VSB TECHNICAL UNIVERSITY OF OSTRAVA | FACULTY OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

Bachelor Thesis Assignment

Student: **Jonáš Koziorek**

Study Programme: B0541A170008 Computational and Applied Mathematics

Title: Study of dynamical systems using the Julia programming language
Studium dynamických systémů pomocí programovacího jazyku Julia

The thesis language: English

Description:

The phenomena of dynamical systems has attracted researchers from various scientific fields for the past decades. One of the most important parts of the mathematical theory of dynamical systems is focused on the detection of the properties of dynamical systems. For this purpose, mathematical and also algorithmic approach is developed to detect system's complexity.

The main aim of this thesis is to study dynamical properties of suitable mathematical models using the Julia programming language.

The goals of the thesis:

1. to study and define all needed notions,
2. to construct typical models from the dynamical systems theory,
3. to characterize investigated model's dynamical behavior,
4. to investigate non-trivial dynamical phenomena, e.g. intermittencies,

References:

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[2] Alan Garfinkel, Jane Shevtsov, Yina Guo , Modeling Life, The Mathematics of Biological Systems, Springer International Publishing AG 2017
[3] Bergé, Pierre, Order within chaos, New York : Paris : John Wiley & Sons ; Hermann, 1986
[4] S. Lynch, Dynamical systems with Applications using Matlab, Birkhauser, 2004, ISBN: 0-8176-4321-4
[5] Bezanson, Jeff and Edelman, Alan and Karpinski, Stefan and Shah, Viral B, Julia: A fresh approach to numerical computing, SIAM review, 59 (1), 65-98, 2017.
[6] George Datseris (2018). DynamicalSystems.jl: A Julia software library for chaos and nonlinear dynamics. Journal of Open Source Software, 3(23), 598.
[7] Rackauckas, C., & Nie, Q. (2017). Differentialequations.jl–a performant and feature-rich ecosystem for solving differential equations in julia. Journal of Open Research Software, 5(1).

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Extent and terms of a thesis are specified in directions for its elaboration that are opened to the public on the web sites of the faculty.

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Date of issue:

Date of submission:

Study programme guarantor: prof. RNDr. Jiří Bouchala, Ph.D.

In IS EDISON assigned: