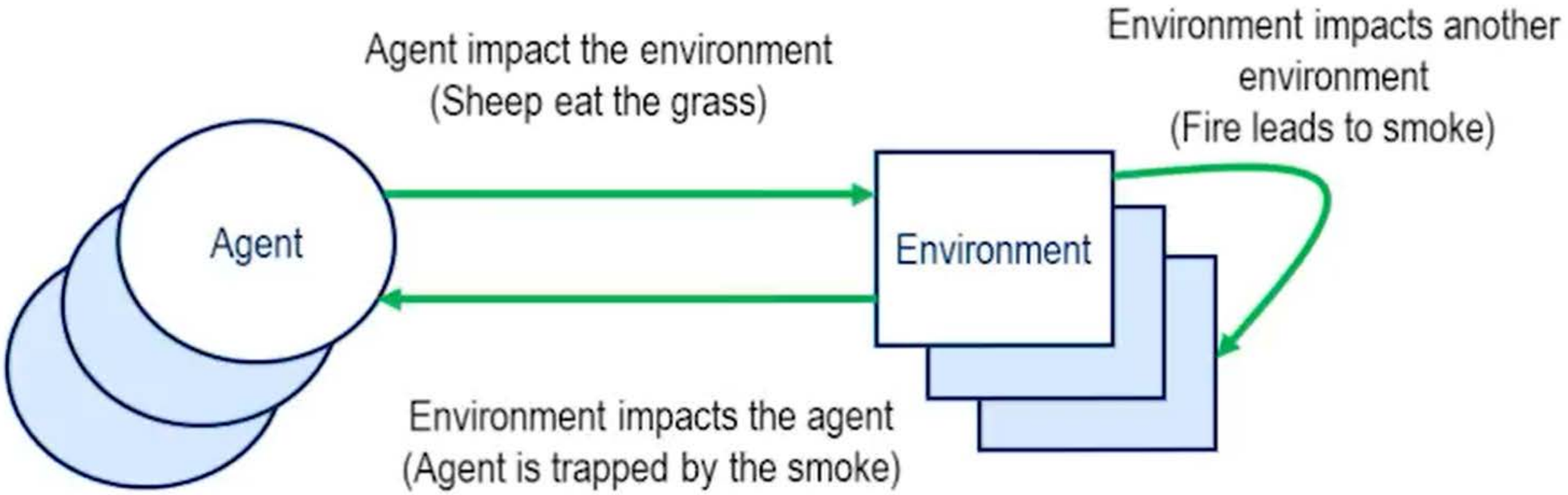


Fire



Smoke

SUMMARY



Adapted from Batty (2005)

Agent-Environment Interaction- Summary

Let us continue with interactions that include the environment.

In the previous lecture, we introduced interactions and focused on agent-agent interactions.

In this lecture, we will continue to talk about interactions, but we will focus on

- **agent-environment interactions,**
- **environment-environment interactions, and**
- **environment-agent interactions.**

Now that you know a little bit more about agent interactions, we will move to interactions with environments.

- **A good way to do this is to think about how environments are dynamic.**

- **There are three ways in which dynamic environments can change during a simulation:**

    - **because of an interaction of an agent on their own, or**

    - **because of a change in another environment.**

- **The first and the last examples are examples of interactions with environments.**

- **The simplest interaction possible between an agent and an environment is that the agent knows the value of the environment and can act using this value.**

- **Let us go back to the evacuation simulation.**

    - **In this simulation, the agents can retrieve the distance to the exit value from the raster environment.**

    - **Based on this information, the agent will decide to which cell it will move.**
    - **The agent will always move to the cell with the lowest value, as that is closest to the exit.**

    - **The distance values are fixed throughout the simulation, yet there are environments that are dynamic.**

        - **An example is smoke that develops due to a fire.**

            - **Some agents are initially not trapped by that smoke, But a few steps later, the smoke area has grown and they are now trapped, and they need to change their behaviour.**

        - **In the previous example, the agent changes its behaviour due to an environment.**
            - **So the environment affects the agent behaviour.**
        - **The opposite can also happen the agent affects the environment. The agent can also change the value of a raster cell.**
            - **You've seen this already in the wolf sheep predation model.**
                - **When the sheep is on a cell with grass, the sheep can eat the grass and it is going to change the value of the environment.**
                - **The cell will be turned into bare soil.**
            - **Other interactions leading to changes in the environment are, for example, an agent building a house in a certain location.**
                - **This house does not have to be a cell, but can also be a polygon.**

- **There is also interaction between environments.**
    - **A simple example is the smoke in the evacuation simulation.**
        - **Perhaps this smoke is caused by a fire.**
        - **This fire is represented as another raster environment.**
        - **Based on the spread of the fire, the smoke will diffuse.**
    - **Another example for the wolf-sheep model involves the grass.**
        - **The grass can only grow when there is enough groundwater.**
        - **The groundwater can be represented as an environment that will influence the grass environment.**

- **I hope that you have learned from this lesson how environments can influence agent behaviour and the other way around.**

- **Perhaps the examples you have seen in this lecture can be an inspiration for your own models.**