

Protokoll 3rd Research Session

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1 Recap

First we recapitulated what we found out in research session 2, specifically what we know about trees and cacti.

2 Results from this Session

2.1 Till Bruckdorfers proof

We talked about Till Bruckdorfers proof that computing a MaxSPED is NP-hard. Till Bruckdorfers [1] uses a reduction from positive planar 1-in-3SAT. In positive planar 1-in-3SAT every clause has exactly 3 literals, none of them are negated and a satisfying assignement makes exactly one and only one of those 3 literals per clause true. Additionally there is a planar representation of the formula where all variables are represented by vertices placed on a spine and connected to vertices representing the clauses placed above or below the spine via edges.

2.2 Construction of the Reduction

The reduction construction is done by representing a clause still as a vertex in which three paths meet. These paths (of segments) have an even number of segments and are connected to a single segment which represents the variable. It was mentioned that the construction description of the reduction was not entirely clear, in that we didn't know how exactly the paths are connected to the variable segment.

2.3 Proposed changes

We proposed a solution to this by constructing the variables also as pairs of segments (see figure 1). Further we want to limit the number of segments that intersect a single segment to three. In variable gadgets this is also done by the justz mentioned solution. Clause gadgets are transformed into triangles

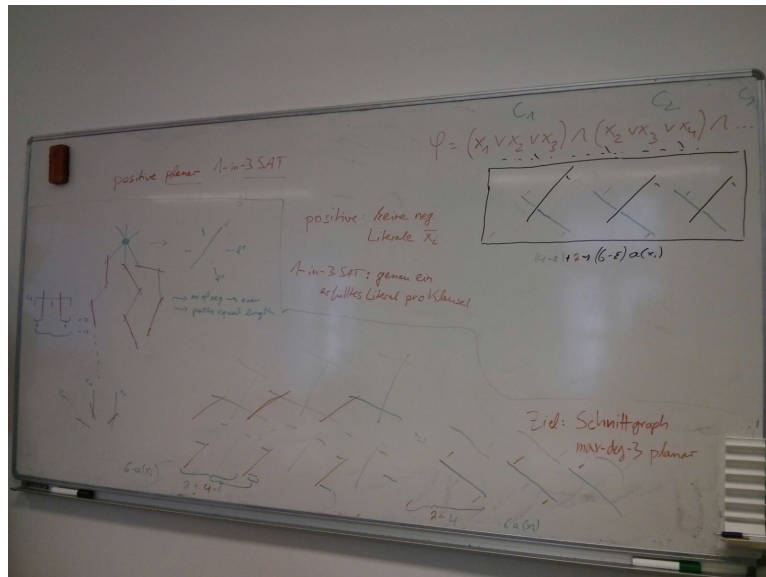


Abbildung 1: Positive planar 1-in-3SAT sketches and proposed solution for problematic part

(see figures 2a and 2b). Especially at the triangles, no other way of drawing stubs should have an equal or higher value to guarantee equivalence.

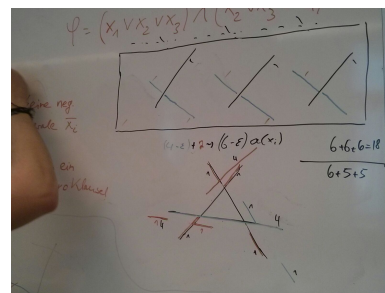
In summary we think that computing a MaxSPED for a graph with a planar intersection graph of max-degree 3 is NP-hard.

Literatur

- [1] Till Bruckdorfer. *Schematics of Graphs and Hypergraphs*. PhD thesis, Uni Tübingen, 2015.



(a) a



(b) b

Abbildung 2: details on construction of the clause as triangle