Topological closure of formal powers series ideals and application to topological rewriting theory

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We will present the paper [1], where we investigate formal power series ideals and their relationship to topological rewriting theory. Since commutative formal power series algebras are Zariski rings, their ideals are closed for the adic topology defined by the maximal ideal generated by the indeterminates. In [1], we provide a constructive proof of this result which, given a formal power series in the topological closure of an ideal, consists in computing a cofactor representation of the series with respect to a standard basis of the ideal. We apply this result in the context of topological rewriting theory, where two natural notions of confluence arise: topological confluence and infinitary confluence; in general, infinitary confluence is a strictly stronger notion than topological confluence. Using topological closure of ideals, we finally show that in the context of rewriting theory on commutative formal power series, infinitary and topological confluences are equivalent when the monomial order considered is compatible with the degree.

References

[1] Cyrille Chenavier, Thomas Cluzeau and Adya Musson-Leymarie. Topological closure of formal powers series ideals and application to topological rewriting theory. *J. Symbolic Comput.*, 2025.