Sketch

August 1, 2019 10:51 AM

Title: The Mysteries of BF.

Abstract: The BF quantum field theory on one hand, and prior art regarding finite type invariants of w-knots on the other hand, suggest that there should be a "Kontsevich Integral" for general 2-knots in 4-space (of not necessarily the "simple" or "welded" or "w" type). Where is it? Why don't we know about it? Why aren't we studying it?

Contents.

1. Apologize for being out of shape in matters 4D.
2. A quick summary of CS:
   a. The CS Lagrangian. Using Faddeev-Popov/BRST/Feynman Diagrams leads to CSI.
   b. CSI in a quick picture.
   c. Converges! Invariant! (Hard).
   d. Evaluatable in a quick picture. (Porrier's)
   e. Characterizable in a quick picture. (Bracelets).
3. A quick summery of BF:
   a. The BF Lagrangian. Using BV/Feynman Diagrams leads to CSI.
   b. CSI in a quick picture.
   c. Converges? Invariant? (Cattaneo-Rossi, etc).
   d. Evaluatable??
   e. Characterizable?
4. A quick summary of the w-story.

Alternative:

Abstract: This will be a "large structures" talk. I will explain how several large structures fit together nicely in 3D: universal finite type invariants, quantum field theory, configuration space integrals, and perhaps a bit more. The picture isn't so clean in 4D, but it isn't yet clear if this is simply because we didn't work hard enough yet, or if things are intrinsically different.

Dror Bar-Natan: Talks: Banff-1911:

Thanks for inviting me to Banff!

The Mysteries of BF

ωεβ:=http://drorbn.net/b19/

Abstract. The BF quantum field theory on one hand, and prior art regarding finite type invariants of w-knots on the other hand, suggest that there should be a "Kontsevich Integral" for general 2-knots in 4-space (of not necessarily the "simple" or "welded" or "w" type). Where is it? Why don't we know about it? Why aren't we studying it?
This will be a "large structures" talk. I will explain how several large structures fit together nicely in 3D and several other large structures show potential in 4D. Personally I prefer "every detail shown" talks. Sorry.

Confession I barely étendre know what I'm talking about.

BF following Louvain day 5, Hamilton 14-12
characterization from AP/2014-04/BF2C

The w-story following Portfolio p. 55, 64, 69, (53) Portfolio p. 53, 64, 67,

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CS Box from Louvain-1506 day 3

FP, BRST, FD. w&d Louv3

CSI box from Sam

converges? Invariant? Evaluateable

Brackets: Fields-1411, mostly fresh, to the appearance of chord diagrams.

Then some construction of Z^w, then evaluation by printing the output for ~~the~~ borromeans.

Recent Abstracts. • *Everything around sl_{2+}^{ϵ} is DoPeGDO. So what?* UCLA, Nov 2019, ωεβ/ucla: I'll explain what "everything around" means: classical and quantum m, Δ, S, tr, R, C, and θ, as well as P, Φ, J, $\mathbb{D}$, and more, and all of their compositions. What DoPeGDO means: the category of Docile Perturbed Gaussian Differential Operators. And what sl_{2+}^{ϵ} means: a solvable approximation of the semi-simple Lie algebra sl_2.

Knot theorists should rejoice because all this leads to very powerful and well-behaved poly-time-computable knot invariants. Quantum algebraists should rejoice because it's a realistic playground for testing complicated equations and theories.

• *Some Feynman Diagrams in Algebra.* Sydney, Oct 2019, ωεβ/syd2: I will explain how the computation of compositions of maps of a certain natural class, from one polynomial ring into another, naturally leads to a certain composition operation of quadratics and to Feynman diagrams.

• *Algebraic Knot Theory.* Sydney, Sep 2019, ωεβ/syd1: This will be a very "light" talk: I will explain why about 13 years nother, naturally leads to a certain composition operation of quadratics and to Feynman diagrams.

• *Algebraic Knot Theory.* Sydney, Sep 2019, ωεβ/syd1: This will be a very "light" talk: I will explain why about 13 years ago, in order to have a say on some problems in knot theory, I've set out to find tangle invariants with some nice compositional properties. In later talks in different seminars here in Sydney I will explain how such invariants were found — though they are yet to be explored and utilized.

• *The Dogma is Wrong.* Les Diablerets, Aug 2017, ωεβ/ld: It has long been known that there are knot invariants associated to semi-simple Lie algebras, and there has long been a dogma as for how to extract them: "quantize and use representation theory". We present an alternative and better procedure: "centrally extend, approximate by solvable, and learn how to re-order exponentials in a universal enveloping algebra". While equivalent to the old invariants via a complicated process, our invariants are in practice stronger, faster to compute (poly-time vs. exp-time), and clearly carry topological information.

• *On Elves and Invariants,* Knots in Washington, Dec 2016, ωεβ/kiw:Whether or not you like the formulas on this page, they describe the strongest truly computable knot invariant we know.

References.

[Za] D. Zagier, *The Dilogarithm Function,* in Cartier, Moussa, Julia, and Vanhove (eds) *Frontiers in Number Theory, Physics, and Geometry II.* Springer, Berlin, Heidelberg, and ωεβ/Za.

"God created the knots, all else in topology is the work of mortals."

Leopold Kronecker (modified)

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