

## Abstract

We derive generalizations of McShane's identity for higher ranked surface group representations by studying a family of mapping class group invariant functions introduced by Goncharov and Shen, which generalize the notion of horocycle lengths. In particular, we obtain McShane-type identities for finite-area cusped convex real projective surfaces by generalizing the Birman–Series geodesic scarcity theorem. More generally, we establish McShane-type identities for positive surface group representations with loxodromic boundary monodromy, as well as McShane-type inequalities for general rank positive representations with unipotent boundary monodromy. Our identities are systematically expressed in terms of projective invariants, and we study these invariants: we establish boundedness and Fuchsian rigidity results for triple and cross ratios. We apply our identities to derive the simple spectral discreteness of unipotent-bordered positive representations, collar lemmas, and generalizations of the Thurston metric.