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The rational conformal modeling question

For a domain $D \subset \mathbb{C}$ and a meromorphic function $f : D \to \mathbb{C}$, the *rational conformal modeling question* asks whether there exists an injective analytic map (a conformal map) $\varphi : D \to \mathbb{C}$ and a rational function R such that $f = R \circ \varphi$ on D. If D is simply connected, and f is analytic, it is reasonable to expect R to be a polynomial (the *polynomial conformal modeling question*). The *conformal degree* of f on D is the minimal degree of the rational function R.

Partial solutions for the polynomial and rational conformal modeling questions will be discussed, with results regarding the conformal degree as well. Of special interest is the case where $D = \mathbb{D}$, the unit disk, and f is a finite Blaschke product. In this case the polynomial conformal modeling question is related to the fingerprint of a polynomial lemniscate. The problem of computing the polynomial conformal model (ie. the function R) and the conformal map (ie. the function φ) for a given finite Blaschke product f will also be discussed.