

COMBINATORICS OF TRAIN TRACKS

BY

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ADVANCED OF MATHEMATICS STUDIES

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Combinatorics Of Train Tracks

William Abikoff, Andrew Haas



Combinatorics Of Train Tracks:

Combinatorics of Train Tracks. (AM-125), Volume 125 R. C. Penner, John L. Harer, 2016-03-02 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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Problems on Mapping Class Groups and Related Topics Benson Farb, 2006-09-12 The appearance of mapping class groups in mathematics is ubiquitous The book presents 23 papers

containing problems about mapping class groups the moduli space of Riemann surfaces Teichmüller geometry and related areas Each paper focusses completely on open problems and directions The problems range in scope from specific computations to broad programs The goal is to have a rich source of problems which have been formulated explicitly and accessibly The book is divided into four parts Part I contains problems on the combinatorial and cohomological group theoretic aspects of mapping class groups and the way in which these relate to problems in geometry and topology Part II concentrates on connections with classification problems in 3 manifold theory the theory of symplectic 4 manifolds and algebraic geometry A wide variety of problems from understanding billiard trajectories to the classification of Kleinian groups can be reduced to differential and synthetic geometry problems about moduli space Such problems and connections are discussed in Part III Mapping class groups are related both concretely and philosophically to a number of other groups such as braid groups lattices in semisimple Lie groups and automorphism groups of free groups Part IV concentrates on problems surrounding these relationships This book should be of interest to anyone studying geometry topology algebraic geometry or infinite groups It is meant to provide inspiration for everyone from graduate students to senior researchers

Geometry of Riemann Surfaces William J. Harvey, Frederick P. Gardiner, Gabino González-Diez, Christos Kourouniotis, 2010-02-11 Original research and expert surveys on Riemann surfaces Discrete Groups and Geometric Structures Karel Dekimpe, Paul Igodt, Alain Valette, 2009-11-12 This volume reports on research related to Discrete Groups and Geometric Structures as presented during the International Workshop held May 26-30 2008 in Kortrijk Belgium Readers will benefit from impressive survey papers by John R Parker on methods to construct and study lattices in complex hyperbolic space and by Ursula Hamenstadt on properties of group actions with a rank one element on proper $\mathrm{CAT}(0)$ spaces This volume also contains research papers in the area of group actions and geometric structures including work on loops on a twice punctured torus the simplicial volume of products and fiber bundles the homology of Hantzsche-Wendt groups rigidity of real Bott towers circles in groups of smooth circle homeomorphisms and groups generated by spine reflections admitting crooked fundamental domains *Groups* T. W. Müller, 2004-04-08 In 1999 a number of eminent mathematicians were invited to Bielefeld to present lectures at a conference on topological combinatorial and arithmetic aspects of infinite groups The present volume consists of survey and research articles invited from participants in this conference Topics covered include topological finiteness properties of groups Kac-Moody groups the theory of Euler characteristics the connection between groups formal languages and automata the Magnus-Nielsen method for one-relator groups atomic and just infinite groups topology in permutation groups probabilistic group theory the theory of subgroup growth hyperbolic lattices in dimension three generalised triangle groups and reduction theory All contributions are written in a relaxed and attractive style accessible not only to specialists but also to good graduate and post graduate students who will find inspiration for a number of basic research projects at various levels of technical difficulty **Encyclopaedia of Mathematics** Michiel

Hazewinkel,2012-12-06 This is the second supplementary volume to Kluwer s highly acclaimed eleven volume Encyclopaedia of Mathematics This additional volume contains nearly 500 new entries written by experts and covers developments and topics not included in the previous volumes These entries are arranged alphabetically throughout and a detailed index is included This supplementary volume enhances the existing eleven volumes and together these twelve volumes represent the most authoritative comprehensive and up to date Encyclopaedia of Mathematics available **In the Tradition of Ahlfors and Bers, III** William Abikoff,Andrew Haas,2004 Contains proceedings that reflects the 2001 Ahlfors Bers Colloquium held at the University of Connecticut Storrs This book is suitable for graduate students and researchers interested in complex analysis **The Cumulative Book Index** ,1992 A world list of books in the English language In the Tradition of Thurston III Ken'ichi Ohshika,Athanase Papadopoulos,2024-03-19 William Thurston s ideas have altered the course of twentieth century mathematics and they continue to have a significant influence on succeeding generations of mathematicians The purpose of the present volume and of the other volumes in the same series is to provide a collection of articles that allows the reader to learn the important aspects of Thurston s heritage The topics covered in this volume include Kleinian groups holomorphic motions earthquakes from the Anti de Sitter point of view the Thurston and Weil Petersson metrics on Teichm ller space 3 manifolds geometric structures dynamics on surfaces homeomorphism groups of 2 manifolds and the theory of orbifolds **Invariants of Knots and 3-manifolds (Kyoto 2001)** Tomotada Ohtsuki,2002 Decomposition Theorems for Complex Projective Structures Shimpei Baba,2009 **Symplectic Floer Homology of Area-preserving Surface Diffeomorphisms and Sharp Fixed Point Bounds** Andrew Walker Cotton-Clay,2009 **Annales Scientifiques de L'École Normale Supérieure** École normale supérieure (France),2011 Iteration of Mapping Classes and Limits of Hyperbolic 3-manifolds Jeffrey Farlowe Brock,1997 □□□□□□□□ ,1992 **Bulletin of the Belgian Mathematical Society, Simon Stevin** ,2001 Journal of the Korean Mathematical Society ,2008 □□□□□□□□ ,2000 *Foliations and the Geometry of 3-Manifolds* Danny Calegari,2007-05-17 This unique reference aimed at research topologists gives an exposition of the pseudo Anosov theory of foliations of 3 manifolds This theory generalizes Thurston s theory of surface automorphisms and reveals an intimate connection between dynamics geometry and topology in 3 dimensions Significant themes returned to throughout the text include the importance of geometry especially the hyperbolic geometry of surfaces the importance of monotonicity especially in 1 dimensional and co dimensional dynamics and combinatorial approximation using finite combinatorial objects such as train tracks branched surfaces and hierarchies to carry more complicated continuous objects

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