Switch Regular Upward Planarity Testing

1 Question

An *upward planar drawing* of a planar digraph G is a crossing-free drawing Γ of G such that all the edges are represented as curves monotonically increasing in the vertical direction. A *switch angle* in a face f of Γ is an angle formed by two consecutive edges e_1, e_2 on the boundary of f such that e_1 and e_2 have opposite direction. Each switch angle in a face of Γ can be labeled either S (if the associated geometric angle is smaller than π) or L (if the associated geometric angle is larger than π).

An internal face f of Γ is *switch regular* if walking clockwise on its boundary there is at most one maximal sub-sequence of S labels with length greater than one. The external face of Γ is *switch regular* if there is no two consecutive S labels walking clockwise on its boundary. Drawing Γ is *switch regular* if all its faces are switch regular.

Let G be an embedded planar digraph; we ask whether there exists a polynomial-time algorithm that tests if G admits a switch regular upward planar drawing that preserves its embedding.

2 Observations

The concept of switch regular upward planar drawings have been introduced in [2], and the authors provide an efficient checker to test the correctness of these kind of drawings.

A popular polynomial-time algorithm for the upward planarity testing of embedded planar digraphs is described in [1], but this algorithm can in general give rise to upward planar drawings that are not switch regular.

References

[1] P. Bertolazzi, G. D. Battista, G. Liotta, and C. Mannino. Upward drawings of triconnected digraphs. *Algorithmica*, 6(12):476–497, 1994.

[2] G. Di Battista and G. Liotta. Upward planarity checking: "faces are more than polygons". In *Graph Drawing (Proc. GD '98)*, volume 1547 of *Lecture Notes Computer Science*, pages 72–86, 1998.