SIMPLIFIED KHOVANOV-ROZANSKY CALCULUS

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In this talk we will discuss the knot invariants for the virtual knots. Although the methods of calculating SU(2) invariants were provided some time ago by L.Kauffman the much richer SU(N) invariants were unknown. The reason for this is that the quantum group approach, used for ordinary knots, breaks down due to the existence of virtual crossing. We used recent advances in calculating Khovanov-Rozansky homologies to introduce another approach to the evaluating SU(N) invariants (HOMFLY polynomials) for ordinary and virtual knots. This approach is a simplified Khovanov-Rozansky calculus which appears as an intermediate step in the homologies evaluation.

This approach requires constructing the hypercube of the dimensions of different Seifert cycles corresponding to the knot. The main difficulty is to quantize these dimensions. At $q = 1$ the problem is reformulated in terms of fat (ribbon) graphs, where Seifert cycles play the role of vertices. Ward identities in associated matrix model provide a set of recursions between classical dimensions. For $q \neq 1$ most of these relations are broken (i.e. deformed in an uncontrollable way), and only few are protected by Reidemeister invariance. Still they are helpful for evaluation of quantum dimensions, including negative ones, which are relevant for virtual link diagrams. The developed formalism allows explicit expressions for various virtual knots, including the 2-cabled HOMFLY of virtual trefoil and virtual 3.2 knot.

In this talk we will discuss the properties of the method and various elements which appear there as well as the resulting polynomials for virtual knots/links.

References

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