Conversion of Hand Drawn Electrical Circuit Schematics into LTSpice Format using Deep Learning Methods

Konvertierung von Handgeschriebenen Elektrischen Schaltungen in LTSpice Format mithilfe von Deep Learning Methoden

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Thesis Description

An electrical circuit schematic is a way to represent an electrical circuit in a graphical form. It consists of symbols representing hardware components and wires connecting those components. Additionally a schematic can contain component annotations describing the name and value of the component. As an example, an annotation for a resistor could be "R0 1000 Ω" where "R0" represents the name of the resistor and "1000 Ω" its component value.

The knowledge of the schematic symbols and the corresponding calculations to acquire different values, such as voltage or current, is taught in schools and university [LEHRPLAN]. Here, students rely on solutions given by their professors, or on dedicated circuit simulation software such as LTSpice, to verify their calculation results. In the case of the simulation software the hand drawn electrical circuit has to be rebuild in the application. This is a tedious task and requires also a priori knowledge of the underlying program. With an automated solution, a scan of a circuit could be converted into the format of the simulation program.

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Each symbol in corresponds to a hardware component in the TODO "real world". Those hardware components have a component value associated to them. With that TODO UEBERBGRIFF "values" like voltage, current and other "values" can be calculated to analyze the circuit TODO MEH. The symbols (TODO for schematics) and (TODO the formulas to perform) calculations to obtain component values are thought in school and university. (TODO) To verify the validity of their calculations, students rely on solutions or on the verification from dedicated circuit simulation programs like LTSpice. (TODO) To obtain verification results from LTSpice the hand drawn circuit has to be rebuild in the software, that produces overhead which could be evaded when the scan of the hand drawn circuit could be directly converted into LTSpice format.

The conversion problem can be decomposed in TODO NUMBER problems.

1. Classification of the components 2.

JUST SOME IDEAS

Despite the growing digitalization hand drawn electrical circuit schematics are still thought in school and university. Various calculations can be performed to identify values like voltage, current or component value or current flowing through those components. Often without having the solution for the calculation students are not able to verify their results. It is although possible to redraw the circuit in dedicated circuit simulation tools to obtain the right values for the calculation. This requires knowledge of the

1. Segmentation of the Critically Infarcted Tissue
    (a) Pre-Processing

   (b) Segmentation with Deep Learning
   (c) *Possibly: Post-Processing*
2. Systematic Parametrization of the Model
3. Analysis of the Deep Learning Model
   (a) Determination of the relevant Perfusion Parameters
   (b) *Possibly: Evaluation of the Artifact-freedom of the Segmentation*