

A Machine Learning Approach for Node Size Approximation in Top-down Layout

Top-down Layout is a technique to draw large hierarchical diagrams from the root node downwards, scaling children down to fit in the space provided by their parents. This is in contrast to bottom-up layout where children are laid out first and the parents' dimensions are determined accordingly afterwards.

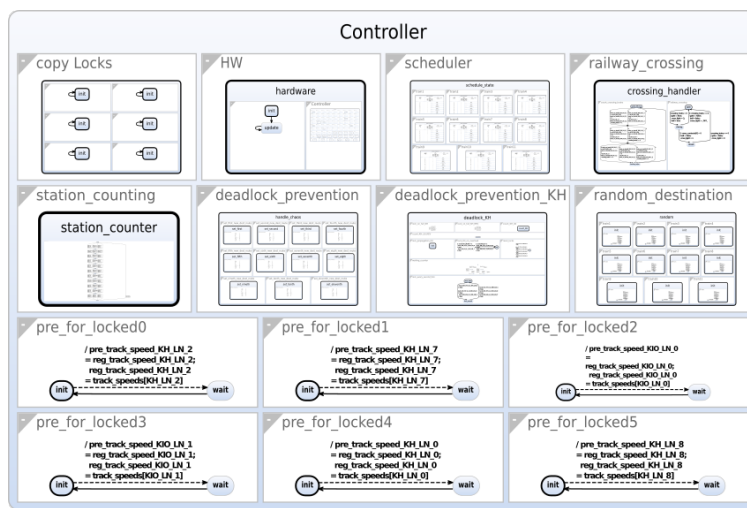
In top-down layout a strategy needs to be used to set node sizes without knowledge of the hierarchical contents of the node as that has not been processed/laid out at that point. Current strategies are:

- Using a default base size
- Counting the number of children and taking the square root as a multiplication factor for the default base size
- Computing the layout of only the children (look-ahead layout)

The main challenge is to get an approximation that gives a suitable aspect ratio (close to what will actually be required).

Graphs are complex feature vectors and the solution space is very large without necessarily one correct and optimal answer. Therefore, a machine learning (ML)-based approach may help find good solutions.

Example Top-down Layout of an SCChart



Goals

- Use the KiCoDia benchmarking tool to extract feature vectors from existing models
- Train and evaluate an ML model on the extracted data sets
- Integrate the model as a new node size approximator into top-down layout

Scope

Master's (Bachelor's) Thesis

Related Work/Literature

[Under Review] M. Kasperowski and R. von Hanxleden, *Top-down Layout: Effectively Utilizing Zoom for Drawings of Compound Graphs*

M. Nielsen, *Neural Networks and Deep Learning*, Determination Press, 2015 (<http://neuralnetworksanddeeplearning.com/index.html>)

I. Goodfellow and Y. Bengio and A. Courville, *Deep Learning*, MIT Press, 2016 (<https://www.deeplearningbook.org/>)

Involved Languages/Technologies

- Java / Xtend, Python
- KiCo
- ML Frameworks (to be chosen)

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