The Classification and the Hilbert Polynomials of the Coloring of Quandles With Size 6

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Knot theory, counting a knot invariant for a knot L has been long studied. Using an algebraic structure called quandle, we calculate the knot invariant, in other words coloring of the knot. Schlank and Davis showed that by converting the knots to the closed braid s^{-} of n strings through Alexander's theorem, it is possible to compute the expected number of the coloring of the quandle Q through the Hilbert Polynomial PQ(x). We first identify the unknown quandle of size 4, J2, and compute the associated Hilbert Polynomial. Furthermore, we introduce two new methods to decompose a quandle, which are fiber product and twisted disjoint union. These 2 categorical acts allow a unique mapping so that it may be used in multiple mapping for the same two quandles. Finally, by these methods and known results by Schlank and Davis, we classified all the quandles of size 6 and computed the Hilbert Polynomial of a selected few.

Awards Won:
Air Force Research Laboratory on behalf of the United States Air Force: Glass trophy and USAF medal for each recipient
Air Force Research Laboratory on behalf of the United States Air Force: First Award of $750 in each Regeneron ISEF Category,