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Special identities for the pre-Jordan product in the free dendriform algebra

The Hopf algebra of planar binary trees studied by Loday and Ronco in 1998 can be regarded as the free dual dialgebra introduced by Loday in 1998, now known as the free dendriform algebra. This algebra has two operations whose sum is associative and can be obtained from a Rota-Baxter algebra as shown independently by Aguiar and Ebrahimi-Fard.

Pre-Lie and pre-Jordan algebras were introduced in the study of the Yang-Baxter equation and can be obtained from a Rota-Baxter operator on Lie and Jordan algebras respectively. Dendriform algebras with the pre-Lie or the pre-Jordan product are also pre-Lie or pre-Jordan algebras respectively.

The problem of constructing universal dendriform envelopes of pre-Lie algebras with an injective natural map is still open. We approached the same problem for pre-Jordan algebras from the point of view of polynomial identities. We found special identities for the pre-Jordan product in the free dendriform algebra, which means that universal dendriform envelopes for pre-Jordan algebras do not have in general an injective natural map.

This is a joint work with Prof. Murray Bremner.