JOHANNES KEPLER
UNIVERSITÄT LINZ

Bachelor's Thesis

SMAVIZ: Interactive and Playful Visualizations of String-Matching Algorithms

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In the course "Algorithmen und Datenstrukturen 1" (Algorithms and Data Structures 1) at the Johannes Kepler University, students are introduced to various string search algorithms. Currently, the teaching materials for these algorithms are limited to slides and blackboard explanations. To enhance the learning experience for students and provide lecturers with more effective teaching aids, interactive and playful visualizations of string-matching algorithms can be developed.

The goal of this bachelor's thesis is to create an interactive visualization tool that helps students learn and lecturers teach string search algorithms more effectively. The tool should include the following features:

1. Interactive visualizations of various string search algorithms:
   - Implement visualizations for multiple single-string search algorithms, such as the Brute-Force algorithm, the Knuth-Morris-Pratt algorithm, and the Rabin-Karp-Moore algorithm.
   - Include at least one multi-string search algorithm visualization, such as the Aho-Corasick algorithm or the Rabin-Karp algorithm.
   - Allow users to input their own strings and patterns to observe how the algorithms work in different scenarios.
2. Playing mode for student engagement:
   - Develop a playing mode that expects students to perform certain steps of the algorithms. For example, students might have to fill out the failure function table of the Knuth-Morris-Pratt algorithm.
   - Provide immediate feedback on the correctness of student answers and offer explanations for incorrect responses.
3. User-friendly interface and visualizations:
   - Design an intuitive and visually appealing user interface that allows easy navigation between different algorithms and modes.
   - Create clear and informative visualizations that effectively illustrate the workings of each algorithm, including step-by-step animations and highlighting of matched patterns.
   - Provide options to control the speed of the visualizations and to pause, resume, or step through the algorithm execution.

The interactive visualization tool should be developed using web technologies such as HTML, CSS, and JavaScript, making it accessible through a web browser. The implementation should be well-structured, maintainable, and extensible to allow for future additions or modifications.

Modalities:
The progress of the project should be discussed at least every four weeks with the advisor. A time schedule and a milestone plan must be set up within the first 3 weeks and discussed with the advisor. It should be continuously refined and monitored to make sure that the thesis will be completed in time. The final version of the thesis must be submitted not later than 31.10.2024.