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## Rational Homotopical Models and Uniqueness

Martin Majewski



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# Rational Homotopical Models And Uniqueness

**Serge Bouc**



## **Rational Homotopical Models And Uniqueness:**

**Rational Homotopical Models and Uniqueness** Martin Majewski, 2000 The main goal of this paper is to prove the following conjecture of Baues and Lemaire the differential graded Lie algebra associated with the Sullivan model of a space is homotopy equivalent to its Quillen model In addition we show the same for the cellular Lie algebra model which we build from the simplicial analog of the classical Adams Hilton model It turns out that this cellular Lie algebra model is one link in a chain of models connecting the models of Quillen and Sullivan The key result which makes all this possible is Anick's correspondence between differential graded Lie algebras and Hopf algebras up to homotopy In addition we show that the Quillen model is a rational homotopical equivalence and we conclude the same for the other models using our main result The construction of the three models is given in detail The background from homotopy theory differential algebra and algebra is presented in great generality

**Rational Homotopical Models & Uniqueness** Martin Majewski, 2014-09-11 The main goal of this paper is to prove the following conjecture of Baues and Lemaire the differential graded Lie algebra associated with the Sullivan model of a space is homotopy equivalent to its Quillen model In addition the authors show the same for the cellular Lie algebra model which they build from the simplicial analogue of the classical Adams Hilton model It turns out that this cellular Lie algebra model is one link in a chain of models connecting the models of Quillen and Sullivan The key result which makes all this possible is Anick's correspondence between differential graded Lie algebras and Hopf algebras up to homotopy

Rational Homotopy Theory Yves Felix, Stephen Halperin, J.-C. Thomas, 2012-12-06 as well as by the list of open problems in the final section of this monograph The computational power of rational homotopy theory is due to the discovery by Quillen 135 and by Sullivan 144 of an explicit algebraic formulation In each case the rational homotopy type of a topological space is the same as the isomorphism class of its algebraic model and the rational homotopy type of a continuous map is the same as the algebraic homotopy class of the corresponding morphism between models These models make the rational homology and homotopy of a space transparent They also in principle always and in practice sometimes enable the calculation of other homotopy invariants such as the cup product in cohomology the Whitehead product in homotopy and rational Lusternik Schnirelmann category In its initial phase research in rational homotopy theory focused on the identification of these models These included the definition of rational homotopy invariants in terms of the homotopy Lie algebra the translation of the Whitehead product to the homotopy groups of the loop space  $\Omega X$  under the isomorphism  $H_1(\Omega X) \cong \pi_1(X)$  and the length Since then however work has concentrated on the properties of these invariants and has uncovered some truly remarkable and previously unsuspected phenomena For example If  $X$  is an  $n$  dimensional simply connected finite CW complex then either its rational homotopy groups vanish in degrees  $2 \leq n$  or else they grow exponentially

*Rational Homotopy Theory and Differential Forms* Phillip Griffiths, John Morgan, 2013-10-02 This completely revised and corrected version of the well known Florence notes circulated by the authors together with E Friedlander examines basic topology

emphasizing homotopy theory Included is a discussion of Postnikov towers and rational homotopy theory This is then followed by an in depth look at differential forms and de Thom s theorem on simplicial complexes In addition Sullivan s results on computing the rational homotopy type from forms is presented New to the Second Edition Fully revised appendices including an expanded discussion of the Hirsch lemma Presentation of a natural proof of a Serre spectral sequence result Updated content throughout the book reflecting advances in the area of homotopy theory With its modern approach and timely revisions this second edition of Rational Homotopy Theory and Differential Forms will be a valuable resource for graduate students and researchers in algebraic topology differential forms and homotopy theory

**Lie Models in Topology** Urtzi Buijs,Yves Félix,Aniceto Murillo,Daniel Tanré,2020-12-15 Since the birth of rational homotopy theory the possibility of extending the Quillen approach in terms of Lie algebras to a more general category of spaces including the non simply connected case has been a challenge for the algebraic topologist community Despite the clear Eckmann Hilton duality between Quillen and Sullivan treatments the simplicity in the realization of algebraic structures in the latter contrasts with the complexity required by the Lie algebra version In this book the authors develop new tools to address these problems Working with complete Lie algebras they construct in a combinatorial way a cosimplicial Lie model for the standard simplices This is a key object which allows the definition of a new model and realization functors that turn out to be homotopically equivalent to the classical Quillen functors in the simply connected case With this the authors open new avenues for solving old problems and posing new questions This monograph is the winner of the 2020 Ferran Sunyer i Balaguer Prize a prestigious award for books of expository nature presenting the latest developments in an active area of research in mathematics

*Cutting-Edge Mathematics* Henar Herrero,María Cruz Navarro,Hélia Serrano,2024-08-25 The book contains a selection of research and expository papers in pure and applied mathematics presented by various authors as plenary or invited speakers at the biennial congress of the Spanish Royal Mathematical Society held in Ciudad Real Spain in January 2022 The main results focus on the Yang problem and its solution proposed by Globevnik a phylogenetic reconstruction based on algebra the Calderon problem for local and nonlocal Schrödinger equations some open problems in orthogonal polynomial theory Quillen s rational homotopy theory Ulrich bundles and applications and free objects in theory of Banach spaces Researchers in these fields are potential audiences

**Graphs and Patterns in Mathematics and Theoretical Physics** Mikhail Lyubich,Leon Armenovich Takhtadzhian,2005 The Stony Brook Conference Graphs and Patterns in Mathematics and Theoretical Physics was dedicated to Dennis Sullivan in honor of his sixtieth birthday The event s scientific content which was suggested by Sullivan was largely based on mini courses and survey lectures The main idea was to help researchers and graduate students in mathematics and theoretical physics who encounter graphs in their research to overcome conceptual barriers The collection begins with Sullivan s paper Sigma models and string topology which describes a background algebraic structure for the sigma model based on algebraic topology and transversality Other contributions to

the volume were organized into five sections Feynman Diagrams Algebraic Structures Manifolds Invariants and Mirror Symmetry Combinatorial Aspects of Dynamics and Physics These sections along with more research oriented articles contain the following surveys Feynman diagrams for pedestrians and mathematicians by M Polyak Notes on universal algebra by A Voronov Unimodal maps and hierarchical models by M Yampolsky and Quantum geometry in action big bang and black holes by A Ashtekar This comprehensive volume is suitable for graduate students and research mathematicians interested in graph theory and its applications in mathematics and physics

Homotopy of Operads and Grothendieck-Teichmüller Groups  
Benoit Fresse, 2017-05-22 The ultimate goal of this book is to explain that the Grothendieck Teichmüller group as defined by Drinfeld in quantum group theory has a topological interpretation as a group of homotopy automorphisms associated to the little 2 disc operad To establish this result the applications of methods of algebraic topology to operads must be developed This volume is devoted primarily to this subject with the main objective of developing a rational homotopy theory for operads The book starts with a comprehensive review of the general theory of model categories and of general methods of homotopy theory The definition of the Sullivan model for the rational homotopy of spaces is revisited and the definition of models for the rational homotopy of operads is then explained The applications of spectral sequence methods to compute homotopy automorphism spaces associated to operads are also explained This approach is used to get a topological interpretation of the Grothendieck Teichmüller group in the case of the little 2 disc operad This volume is intended for graduate students and researchers interested in the applications of homotopy theory methods in operad theory It is accessible to readers with a minimal background in classical algebraic topology and operad theory

**Higher Structures and Operadic Calculus**  
Bruno Vallette, 2025-05-19 This book presents the notes originating from five series of lectures given at the CRM Barcelona in 21-25 June 2021 during the Higher homotopical structures programme Since their introduction 60 years ago the notions of infinity algebras Stasheff Sugawara higher categories Boardman Vogt operads May and model categories Quillen have given rise to powerful new tools which made possible the resolution of open problems and prompted revolutions in many domains like algebraic topology rational homotopy theory faithful algebraic invariants of the homotopy type of spaces deformation theory formality theorems formal moduli problems and mathematical physics quantization of Poisson manifolds quantum field theories to name but a few This theory of higher structures using operadic calculus is currently under rapid development The aim of this book is to provide the community with an accessible state of the art while at the same time giving interested researchers and advanced students a brief overview on the subject

*Rational Homotopy Theory II* Steve Halperin, Yves Felix, Jean-claude Thomas, 2015-02-11 This research monograph is a detailed account with complete proofs of rational homotopy theory for general non simply connected spaces based on the minimal models introduced by Sullivan in his original seminal article Much of the content consists of new results including generalizations of known results in the simply connected case The monograph also includes an expanded version of recently published results about the growth and

structure of the rational homotopy groups of finite dimensional CW complexes and concludes with a number of open questions This monograph is a sequel to the book Rational Homotopy Theory RHT published by Springer in 2001 but is self contained except only that some results from RHT are simply quoted without proof

*Non-Additive Exact Functors and Tensor Induction for Mackey Functors* Serge Bouc, 2000 First the author introduces a generalization of the notion of right exact functor between abelian categories to the case of non additive functors The main result of this section is an extension theorem any functor defined on a suitable subcategory can be extended uniquely to a right exact functor defined on the whole category Next those results are used to define various functors of generalized tensor induction associated to finite bisets between categories attached to finite groups This includes a definition of tensor induction for Mackey functors for cohomological Mackey functors for  $p$  permutation modules and algebras This also gives a single formalism of bisets for restriction inflation and ordinary tensor induction for modules

**Intersection Cohomology, Simplicial Blow-Up and Rational Homotopy** David Chataur, Martintxo Saralegi-Aranguren, Daniel Tanré, 2018-08-09 Let  $X$  be a pseudomanifold In this text the authors use a simplicial blow up to define a cochain complex whose cohomology with coefficients in a field is isomorphic to the intersection cohomology of  $X$  introduced by M Goresky and R MacPherson The authors do it simplicially in the setting of a filtered version of face sets also called simplicial sets without degeneracies in the sense of C P Rourke and B J Sanderson They define perverse local systems over filtered face sets and intersection cohomology with coefficients in a perverse local system In particular as announced above when  $X$  is a pseudomanifold the authors get a perverse local system of cochains quasi isomorphic to the intersection cochains of Goresky and MacPherson over a field We show also that these two complexes of cochains are quasi isomorphic to a filtered version of Sullivan s differential forms over the field  $Q$  In a second step they use these forms to extend Sullivan s presentation of rational homotopy type to intersection cohomology

Caustics for Dissipative Semilinear Oscillations Jean-Luc Joly, Guy Métivier, Jeffrey Rauch, 2000 This book is intended for graduate students and research mathematicians interested in partial differential equations

*Homogeneous Integral Table Algebras of Degree Three: A Trilogy* Harvey I. Blau, 2000 Homogeneous integral table algebras of degree three with a faithful real element The algebras of the title are classified to exact isomorphism that is the sets of structure constants which arise from the given basis are completely determined Other results describe all possible extensions pre images with a faithful element which is not necessarily real of certain simple homogeneous integral table algebras of degree three On antisymmetric homogeneous integral table algebras of degree three This paper determines the homogeneous integral table algebras of degree three in which the given basis has a faithful element and has no nontrivial elements that are either real symmetric or linear and where an additional hypothesis is satisfied It is shown that all such bases must occur as the set of orbit sums in the complex group algebra of a finite abelian group under the action of a fixed point free automorphism of order three Homogeneous integral table algebras of degree three with no nontrivial linear elements The algebras of the title which

also have a faithful element are determined to exact isomorphism All of the simple homogeneous integral table algebras of degree three are displayed and the commutative association schemes in which all the nondiagonal relations have valency three and where some relation defines a connected graph on the underlying set are classified up to algebraic isomorphism

**Canadian Journal of Mathematics** ,1992-12      **Splitting Theorems for Certain Equivariant Spectra** L. Gaunce Lewis,2000 This book is intended for graduate students and research mathematicians interested in algebraic topology

**Geometry, Spectral Theory, Groups, and Dynamics** Robert Brooks,Michael Entov,Yehuda Pinchover,Michah Sageev,2005 This volume contains articles based on talks given at the Robert Brooks Memorial Conference on Geometry and Spectral Theory and the Workshop on Groups Geometry and Dynamics held at Technion the Israel Institute of Technology Haifa Robert Brooks 1952 2002 broad range of mathematical interests is represented in the volume which is devoted to various aspects of global analysis spectral theory the theory of Riemann surfaces Riemannian and discrete geometry and numbertheory A survey of Brooks work has been written by his close colleague Peter Buser Also included in the volume are articles on analytic topics such as Szego s theorem and on geometric topics such as isoperimetric inequalities and symmetries of manifolds The book is suitable for graduate studentsand researchers interested in various aspects of geometry and global analysis

**Canonical Sobolev Projections of Weak Type  $(1,1)$**  Earl Berkson,2001 Let  $S$  be a second order smoothness in the  $\mathbb{R}^n$  setting We can assume without loss of generality that the dimension  $n$  has been adjusted as necessary so as to insure that  $S$  is also non degenerate This title describes how  $S$  must fit into one of three mutually exclusive cases and in each of these cases the authors characterize by a simple intrinsic condition the second order smoothnesses  $S$  whose canonical Sobolev projection  $P_S$  is of weak type  $(1,1)$  in the  $\mathbb{R}^n$  setting

*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      *Operads in Algebra, Topology and Physics* Martin Markl,Steven Shnider,James D. Stasheff,2002 Operads are mathematical devices which describe algebraic structures of many varieties and in various categories From their beginnings in the 1960s they have developed to encompass such areas as combinatorics knot theory moduli spaces string field theory and deformation quantization

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