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UNIVERSITY LINZ**

Bachelor's Thesis

## **Visualization of Heap Object Trends**

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AntTracks comprises a modified Java VM based on the Hotspot VM, i.e., AntTracks VM, and the AntTracks Analyzer, an offline post-processing analysis tool.

The VM's aim is to allow tracking of an application's entire life cycle by writing information about certain events to a trace file. This events include object allocations, object movements by the garbage collector, pointers between the objects and so on.

Such an event trace can then be analyzed in the offline post-processing tool. Based on the information parsed from the trace file the tool is able to reconstruct the heap for any garbage collection point.

Currently, beside other features, the analysis tool visualizes the application's memory development over time using charts. This charts group the heap objects based on fixed criteria such as the heap object's containing heap space.

The goal of this thesis is to develop a tool component that allows the easy identification of growing memory parts and their relation to certain heap objects. It should allow to visualize the development of a certain heap object property over time in a stacked area chart, such as a heap object's type or allocation site. Each series in such a chart represents the number of objects (or their respective number of bytes) with a certain property value, e.g., objects of the same type or allocated at the same allocation site. Only the top N series should be shown, e.g. the ten types with the most objects allocated, with the largest series being the topmost in the chart, and the series representing the fewest objects should be the one on the bottom of the stacked area chart. The user should be able to chose based on which metric the series should get stacked: (1) Most alive objects at the beginning of the trend visualization time window, (2) most allocated objects on average during the time window or (3) most objects alive at the end of the trend visualization time window. Based on this visualization, the user quickly can get a feeling for the memory behavior of the observed application.

The user may select to visualize the application's whole life time or to analyze just a certain period. AntTracks already has functionality to classify a certain heap state, i.e., a certain point in time, based on arbitrary heap object criteria, i.e., object classifiers. This functionality should also be used to allow the user to select the grouping criteria for the trend visualization. Then, the trace file should be parsed for the given time period, and the heap objects should be classified at every GC point, which provides the basis for the charts' data set.

The final version of the written thesis must be submitted not later than 04 June 2018.

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