Monomial web basis for the SL(N) skein algebra of the twice punctured sphere

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We give a new proof of a slightly modified version of a result of Queffelec–Rose, by constructing a linear basis for the SL(N) skein algebra of the twice punctured sphere for any non-zero complex number q, excluding finitely many roots of unity of small order. In particular, the skein algebra is a commutative polynomial algebra in N-1 generators, where each generator is represented by an explicit SL(N) web, without crossings, on the surface. This includes the case q=1, where the skein algebra is identified with the coordinate ring of the SL(N) character variety of the twice punctured sphere. The proof of both the spanning and linear independence properties of the basis depends on the so-called SL(N) quantum trace map, due originally to Bonahon–Wong in the case n=2. Two consequences of our method are that the quantum trace map and the so-called splitting map embed the polynomial algebra into the Fock–Goncharov quantum higher Teichmüller space and the Lê–Sikora stated skein algebra, respectively, of the annulus. We end by discussing the relationship with Fock–Goncharov duality. This is joint work with Tommaso Cremaschi.

In Special Session 32 on Vector Bundles on Varieties and Quantization at the Mathematical Congress of the Americas 2025.

MCA 2025 internal code: SS32-T07