Master's Thesis

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## Visualization of Complex Object Structures in Java

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To support programming education in Java, the Visual Studio Code (= VS Code) extension JavaWiz is developed by the Institute for System Software at the Johannes Kepler University Linz. This plugin offers programmers the possibility to follow the behavior of programs step by step in different visualizations. JavaWiz offers specific visualization components, for example a component for visualizing the executed instructions with the variable values, a component for visualizing methods in the form of flowcharts, or a component for visualizing dynamic data structures.

At present there is also an elementary component for the visualization of the stack and the heap of a Java application. It turned out that the visualization of the object structures is on the one hand particularly important for the understanding of object-oriented programs and on the other hand represents a special challenge. In this work therefore a new component should be created for the visualization of the object structures at the heap.

The work covers the following subtasks:

- Representation of object structures: The scientific literature on the visualization of complex object structures has to be reviewed and promising approaches should be identified.

- Layout algorithms: Suitable layout algorithms for the visualization of complex object structures are to be analyzed.

- Visualization component: Based on the findings from the above analyses, a component for the visualization of complex object structures is to be developed as a plugin for Visual Studio Code. The development language is TypeScript and the visualization framework is D3.js.