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# Self-Similar Groups

Volodymyr Nekrashevych



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# Self Similar Groups

**Volodymyr Nekrashevych**



## Self Similar Groups:

*Self-Similar Groups* Volodymyr Nekrashevych, 2014-05-21 Self similar groups groups generated by automata appeared initially as examples of groups that are easy to define but that enjoy exotic properties like nontrivial torsion intermediate growth etc The book studies the self similarity phenomenon in group theory and shows its intimate relation with dynamical systems and more classical self similar structures such as fractals Julia sets and self affine tilings The relation is established through the notions of the iterated monodromy group and the limit space which are the central topics of the book A wide variety of examples and different applications of self similar groups to dynamical systems and vice versa are discussed It is shown in particular how Julia sets can be reconstructed from the respective iterated monodromy groups and that groups with exotic properties appear now not just as isolated examples but as naturally defined iterated monodromy groups of rational functions The book is intended to be accessible to a wide mathematical readership including graduate students interested in group theory and dynamical systems

**Self-Similar Groups** Volodymyr Nekrashevych, 2014-05-21 Self similar groups groups generated by automata initially appeared as examples of groups that are easy to define but have exotic properties like nontrivial torsion intermediate growth etc This book studies the self similarity phenomenon in group theory and shows its relationship with dynamical systems

**Fractal Geometry and Stochastics IV** Christoph Bandt, Peter Mörters, Martina Zähle, 2010-01-08 Over the last fifteen years fractal geometry has established itself as a substantial mathematical theory in its own right The interplay between fractal geometry analysis and stochastics has highly influenced recent developments in mathematical modeling of complicated structures This process has been forced by problems in these areas related to applications in statistical physics biomathematics and finance This book is a collection of survey articles covering many of the most recent developments like Schramm Loewner evolution fractal scaling limits exceptional sets for percolation and heat kernels on fractals The authors were the keynote speakers at the conference Fractal Geometry and Stochastics IV at Greifswald in September 2008

Infinite Groups: Geometric, Combinatorial and Dynamical Aspects Laurent Bartholdi, Tullio Ceccherini-Silberstein, Tatiana Smirnova-Nagnibeda, Andrzej Zuk, 2006-03-28 This book offers a panorama of recent advances in the theory of infinite groups It contains survey papers contributed by leading specialists in group theory and other areas of mathematics Topics include amenable groups Kaehler groups automorphism groups of rooted trees rigidity C algebras random walks on groups pro  $p$  groups Burnside groups parafree groups and Fuchsian groups The accent is put on strong connections between group theory and other areas of mathematics

**Groups and Topological Dynamics** Volodymyr Nekrashevych, 2022-10-11 This book is devoted to group theoretic aspects of topological dynamics such as studying groups using their actions on topological spaces using group theory to study symbolic dynamics and other connections between group theory and dynamical systems One of the main applications of this approach to group theory is the study of asymptotic properties of groups such as growth and amenability The book presents recently developed techniques of studying groups of

dynamical origin using the structure of their orbits and associated groupoids of germs applications of the iterated monodromy groups to hyperbolic dynamical systems topological full groups and their properties amenable groups groups of intermediate growth and other topics The book is suitable for graduate students and researchers interested in group theory transformations defined by automata topological and holomorphic dynamics and theory of topological groupoids Each chapter is supplemented by exercises of various levels of complexity

**Groups St Andrews 2005: Volume 1** C. M.

Campbell,2007-01-04 Selected papers from Groups St Andrews 2005 cover a wide spectrum of modern group theory

*Languages and Automata* Benjamin Steinberg,2024-10-21 This reference discusses how automata and language theory can be used to understand solutions to solving equations in groups and word problems in groups Examples presented include how Fine scale complexity theory has entered group theory via these connections and how cellular automata has been generalized into a group theoretic setting Chapters written by experts in group theory and computer science explain these connections

*Conformal Graph Directed Markov Systems on Carnot Groups* Vasileios Chousionis,Jeremy T. Tyson,Mariusz Urbanski,2020-09-28 The authors develop a comprehensive theory of conformal graph directed Markov systems in the non Riemannian setting of Carnot groups equipped with a sub Riemannian metric In particular they develop the thermodynamic formalism and show that under natural hypotheses the limit set of an Carnot conformal GDMS has Hausdorff dimension given by Bowen s parameter They illustrate their results for a variety of examples of both linear and nonlinear iterated function systems and graph directed Markov systems in such sub Riemannian spaces These include the Heisenberg continued fractions introduced by Lukyanenko and Vandehey as well as Kleinian and Schottky groups associated to the non real classical rank one hyperbolic spaces

**Fractals in Graz 2001** Peter Grabner,Wolfgang Woess,2012-12-06 This book

contains the proceedings of the conference Fractals in Graz 2001 Analysis Dynamics Geometry Stochastics that was held in the second week of June 2001 at Graz University of Technology in the capital of Styria southeastern province of Austria The scientific committee of the meeting consisted of M Barlow Vancouver R Strichartz Ithaca P Grabner and W Woess both Graz the latter two being the local organizers and editors of this volume We made an effort to unite in the conference as well as in the present proceedings a multitude of different directions of active current work and to bring together researchers from various countries as well as research fields that all are linked in some way with the modern theory of fractal structures Although or because in Graz there is only a very small group working on fractal structures consisting of non insiders we hope to have been successful with this program of wide horizons All papers were written upon explicit invitation by the editors and we are happy to be able to present this representative panorama of recent work on potential theory random walks spectral theory fractal groups dynamic systems fractal geometry and more The papers presented here underwent a refereeing process

Groups, Graphs and Random Walks Tullio Ceccherini-Silberstein,Maura Salvatori,Ecaterina

Sava-Huss,2017-06-29 An up to date panoramic account of the theory of random walks on groups and graphs outlining

connections with various mathematical fields      Analysis on Graphs and Its Applications Pavel Exner, 2008 This book addresses a new interdisciplinary area emerging on the border between various areas of mathematics physics chemistry nanotechnology and computer science The focus here is on problems and techniques related to graphs quantum graphs and fractals that parallel those from differential equations differential geometry or geometric analysis Also included are such diverse topics as number theory geometric group theory waveguide theory quantum chaos quantum wires systems carbon nano structures metal insulator transition computer vision and communication networks This volume contains a unique collection of expert reviews on the main directions in analysis on graphs e g on discrete geometric analysis zeta functions on graphs recently emerging connections between the geometric group theory and fractals quantum graphs quantum chaos on graphs modeling waveguide systems and modeling quantum graph systems with waveguides control theory on graphs as well as research articles      Frontiers in Complex Dynamics Araceli Bonifant, Misha Lyubich, Scott Sutherland, 2014-03-16 John Milnor best known for his work in differential topology K theory and dynamical systems is one of only three mathematicians to have won the Fields medal the Abel prize and the Wolf prize and is the only one to have received all three of the Leroy P Steele prizes In honor of his eightieth birthday this book gathers together surveys and papers inspired by Milnor's work from distinguished experts examining not only holomorphic dynamics in one and several variables but also differential geometry entropy theory and combinatorial group theory The book contains the last paper written by William Thurston as well as a short paper by John Milnor himself Introductory sections put the papers in mathematical and historical perspective color figures are included and an index facilitates browsing This collection will be useful to students and researchers for decades to come The contributors are Marco Abate Marco Arizzi Alexander Blokh Thierry Bousch Xavier Buff Serge Cantat Tao Chen Robert Devaney Alexandre Dezotti Tien Cuong Dinh Romain Dujardin Hugo Garc a Compe n William Goldman Rotislav Grigorchuk John Hubbard Yunping Jiang Linda Keen Jan Kiwi Genadi Levin Daniel Meyer John Milnor Carlos Moreira Vincente Mu oz Viet Anh Nguy n Lex Oversteegen Ricardo P rez Marco Ross Ptacek Jasmin Raissy Pascale Roesch Roberto Santos Silva Dierk Schleicher Nessim Sibony Daniel Smania Tan Lei William Thurston Vladlen Timorin Sebastian van Strien and Alberto Verjovsky      Ecohydrology Amilcare Porporato, Jun Yin, 2022-02-17 Ecohydrology is a fast growing branch of science at the interface of ecology and geophysics studying the interaction between soil water vegetation microbiome atmosphere climate and human society This textbook gathers the fundamentals of hydrology ecology environmental engineering agronomy and atmospheric science to provide a rigorous yet accessible description of the tools necessary for the mathematical modelling of water energy carbon and nutrient transport within the soil plant atmosphere continuum By focusing on the dynamics at multiple time scales from the diurnal scale in the soil plant atmospheric system to long term stochastic dynamics of water availability responsible for ecological patterns and environmental fluctuations it explains the impact of hydroclimatic variability on vegetation and soil microbial systems through biogeochemical cycles and ecosystems

under different socioeconomical pressures It is aimed at advanced students researchers and professionals in hydrology ecology Earth science environmental engineering environmental science agronomy and atmospheric science Groups St Andrews 2009 in Bath: Volume 1 C. M. Campbell, M. R. Quick, E. F. Robertson, C. M. Roney-Dougal, G. C. Smith, G. Traustason, 2011-06-16 Groups St Andrews 2009 was held in the University of Bath in August 2009 and this first volume of a two volume book contains selected papers from the international conference Five main lecture courses were given at the conference and articles based on their lectures form a substantial part of the proceedings This volume contains the contributions by Gerhard Hiss RWTH Aachen and Volodymyr Nekrashevych Texas A M Apart from the main speakers refereed survey and research articles were contributed by other conference participants Arranged in alphabetical order these articles cover a wide spectrum of modern group theory The regular proceedings of Groups St Andrews conferences have provided snapshots of the state of research in group theory throughout the past 30 years Earlier volumes have had a major impact on the development of group theory and it is anticipated that this volume will be equally important

**Holomorphic Dynamics and Renormalization** Mikhail Lyubich, Michael Yampolsky, 2008 Collects papers that reflect some of the directions of research in two closely related fields Complex Dynamics and Renormalization in Dynamical Systems This title contains papers that introduces the reader to this fascinating world and a related area of transcendental dynamics It also includes open problems and computer simulations **Fractal Geometry and Stochastics V** Christoph

Bandt, Kenneth Falconer, Martina Zähle, 2015-07-08 This book collects significant contributions from the fifth conference on Fractal Geometry and Stochastics held in Tabarz Germany in March 2014 The book is divided into five topical sections geometric measure theory self similar fractals and recurrent structures analysis and algebra on fractals multifractal theory and random constructions Each part starts with a state of the art survey followed by papers covering a specific aspect of the topic The authors are leading world experts and present their topics comprehensibly and attractively Both newcomers and specialists in the field will benefit from this book *Groups, Languages and Automata* Derek F. Holt, Sarah Rees, Claas E.

Röver, 2017-02-23 A reference book discussing applications of formal language theory to group theory particularly geometric and computational group theory **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 Teichmüller space 3 manifolds geometric structures dynamics on surfaces homeomorphism groups of 2 manifolds and the theory of orbifolds **Isomorphism Conjectures in K- and L-Theory**

Wolfgang Lück, 2025-09-30 This monograph is devoted to the Isomorphism Conjectures formulated by Baum and Connes and

by Farrell and Jones These conjectures are central to the study of the topological K theory of reduced group C algebras and the algebraic K and L theory of group rings They have far reaching applications in algebra geometry group theory operator theory and topology The book provides a detailed account of the development of these conjectures their current status methods of proof and their wide ranging implications These conjectures are not only powerful tools for concrete computations but also play a crucial role in proving other major conjectures Among these are the Borel Conjecture on the topological rigidity of aspherical closed manifolds the stable Gromov Lawson Rosenberg Conjecture on the existence of Riemannian metrics with positive scalar curvature on closed Spin manifolds Kaplansky s Idempotent Conjecture and the related Kadison Conjecture the Novikov Conjecture on the homotopy invariance of higher signatures and conjectures concerning the vanishing of the reduced projective class group and the Whitehead group of torsionfree groups     *Azimuthal Walsh Filters* Indrani Bhattacharya,Lakshminarayan Hazra,2020-08-13 This book explores the possibility of using azimuthal Walsh filters as an effective tool for manipulating far field diffraction characteristics near the focal plane of rotationally symmetric imaging systems It discusses the generation and synthesis of azimuthal Walsh filters and explores the inherent self similarity presented in various orders of these filters classifying them into self similar groups and sub groups Further it demonstrates that azimuthal Walsh filters possess a unique rotational self similarity exhibited among adjacent orders Serving as an atlas of diffraction phenomena with pupil functions represented by azimuthal Walsh filters of different orders this book describes how orthogonality and self similarity of these filters could be harnessed to sculpture 2D and 3D light distributions near the focus

This book delves into Self Similar Groups. Self Similar Groups is an essential topic that needs to be grasped by everyone, from students and scholars to the general public. The book will furnish comprehensive and in-depth insights into Self Similar Groups, encompassing both the fundamentals and more intricate discussions.

1. This book is structured into several chapters, namely:

- Chapter 1: Introduction to Self Similar Groups
- Chapter 2: Essential Elements of Self Similar Groups
- Chapter 3: Self Similar Groups in Everyday Life
- Chapter 4: Self Similar Groups in Specific Contexts
- Chapter 5: Conclusion

2. In chapter 1, the author will provide an overview of Self Similar Groups. This chapter will explore what Self Similar Groups is, why Self Similar Groups is vital, and how to effectively learn about Self Similar Groups.
3. In chapter 2, the author will delve into the foundational concepts of Self Similar Groups. This chapter will elucidate the essential principles that must be understood to grasp Self Similar Groups in its entirety.
4. In chapter 3, the author will examine the practical applications of Self Similar Groups in daily life. The third chapter will showcase real-world examples of how Self Similar Groups can be effectively utilized in everyday scenarios.
5. In chapter 4, the author will scrutinize the relevance of Self Similar Groups in specific contexts. The fourth chapter will explore how Self Similar Groups is applied in specialized fields, such as education, business, and technology.
6. In chapter 5, the author will draw a conclusion about Self Similar Groups. The final chapter will summarize the key points that have been discussed throughout the book.

This book is crafted in an easy-to-understand language and is complemented by engaging illustrations. It is highly recommended for anyone seeking to gain a comprehensive understanding of Self Similar Groups.

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