



On large orientation-reversing finite group-actions on 3-manifolds and equivariant Heegaard decompositions

Bruno P. Zimmermann¹ 

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Abstract

We consider finite group-actions on closed, orientable and nonorientable 3-manifolds; such a finite group-action leaves invariant the two handlebodies of a Heegaard splitting of M of some genus g . The maximal possible order of a finite group-action of an orientable or nonorientable handlebody of genus $g > 1$ is $24(g - 1)$, and in the present paper we characterize the 3-manifolds M and groups G for which the maximal possible order $|G| = 24(g - 1)$ is obtained, for some G -invariant Heegaard splitting of genus $g > 1$. If M is reducible then it is obtained by doubling an action of maximal possible order $24(g - 1)$ on a handlebody of genus g . If M is irreducible then it is a spherical, Euclidean or hyperbolic manifold obtained as a quotient of one of the three geometries by a normal subgroup of finite index of a Coxeter group associated to a Coxeter tetrahedron, or of a twisted version of such a Coxeter group.

Keywords 3-Manifold · Finite group-action · Equivariant Heegaard decomposition · Maximally symmetric 3-manifold · Tetrahedral Coxeter group

Mathematics Subject Classification 57M60 · 57S17 · 57S25

1 Introduction

The maximal possible order of a finite group G of orientation-preserving diffeomorphisms of an orientable handlebody of genus $g > 1$ is $12(g - 1)$ ([3,9]); for orientation-reversing finite group-actions on an orientable handlebody and for actions on a nonorientable handlebody, the maximal possible order is $24(g - 1)$; we will always assume $g > 1$ in the present paper.

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Equivariant Surgery And Classification Of Finite Group Actions On Manifolds

Karl H. Dovermann, Reinhard Schultz



Equivariant Surgery And Classification Of Finite Group Actions On Manifolds:

Equivariant Surgery and Classification of Finite Group Actions on Manifolds Karl Heinz Dovermann, Melvin Rothenberg, 1988 In this work we develop an equivariant Sullivan Wall surgery exact sequence in the category of smooth and locally linear actions of finite groups which satisfy the gap hypothesis We then apply this machinery to various problems of classifying group actions on manifolds

Equivariant Surgery and Classification of Finite Group Actions on Manifolds Karl Heinz Dovermann, Melvin Rothenberg, 1988 *Equivariant Surgery Theories and Their Periodicity Properties* Karl H. Dovermann, Reinhard Schultz, 2006-11-14 The theory of surgery on manifolds has been generalized to categories of manifolds with group actions in several different ways This book discusses some basic properties that such theories have in common Special emphasis is placed on analogs of the fourfold periodicity theorems in ordinary surgery and the roles of standard general position hypotheses on the strata of manifolds with group actions The contents of the book presuppose some familiarity with the basic ideas of surgery theory and transformation groups but no previous knowledge of equivariant surgery is assumed The book is designed to serve either as an introduction to equivariant surgery theory for advanced graduate students and researchers in related areas or as an account of the authors previously unpublished work on periodicity for specialists in surgery theory or transformation groups

Group Actions on Manifolds Reinhard Schultz, 1985 Presents an understanding of the sorts of problems one studies in group actions and the methods used to study such problems This book features articles based upon lectures at the 1983 AMS IMS SIAM Joint Summer Research Conference Group Actions on Manifolds held at the University of Colorado

Equivariant Surgery and Classification of Finite Group Actions on Manifolds Alex Heller, Friedrich Tomi, Karl Heinz Dovermann, Mladen Bestvina, Siegfried Graf, 1988

Algebraic Topology. Poznan 1989 Stefan Jackowski, Bob Oliver, Krzysztof Pawalowski, 2006-11-14 As part of the scientific activity in connection with the 70th birthday of the Adam Mickiewicz University in Poznan an international conference on algebraic topology was held In the resulting proceedings volume the emphasis is on substantial survey papers some presented at the conference some written subsequently

Real Algebraic Geometry and Topology Selman Akbulut, 1995 This book contains the proceedings of the Real Algebraic Geometry Topology Conference held at Michigan State University in December 1993 Presented here are recent results and discussions of new ideas pertaining to such topics as resolution theorems algebraic structures topology of nonsingular real algebraic sets and the distribution of real algebraic sets in projective space

Transformation Groups Katsuo Kawakubo, 2006-11-14

Finite Group Actions on Simply-Connected Manifolds and CW Complexes Amir H. Assadi, 1982 The problem that we are concerned with is the existence and construction of embeddings of a given G CW complex G manifold in another G CW complex G manifold having a prescribed homotopy type and a prescribed family of isotropy subgroups

Current Trends in Transformation Groups Anthony Bak, Masaharu Morimoto, Fumihiro Ushitaki, 2002-07-31 This book provides an overview of some of the most active topics in the theory of

transformation groups over the past decades and stresses advances obtained in the last dozen years The emphasis is on actions of Lie groups on manifolds and CW complexes Manifolds and actions of Lie groups on them are studied in the linear semialgebraic definable analytic smooth and topological categories Equivalent vector bundles play an important role The work is divided into fifteen articles and will be of interest to anyone researching or studying transformations groups The references make it easy to find details and original accounts of the topics surveyed including tools and theories used in these accounts

Handbook of Geometric Topology R.B. Sher,R.J. Daverman,2001-12-20 Geometric Topology is a foundational component of modern mathematics involving the study of spacial properties and invariants of familiar objects such as manifolds and complexes This volume which is intended both as an introduction to the subject and as a wide ranging resouce for those already grounded in it consists of 21 expository surveys written by leading experts and covering active areas of current research They provide the reader with an up to date overview of this flourishing branch of mathematics

Journal of the Faculty of Science, the University of Tokyo ,1990

Surveys in Noncommutative Geometry Nigel Higson,John Roe,2006 In June 2000 the Clay Mathematics Institute organized an Instructional Symposium on Noncommutative Geometry in conjunction with the AMS IMS SIAM Joint Summer Research Conference These events were held at Mount Holyoke College in Massachusetts from June 18 to 29 2000 The Instructional Symposium consisted of several series of expository lectures which were intended to introduce key topics in noncommutative geometry to mathematicians unfamiliar with the subject Those expository lectures have been edited and are reproduced in this volume The lectures of Rosenberg and Weinberger discuss various applications of noncommutative geometry to problems in ordinary geometry and topology The lectures of Lagarias and Tretkoff discuss the Riemann hypothesis and the possible application of the methods of noncommutative geometry in number theory Higson gives an account of the residue index theorem of Connes and Moscovici Noncommutative geometry is to an unusual extent the creation of a single mathematician Alain Connes The present volume gives an extended introduction to several aspects of Connes work in this fascinating area

The Topological Classification of Stratified Spaces Shmuel Weinberger,1994 This book provides the theory for stratified spaces along with important examples and applications that is analogous to the surgery theory for manifolds In the first expository account of this field Weinberger provides topologists with a new way of looking at the classification theory of singular spaces with his original results Divided into three parts the book begins with an overview of modern high dimensional manifold theory Rather than including complete proofs of all theorems Weinberger demonstrates key constructions gives convenient formulations and shows the usefulness of the technology Part II offers the parallel theory for stratified spaces Here the topological category is most completely developed using the methods of controlled topology Many examples illustrating the topological invariance and noninvariance of obstructions and characteristic classes are provided Applications for embeddings and immersions of manifolds for the geometry of group actions for algebraic varieties and for rigidity theorems are found in Part III This volume

will be of interest to topologists as well as mathematicians in other fields such as differential geometry operator theory and algebraic geometry *Notices of the American Mathematical Society* American Mathematical Society,1988 *Topology Symposium Siegen 1979* Ulrich Koschorke,W.D. Neumann,2006-12-08 **Michigan Mathematical Journal** ,1992

Surgery Theory Wolfgang Lück,Tibor Macko,2024-07-05 This monograph provides a comprehensive introduction to surgery theory the main tool in the classification of manifolds Surgery theory was developed to carry out the so called Surgery Program a basic strategy to decide whether two closed manifolds are homeomorphic or diffeomorphic This book provides a detailed explanation of all the ingredients necessary for carrying out the surgery program as well as an in depth discussion of the obstructions that arise The components include the surgery step the surgery obstruction groups surgery obstructions and the surgery exact sequence This machinery is applied to homotopy spheres the classification of certain fake spaces and topological rigidity The book also offers a detailed description of Ranicki s chain complex version complete with a proof of its equivalence to the classical approach developed by Browder Novikov Sullivan and Wall This book has been written for learning surgery theory and includes numerous exercises With full proofs and detailed explanations it also provides an invaluable reference for working mathematicians Each chapter has been designed to be largely self contained and includes a guide to help readers navigate the material making the book highly suitable for lecture courses seminars and reading courses *Geometric and Algebraic Topology* Henryk Toruńczyk,Stefan Jackowski,Stanisław Spież,1986

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