



Combinatorics of Train Tracks. (AM-125)

By R. C. Penner, John L. Harer



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Measured geodesic laminations are a natural generalization of simple closed curves in surfaces, and they play a decisive role in various developments in two- and three-dimensional topology, geometry, and dynamical systems. This book presents a self-contained and comprehensive treatment of the rich combinatorial structure of the space of measured geodesic laminations in a fixed surface. Families of measured geodesic laminations are described by specifying a train track in the surface, and the space of measured geodesic laminations is analyzed by studying properties of train tracks in the surface. The material is developed from first principles, the techniques employed are essentially combinatorial, and only a minimal background is required on the part of the reader. Specifically, familiarity with elementary differential topology and hyperbolic geometry is assumed. The first chapter treats the basic theory of train tracks as discovered by W. P. Thurston, including recurrence, transverse recurrence, and the explicit construction of a measured geodesic lamination from a measured train track. The subsequent chapters develop certain material from R. C. Penner's thesis, including a natural equivalence relation on measured train tracks and standard models for the equivalence classes (which are used to analyze the topology and geometry of the space of measured geodesic laminations), a duality between transverse and tangential structures on a train track, and the explicit computation of the action of the mapping class group on the space of measured geodesic laminations in the surface.



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Editorial Review

Review

"The book is beautifully written, with a clear path of theoretical development amid a wealth of detail for the technician. . . . [T]his text provides a valuable reference work as well as a readable introduction for the student or newcomer to the area."--*Zentralblatt für Mathematik*

From the Back Cover

We study here one aspect of the mathematics pioneered by William P. Thurston, namely, the rich combinatorial structure of the space of measured geodesic laminations in a fixed surface. Roughly, a train track is a CW complex in the surface (together with extra structure), and appropriate train tracks correspond to charts on this manifold.

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