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Hurwitz formulas and complex reflection groups

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Hurwitz numbers enumerate tuples of elements of the symmetric group S_n having a fixed cycle type, whose product is the identity. Among other reasons, they are studied by combinatorialists (like me) because they give rise to remarkable and non trivial counting formulas. In particular when all factors except one are transpositions and the last one is a full cycle, there is a nice closed formula (in any genus) due to Jackson and Shapiro–Shapiro–Vainshtein. The point of my talk is: this formula is in fact an instance of a universal formula that holds when S_n is replaced by any well-generated complex reflection group, in particular any Coxeter group. The proof, which is representation-theoretical, is unfortunately case by case. In genus 0 we recover a formula conjectured by Looijenga and proved by Deligne, Tits, Zagier, and Bessis (their proof is also case by case). This suggests that there is a lot more to understand: Are there universal proofs? Which parts of Hurwitz theory generalize to this setting? What about the topological recursion?

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