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Logarithmic approach to the double ramification cycle

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Stellingen

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Logarithmic approach to the double ramification cycle
van Rosa Schwarz

1. The universal twisted double ramification cycle defined by the logarithmic compactification of the Abel-Jacobi map generalises the standard and canonically twisted double ramification cycles. [Theorem 1.1.1]
2. The Abel-Jacobi section extends to a proper Abel-Jacobi map from the stack of piecewise-linear functions to the Picard stack.

Motivated by [Steffen Marcus and Jonathan Wise. Logarithmic compactification of the Abel-Jacobi section. *Proceedings of the London Mathematical Society*, 121(5):1207–1250, 2020.]

3. Let $g \geq 0$ and $d \in \mathbb{Z}$. Let $A = (a_1, \dots, a_n)$ be a vector of integers satisfying $\sum_{i=1}^n a_i = d$. The universal twisted double ramification cycle $\mathrm{DR}_{g,A}^{\mathrm{op}} \in \mathrm{CH}_{\mathrm{op}}^g(\mathfrak{Pic}_{g,n,d})$ is calculated by Pixton's formula.

Motivated by [Theorem 7. Younghan Bae, David Holmes, Rahul Pandharipande, Johannes Schmitt, and Rosa Schwarz. Pixton's formula and Abel–Jacobi theory on the Picard stack. *Acta Mathematica*, 230(2):205–319, 2023.]

4. Not every piecewise-polynomial function is a product of piecewise-linear functions, but it will be after sufficient modification of the stack. [Theorem 2.3.8/Theorem 3.3.8]
5. The logarithmic double ramification cycle lies in the tautological subring of the logarithmic Chow ring of the Picard stack. [Corollary 3.4.20]
6. The r -fold double ramification cycle lies in the tautological subring of the Chow ring of $\overline{\mathcal{M}}_{g,n}$ and is invariant under the action of the group $\mathrm{GL}_r(\mathbb{Z})$ on the defining line bundles $\mathcal{L}_1, \dots, \mathcal{L}_r$ on the universal curve over $\overline{\mathcal{M}}_{g,n}$. [Theorem 3.5.6/Theorem 3.5.7]

7. The language of piecewise-polynomial functions allows us to simplify Pixton's formula for computing the double ramification cycle considerably.

Motivated by [Section 6.3. David Holmes, Samuel Molcho, Rahul Pandharipande, Aaron Pixton, and Johannes Schmitt. Logarithmic double ramification cycles. *arXiv:2207.06778*, 2022.]

8. The log structure on $\overline{\mathcal{M}}_{g,n}$ defined by endowing the universal curve \mathcal{C} over $\overline{\mathcal{M}}_{g,n}$ with the basic log structure on a stable log curve, is the same as the log structure defined by the étale local expressions for the boundary divisors $\partial\overline{\mathcal{M}}_{g,n}$.

Motivated by [Fumiharu Kato. Log smooth deformation and moduli of log smooth curves. *Internat. J. Math.*, 11(2):215–232, 2000.]

9. It is a valuable addition to quality of education to teach a teacher how to teach a teaching assistant how to teach the students.
10. A university is an odd combination of critical progressive thinking and tradition driven policy.
11. The geometric centre of the bed is best determined by the position of the cat.