Deformations of infinite volume hyperbolic 3-folds

Abstract. We will explain and prove structure theorems about the interior and boundary of the deformation space of geometrically finite hyperbolic 3-folds with infinite volume. Following Keen and Series we describe explicitly certain subgroups of the holonomy groups which conjecturally define a coordinate system and we will attempt to prove convergence results about these groups using techniques from combinatorial Teichmüller theory. The deformation space of such a holonomy group is not large in the space of all representations and we will describe certain geometrically nice 'orthogonal' deformations by combining techniques of Keen and Series with work of Hodgson, Kerckhoff, and Bromberg.

Content.

1. Basic Teichmüller theory. Quasiconformal deformation spaces and relationship to conformal deformations of surfaces.
2. Laminations. Convex core. General convergence and approximation results.
3. Complex of curves. Embedding into Teichmüller space. Cell decompositions.
4. Peripheral groups. Explicit constructions via amalgamated products. Trace formulae and recursive enumeration.
5. Structure theorem for rank 1 cusps.
6. Cusp points. Embeddings of trivalent graphs. Knots and links, unknotting tunnels.
7. Holding conformal structures constant. Rank two cusps. Dehn filling spaces.

Expected preparation. Basic theory of hyperbolic 3-manifolds (e.g. Ratcliffe, *Foundations of Hyperbolic Manifolds*). Basic theory of Kleinian groups (approx. chapters I to VII of Maskit, *Kleinian Groups*). Teichmüller theory (e.g. Imayoshi and Taniguchi, *An introduction to Teichmüller spaces*).

Books. Lecture notes will be provided. In addition:

- Canary, Epstein, and Marden. *Fundamentals of hyperbolic manifolds: Selected expositions*. LMS Lecture Note Series 328. Cambridge (2006)

- Elzenaar, Martin, and Schillewaert. *Deformation spaces of Kleinian groups generated by two elements of finite order.*
- Marden. *Hyperbolic Manifolds.* Cambridge (2016).

Contact. alexander.elzenaar@monash.edu