Generalized LL parsing for context-free constrained path search problem

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Path querying is an actual problem in bioinformatic, graph databases, ... One of specific problem is formal languages path problem [1] which meens that paths constraints formulated as Query may be specified as context-free grammar: path $P = e_0, \ldots, e_n, \omega = e_0.tag \cdot \cdots \cdot e_n.tag, \omega \in L(G)$

Let we want to find all path with form $A^n B^n$. This constraint can not be specified with regular language as far as $L = \{a^n b^n; n > 0\}$ is not regular but context free. Required language can be specified by grammar G presrnted in picture 1.

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s: A l | middle
middle: A B
l: s B
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Figure 1: Grammar G for language $L = \{a^n b^n; n > 0\}$

We propose a context-free language constrained path problem solution which allow to find all paths and construct implicit representation of result.

Our is based on generalized LL (GLL) [2] parsing algorithm which allow to process arbitrary context-free grammars. Complexity is $O(n^3)$ in worst case and linear for unumbigues grammars, that better then complexity of CYK and Erly which used as base in other solutions.

All-path semantic — SPPF constructed by algorithm contains all paths matched with specified constraints. SPPF for grammar G and graph M which presented in picture !!! is presented in picture !!!. Extensions allow to check whether path from u to v exists and extract it. For example ....

Full index — for dynamic graphs. It is necessary only recalculate ... This operation is native for basic algorithm.

1. REFERENCES

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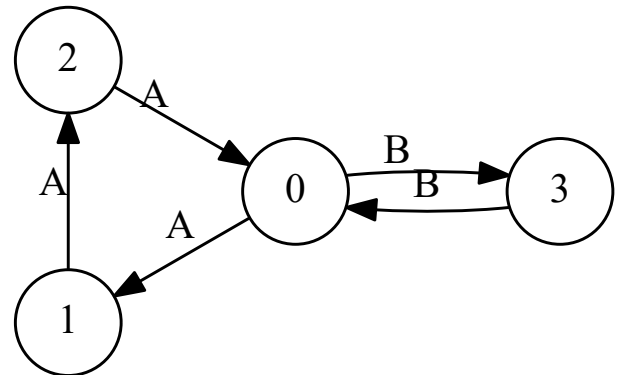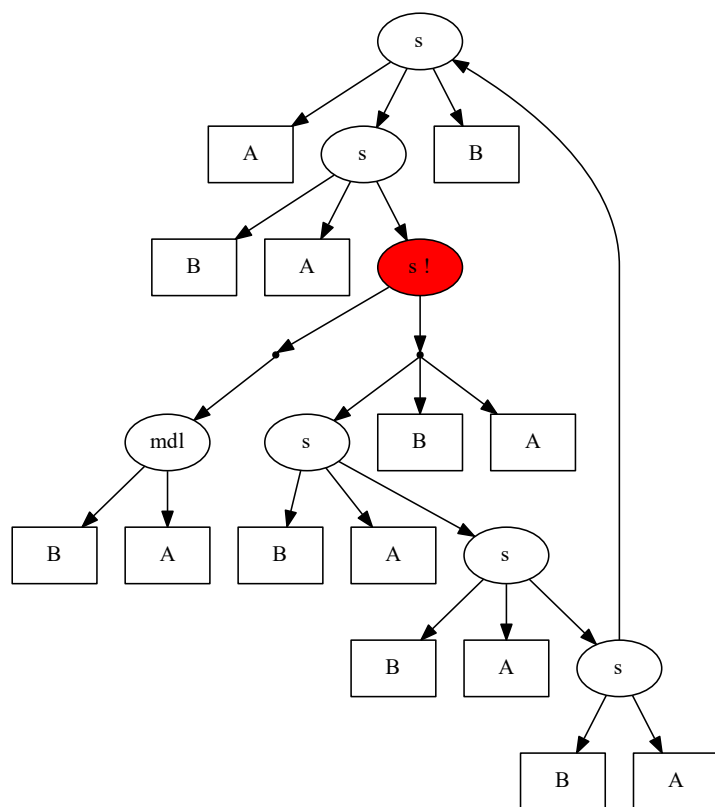
Figure 2: xxx

Figure 3: ccc