

# Homomorphic Expansions for Knotted Trivalent Graphs - Fixing an Anomaly

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## WHAT IS THE TITLE OF THIS PAPER?

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**ABSTRACT.** We construct a homomorphic universal finite type invariant of knotted trivalent graphs, and do some other things.

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Abstract: It had long been known [LM, Da] that there exists a universal finite type invariant ("an expansion")  $Z^{\text{old}}$  for Knotted Trivalent Graphs (KTGs), and that it can be chosen to intertwine between some of the standard operations on knotted trivalent graphs and their chord-diagrammatic counterparts (so that relative to those operations, it is "homomorphic"). Yet perhaps the most important operation on KTGs is the "edge unzip" operation, and while the behaviour of  $Z^{\text{old}}$  under edge unzip is well understood, it is not plainly homomorphic as some "correction factors" appear.

In this paper we present two (equivalent) ways of modifying  $Z^{\text{old}}$  into a new expansion  $Z^{\text{new}}$ , defined on "dotted Knotted Trivalent Graphs" (dKTGs), which is homomorphic with respect to a large set of operations. The first is to replace "edge unzips" by "tree connect sums", and the second involves somewhat restricting the circumstances under which edge unzips are allowed. As we shall explain, the newly defined class dKTG of knotted trivalent graphs retains all the good qualities that KTGs have - it remains firmly connected with the Drinfel'd theory of associators and it is sufficiently rich to serve as a foundation for an "Algebraic Knot Theory".