This is a review text file submitted electronically to MR.

Reviewer: W.M.Goldman

Reviewer number: 014521

Address:

Math Dept. University of Maryland,College Park, Maryland 20742

Author: Tanigawa, Harumi

Short title: Grafting, harmonic maps and projective structures on surfaces

Control number: 1 617 652

Primary classification: 32G

Secondary classification(s): 58E

Review text:

Let M be a compact Riemann surface with a projective structure and let $\gamma \subset M$ be a simple closed curve. By a procedure called "grafting" a new projective structure on a Riemann surface homeomorphic to M is obtained by removing γ and replacing it with an annulus (a Hopf torus split along a simple closed curve). This procedure leaves the holonomy homomorphism unchanged. By recording how the complex structure changes, one obtains a self-map of the Teichmüller space T_g, which is proved to be a real-analytic homeomorphism. From this it follows that for any Riemann surface M there are infinitely many projective structures with Fuchsian holonomy. Furthermore the space of projective structures on M with quasi-Fuchsian holonomy representations has infinitely many components. The proof uses an estimate relating the energy of a harmonic map and the extremal length on the grafted surface.

In addition to these results, the paper contains an exposition of Thurston's unpublished work on projective structures from the late 1970's. In particular Thurston's correspondence between projective structures and pairs (x, μ) (where x is a point in Teichmüller space and μ is a measured lamination on a hyperbolic surface corresponding to x) is sketched, as well as the interpretation of the hyperbolic metric x as an intrinsic "Kobayashi" metric in the category of topological surfaces with complex-projective structure. Applications to the holonomy mapping from the moduli space of projective structures to the space of representations of the fundamental group are also given.