Baldridge, Scott; Kauffman, Louis H.; McCarty, Ben
Unoriented Khovanov homology. (English) Zbl 07474319

The paper under review contains two main results. The first result is the removal of the dependence on orientation for Khovanov homology. Specifically, the authors present a new normalization of Khovanov homology that yields an invariant of links (without a choice of orientation). This normalization may also be applied to an extension of Khovanov homology to virtual links due to Manturov (the version used in the paper is its reformulation due to Dye-Kaestner-Kauffman). The theory obtained via this normalization is the eponymous unoriented Khovanov homology, the graded Euler characteristic of which is a Jones-like polynomial invariant.

Secondly, the authors introduce a construction that decomposes a virtual link into a set of sublinks, known as the core and mantle decomposition. Unlike those of classical links, the pairwise linking numbers of virtual links may be odd; the core and mantle decomposition uses this phenomenon in an essential way. At first the Jones-like polynomials described above do not possess all of the features of the classical Jones polynomial. The authors use the core and mantle decomposition to recover some of these features.

The extension of Khovanov homology to virtual links used in the paper requires a suite of auxiliary information in order to be defined. The paper under review contains a description of how this auxiliary information can be described succinctly, using the notion of an arc-labeled diagram. The authors describe how this method of presenting the auxiliary structure naturally lends itself to computer implementation.

The paper concludes with a description of how the new normalization may also be used to define an unoriented Lee homology for virtual links.

Reviewer: William Rushworth (Syracuse)

MSC:

57K10 Knot theory
57K12 Generalized knots (virtual knots, welded knots, quandles, etc.)
57K14 Knot polynomials
57K18 Homology theories in knot theory (Khovanov, Heegaard-Floer, etc.)

Keywords:
unoriented; Khovanov homology; virtual link; knot; Jones polynomial; Lee homology; parity; core; mantle; multicore decomposition

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References:

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