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Geometry of the Homology Curve Complex

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Suppose S is a closed, oriented surface of genus at least two. This paper investigates the geometry of the homology multicurve complex, $\mathcal{HC}(S,\alpha)$, of S; a complex closely related to complexes studied by Bestvina-Bux-Margalit and Hatcher. A path in $\mathcal{HC}(S,\alpha)$ corresponds to a homotopy class of immersed surfaces in $S\times I$. This observation is used to devise a simple algorithm for constructing quasi-geodesics connecting any two vertices in $\mathcal{HC}(S,\alpha)$, and for constructing minimal genus surfaces in $S\times I$. It is proven that for $g \geq 3$ the best possible bound on the distance between two vertices in $\mathcal{HC}(S, \alpha)$ depends linearly on their intersection number, in contrast to the logarithmic bound obtained in the complex of curves. For $g \geq 4$ it is shown that $\mathcal{HC}(S, \alpha)$ is not δ-hyperbolic.

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