Algebraic curves from their translation surfaces

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We study constructing an algebraic curve from a Riemann surface given via a translation surface, which is a collection of finitely many polygons in the plane with sides identified by translation. We use the theory of discrete Riemann surfaces to give an algorithm for approximating the Jacobian variety of a translation surface whose polygon can be decomposed into squares. We first implement the algorithm in the case of L-shaped polygons where the algebraic curve is already known. The algorithm is also implemented in any genus for specific examples of Jenkins-Strebel representatives, a dense family of translation surfaces that, until now, lived on the analytic side of the transcendental divide between Riemann surfaces and algebraic curves. Using Riemann theta functions, we give numerical experiments and resulting conjectures up to genus 5.

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