

VERIFICATION OF THE JONES UNKNOT CONJECTURE UP TO 24 CROSSINGS

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The Jones conjecture states that the Jones polynomial distinguishes all non-trivial knots from the trivial one. Three years ago we confirmed that conjecture for all knots with diagrams up to 22 crossings. We described the details of that project in [TS1] (cf. [TS2]). The purpose of this note is to announce an extension of this result:

Theorem. *The Jones polynomial distinguishes all knots with diagrams up to 24 crossings from the unknot.*

The method of this verification was that of [TS1] with further optimizations implemented. It involved the following steps:

- (1) Generation of appropriate knot diagrams of 24 crossings, by (a) inserting “algebraically-trivializable” algebraic tangles into Conway polyhedra and by (b) considering closures of algebraic tangles.
- (2) Elimination of diagrams allowing a pass move which reduces either the number of crossings or the number of vertices in the corresponding Conway polyhedron.
- (3) Computation of the determinants of the remaining diagrams.
- (4) Computation of the Kauffman bracket polynomials of determinant 1 diagrams by a divide-and-conquer method.
- (5) Computation of the knot group for the diagrams with monomial Kauffman brackets using the computer program SnapPy [Sn].
- (6) Checking the diagrams with “non-trivial” (non-cyclic) presentation of the knot group by other methods.

The verification for 24 crossings required testing 59,361,435,729,041 non-algebraic knot diagrams and 185,317,928,640 algebraic knot diagrams, for a total of 59,546,753,657,681 knot diagrams – approximately 6 times the number of knot diagrams for 23 crossings.

Computations for 24 crossings were performed on 8-core Intel Xeon L5520 processors operated by the Center for Computational Research at the University at Buffalo for a total of 41.8 core-years of wall-clock time.

REFERENCES

- [Sn] SnapPy, program for studying the topology and geometry of 3-manifolds, www.math.uic.edu/t3m/SnapPy
- [TS1] R. E. Tuzun and A. S. Sikora, Verification of the Jones unknot conjecture to 22 crossings, *J. Knot Theory and its Ramifications* **27** 1840009 (2018).

- [TS2] R. E. Tuzun and A. S. Sikora, Verification Of The Jones Unknot Conjecture Up To 23 Crossings, arXiv:1809.02285

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