Autonomous Intelligent Systems,
Institute for Computer Science VI, University of Bonn

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Exercises for Artificial Life (MA-INF 4201), SS15

Exercises sheet 4, till: Mon 11.5.2015

4.5.2015

	Name	24	25	26	27	28	29	30	$\sum$

Assignment 24 (2 Points)

Propose and specify a change to Langton's Loop that will result in a loop with the double length of the edges.

Assignment 25 (1 Point)

Explain how *Chou-Reggia's Loop* is reproducing itself.
Depict the development of the first 3 steps of *Chou-Reggia's Loop*.

Assignment 26 (1 Point)

How is the space requirement $s(g)$ of Langton's Loop developing with respect to the number of generations g ?
Please explain your answer in a scientific way.
Remark: the O-notation (Landau notation) is sufficient to describe the asymptotic behavior.

Assignment 27 (1 Point)

Take the first example of a Lindenmayer System from the lecture (Mon, May 4, 2015) and prove that the number of symbols, or the length of the string produced, is generating the Fibonacci numbers.
A *simulation* is not adequate to prove this.

Assignment 28 (3 Points)

Create, and specify a Lindenmayer System with exactly three rules that will create in step 5 the 32 symbol string shown below, starting with the Axiom `R` in step 0:

Step 5: `RSSTSTTRSTTRTRRSSTTRTRRSTRRSRSST`

Assignment 29 (3 Points)

Create 3 Lindenmayer systems (rules, alphabet, axiom, ...) and depict the results.
(Do not take examples from the lecture).
a) A Lindenmayer system that is creating a spiral in 2 dimensions. Please state how the length and the shape of the spiral can be adjusted, plot the result in a graph.
b) A Lindenmayer system (2-dim) that creates a shape resembling a natural looking tree.
c) A Lindenmayer system (with context!) that implements a 4 bit Gray coding.

Assignment 30 (4 Points)

Seek for an application of Lindenmayer Systems (you may choose one that has been mentioned in the lecture), and describe it in your own words (approx 1/2 page to maximal one page of text), and answer the following questions within your text:
What is the application trying to do?
How is the Lindenmayer System applied to do this?
What are the major result within this application?