

# Algebraic structures on walks of graphs and quasi-algebraic reconstruction of the identity

Cécile Mammez

One of the goals of this in progress work made in collaboration with Foissy, Giscard and Ronco is to describe algebraically the reconstruction of any walk of a given graph from simple cycles and self-avoiding walks. There exists a combinatorial construction due to Giscard, Thwaite and Jaksch which uses Lawler's loop-erasing procedure and the nesting product  $\odot$  described by Giscard. Unfortunately the product  $\odot$  does not satisfy classical relations such that the associative relation or the Lie relation. So, we have created a co-pre-Lie coproduct from Lawler's loop-erasing procedure on walks and extended it into Hopf algebras. This talk aims at explaining those new Hopf algebras and the description of a quasi-algebraic reconstruction of the identity. We will first remind the Lawler's loop erasing procedure and the product  $\odot$ . Then we will detail the construction of the co-pre-Lie coproduct on walks and underlying Hopf algebras. After that, we will explain how consider any walk as a special walk called cactus. Finally, we will explain how we can calculate a quasi-algebraic reconstruction of the identity by using the dual pre-Lie product and cacti.