

**Autonomous Intelligent Systems,
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Exercises for Artificial Life (MA-INF 4201), SS25

Exercises sheet 1, till: Mon 14. April, 2025

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Remark: The assignments are designed to intensify the work with the research topics presented within the lecture, and to help you practice typical tasks of Artificial Life. You will need more than 50% of all possible points and at least two presentations to be admitted to the exam. Please work in groups of three persons. You have to hand in the solutions by Monday before the start of the lecture, by uploading the solution as a .pdf file to eCampus. Please mention the names of all (3 or 4) participating students in your solutions explicitly.

Assignment 1 (1 Point)

What is the major difference between *Weak Artificial Life* and *Strong Artificial Life*?

Assignment 2 (1 Point)

Name and describe a definition of *live* or *living* that has not been named during the lecture. Please **cite** the publication where you have found the definition in a **scientific way**.

Assignment 3 (1 Point)

Give the four to six criteria that you find to be most feasible to distinguish *living* from *non living*. Explain your decision.

Assignment 4 (2 Points)

Try to sort the following items with respect to their property of being a living item according to one of the definitions (either from the lecture or from assignments 2 or 3):

Yeast, English language, DNA sequence, protozoa, river Rhine, car, wooden chair, mule, colony of ants, a tornado, the plasmodium causing malaria, a dried pea, lettuce from the mensa, C++ compiler, hinny .

Assignment 5 (1 Point)

Describe the different phases of the behaviour that Langton's Ant shows on a uniform white plane in your own words.

Assignment 6 (2 Points)

Compare the resulting patterns and behavior that Langton's Ant shows for the case **A**: starting on a uniform white plane, with case **B**: starting on a uniform black plane.

Assignment 7 (2 Points)

Imagine Langton's Ant starting in a white square of an (infinite) checkerboard. Depict the first 8 steps.

Assignment 8 (2 Points)

Langton's Ant is sometimes called a two-dimensional Turing machine. Can you imagine why?, Try to refer to the formal definition of a Turing machine.

Assignment 9 (1 Point)

There are several tools that can simulate and visualize Langton's Ant. You may use one of these tools to solve the Assignments 5,6,7. Name at least two tools, and tell where and how you have found them. Try at least to characterize the properties of these tools.

Assignment 10 (2 Points)

How would you try to answer the following question:

Is there a starting configuration, that generates a pure periodic behavior for Langton's Ant?