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Abstracts

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ABSTRACTS

EPSTEIN David, Computers, Groups and Hyperbolic Geometry.

We give a brief introduction to a new theory of how to manipulate groups given by generators and relators. For the convenience of the mathematicians, reasonably full proofs are given of some standard results in computer science, showing the relation of regular languages to first order predicate calculus. We explain how standard geometric hypotheses give rise to properties of related groups which are expressed most naturally in the language of computer science. Such considerations enable us to produce fast and practical programs to manipulate such groups.

GALLOT Sylvestre, Inégalités isopérimétriques et analytiques sur les variétés riemanniennes.

We begin by a survey of some classical comparison theorems in Geometry and Analysis. We aim at giving sharp analytic inequalities (i.e. lower bounds of eigenvalues of the Laplacian on a manifold or on a domain, of Sobolev constants, upper bounds of the heat kernel). The only geometric information which is necessary to get such inequalities is an isoperimetric inequality (i.e. a lower bound of the isoperimetric function of the manifold). For each possible choice of the isoperimetric inequality, we construct a sequence of manifolds which asympotically realises the equality case in both analytic and isoperimetric inequalities. We then establish sharp and universal isoperimetric inequalities under the assumption: "Ricci curvature bounded from below" and "diameter bounded" (this last assumption may be replaced by "Cheeger's isoperimetric constant bounded from below"). These assumptions are necessary and sufficient. Nevertheless, the assumption on Ricci curvature may be replaced by an integral one. We then prove a universal inequality.

GROMOV Mikhael, Width and related invariants of Riemannian manifolds.

The classical notion of width for subsets of R^n was generalized by Uryson to arbitrary metric spaces. We give an overview of this width for complete Riemannian manifolds.

KARCHER Hermann, A geometric classification of positively curved symmetric spaces and the isoparametric construction of the Cayley plane.

(i) Division algebras are defined in terms of the second fundamental form of the cut locus of a positively curved symmetric space. (II) A classification of the division algebras is included. (III) A Weyl identity for isoparametric polynomials for the tubes around the standard embedded projective planes can be written in terms of the multiplication of the division algebras; via the Weyl identity one can rewrite them in terms of geometric invariants. This gives enough extrinsic isometries to show the focal submanifolds to be extrinsically symmetric. (v) The curvature of the focal submanifolds is positive. The hypersurface metrics can be deformed (keeping the totally geodesic curvature foliations) to have positive curvature (Wallach examples) and also into two different Einstein metrics.

KAUFFMAN Louis H., New invariants in the theory of knots.

This paper introduces the Jones polynominal and its generalizations using the author's "bracket" states model. The exposition is almost completely self-contained for the reader who is content to view the theory of knots as the theory of invariants of the formal diagrammatic system generated by the Reidemeister moves. Topics covered are alternating links, chilarity, braid monoid, relationships of Hecke and von Neumann algebras with knot diagrams, the Potts model as a form of the bracket, graph theory and generalized Tutte polynomial, topological invariants of graphs in three-space.

MAUNG MIN - Oo, Almost symmetric spaces.

In this paper compact almost symmetric spaces with small Cartan curvature are investigated. The main Theorem is the following: Let G/K be an irreducible Riemannian symmetric space of non-compact type of rank > 1. Then for any dimension n > 6 and diameters d > 0 there exists an $\varepsilon > 0$ depending only on n and d such that if M is an n-dimensional compact almost homogeneous manifold of type G/K with diameter < d and if A is a Cartan connection for M whose curvature F satisfies $\max \| F \| < \varepsilon$, then A can be deformed to a flat Cartan connection. In particular M is diffeomorphic to a compact quotient of G/K by a discrete group of isometries.

ZIESCHANG Heinner, On Heegaard diagrams of 3-Manifolds.

In this survey we consider Heegaard diagrams as tools for 3-dimensional topology. We present some classical results and facts about curves on handlebodies, and some applications to Seifert fibre spaces and knot exteriors. These applications have been obtained in joint work with M. Boileau and M. Rost.