

Generalized Algorithmic Debugging and Testing

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This paper presents a method for semi-automatic bug localization, generalized algorithmic debugging, which has been integrated with the category partition method for functional testing. In this way the efficiency of the algorithmic debugging method for bug localization can be improved by using test specifications and test results. The long-range goal of this work is a semi-automatic debugging and testing system which can be used during large-scale program development of nontrivial programs.

The method is generally applicable to procedural languages and is not dependent on any ad hoc assumptions regarding the subject program. The original form of algorithmic debugging, introduced by Shapiro, was however limited to small Prolog programs without side-effects, but has later been generalized to concurrent logic programming languages. Another drawback of the original method is the large number of interactions with the user during bug localization.

To our knowledge, this is the first method which uses category partition testing to improve the bug localization properties of algorithmic debugging. The method can avoid irrelevant questions to the programmer by categorizing input parameters and then match these against test cases in the test database. Additionally, we use program slicing, a data flow analysis technique, to dynamically compute which parts of the program are relevant for the search, thus further improving bug localization.

We believe that this is the first generalization of algorithmic debugging for programs with side-effects written in imperative languages such as Pascal. These improvements together makes it more feasible to debug larger programs. However, additional improvements are needed to make it handle pointer-related side-effects and concurrent Pascal programs.

A prototype generalized algorithmic debugger for a Pascal subset without pointer side-effects and a test case generator for application programs in Pascal, C, dBase, and LOTUS have been implemented.

Categories and Subject Descriptors: D.2.5 [Software Engineering]: Testing and Debugging—debugging aids; D.2.6 [Software Engineering]: Programming Environments

General Terms: Algorithms, Experimentation, Performance

Additional Key Words and Phrases: Algorithmic debugging, automated debugging, category partition testing, program slicing

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Generalized Algorithmic Debugging

W. Eric Wong, T.H. Tse



Generalized Algorithmic Debugging:

Generalized Algorithmic Debugging, 1991 Generalized Algorithmic Debugging N. Shahmehri, 1991 Abstract This thesis presents a novel method for semi automatic program debugging the Generalized Algorithmic Debugging Technique GADT The notion of declarative algorithmic debugging was first introduced for logic programming However this is the first algorithmic debugging method based on the principle of declarative debugging which can handle the debugging of programs written in an imperative language including loops and side effects In order to localize a bug the debugging algorithm incrementally acquires knowledge about the debugged program The knowledge is supplied by the user The algorithm terminates when the bug has been localized to within the body of a procedure or an explicit loop The generalized algorithmic debugging method uses program transformation and program flow analysis techniques to transform the subject program to a largely side effect free internal form which is used for bug localization Thus this algorithm defines two views of a program 1 The user view which is the original program with side effects and 2 the transformed view which is the transformed side effect free version of the original program Transparent program debugging is supported by maintaining a mapping between these two views The bug localization algorithm works on the transformed version whereas user interactions are defined in terms of the user view We have presented a general technique which is not based on any ad hoc assumptions about the subject program The flexibility of this method has made it possible to further improve the bug localization algorithm by employing a number of other techniques i e program slicing and test database lookup thus increasing the degree of automation provided by GADT These extensions are topics for ongoing research projects and future work A survey and evaluation of a number of automated debugging systems and the techniques behind these systems are also presented We have introduced several criteria for comparing these techniques with GADT A prototype implementation of the generalized algorithmic debugging technique has been carried out to verify its feasibility and to provide feedback for further refinement of the method This has already resulted in a more efficient set of transformations described in the thesis compared to the initial prototype

Automated and Algorithmic Debugging Peter A. Fritzson, 1993-11-10 Debugging has always been a costly part of software development and many attempts have been made to provide automatic computer support for this task Automated debugging has seen major developments over the last decade One successful development is algorithmic debugging which originated in logic programming but was later generalized to concurrent imperative and lazy functional languages Important advances have also been made in knowledge based program debugging and in approaches to automated debugging based on static and dynamic program slicing based on dataflow and dependence analysis technology This is the first collected volume of papers on automated debugging and presents latest developments tutorial papers and surveys **Generalized Algorithmic Debugging and Testing** Linköping University. Dept. of Computer and Information Science, P. Fritzson, T. Gyimothy, Mariam Kamkar, Nahid Shahmehri, 1990 **Logic-Based Program Synthesis and Transformation** Germán

Puebla,2007-03-16 This book constitutes the thoroughly refereed postproceedings of the 16th International Symposium on Logic Based Program Synthesis and Transformation LOPSTR 2006 held in Venice Italy July 2006 in conjunction with ICALP 2006 PPDP 2006 and CSFW 2006 The 14 revised full papers cover tools for program development partial evaluation and program transformation security and synthesis debugging and testing as well as termination and analysis **Why Programs Fail** Andreas Zeller,2009-06-12 An award winning guide to faster and easier debugging is now updated with the latest tools and techniques It demystifies one of the toughest aspects of software programming showing clearly how to discover what caused software failures and fix them with minimal muss and fuss Programming Language Implementation and Logic Programming Pierre Deransart,Jan Maluszynski,1990-08-08 This volume consists of the papers accepted for presentation at the second international workshop on Programming Language Implementation and Logic Programming PLILP 90 held in Linköping Sweden August 20-22 1990 The aim of the workshop was to identify concepts and techniques used both in implementation of programming languages regardless of the underlying programming paradigm and in logic programming The intention was to bring together researchers working in these fields The volume includes 26 selected papers falling into two categories Papers in the first category present certain ideas from the point of view of a particular class of programming languages or even a particular language The ideas presented seem to be applicable in other classes of languages Papers in the second category directly address the problem of integration of various programming paradigms The proceedings of the predecessor workshop PLILP 88 held in Orleans France May 16-18 1988 are available as Lecture Notes in Computer Science Vol 348 *Logic-Based Program Synthesis and Transformation* Moreno Falaschi,2015-12-16 This book constitutes the thoroughly refereed post conference proceedings of the 25th International Symposium on Logic Based Program Synthesis and Transformation LOPSTR 2015 held in Siena Italy in July 2015 The 21 revised full papers presented together with 3 invited talks were carefully reviewed and selected from 30 submissions The aim of the LOPSTR series is to stimulate and promote international research and collaboration on logic based program development LOPSTR is open to contributions in all aspects of logic based program development all stages of the software life cycle and issues of both programming in the small and programming in the large *Artificial Intelligence and Information-control Systems of Robots '94* International Conference on Artificial Intelligence and Information-Control Systems of Robots 1994, Smolenice (Slovakia),1994 *Radical Innovations of Software and Systems Engineering in the Future* Martin Wirsing,2004-03-18 This book constitutes the thoroughly refereed post proceedings of the 9th International Workshop on Radical Innovations of Software and Systems Engineering in the Future RISSEF 2002 held in Venice Italy in October 2002 The 24 revised full papers presented were carefully reviewed and selected from the 36 invited workshop presentations The authors evaluate all major paradigms and conceptual issues in software and systems design and analysis especially regarding their potential for modifications to cope with future needs **Artificial Intelligence And Information - Proceedings Of The 6th**

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Computational Science and Its Applications - ICCSA 2003 Vipin Kumar,2003-05-08 The three volume set LNCS 2667 LNCS 2668 and LNCS 2669 constitutes the refereed proceedings of the International Conference on Computational Science and Its Applications ICCSA 2003 held in Montreal Canada in May 2003 The three volumes present more than 300 papers and span the whole range of computational science from foundational issues in computer science and mathematics to advanced applications in virtually all sciences making use of computational techniques The proceedings give a unique account of recent results in computational science *Proceedings of the Sixth ACM SIGPLAN International Conference on Functional Programming (ICFP '01), Florence, Italy, September 3-5, 2001* ,2001

Progress in Artificial Intelligence Luis Antunes,H. Sofia Pinto,2011-10-05 This book contains a selection of higher quality and reviewed papers of the 15th Portuguese Conference on Artificial Intelligence EPIA 2011 held in Lisbon Portugal in October 2011 The 50 revised full papers presented were carefully reviewed and selected from a total of 203 submissions The papers are organized in topical sections on affective computing ambient intelligence environments artificial intelligence methodologies for games artificial intelligence in transportation systems artificial life evolutionary algorithms computational logic with applications general artificial intelligence intelligent robotics knowledge discovery and business intelligence multi agent systems theory and applications social simulation and modeling text mining and applications and doctoral symposium on artificial intelligence

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Handbook of Software Fault Localization W. Eric Wong,T.H. Tse,2023-05-02 Handbook of Software Fault Localization A comprehensive analysis of fault localization techniques and strategies In Handbook of Software Fault Localization Foundations and Advances distinguished computer scientists Prof W

Eric Wong and Prof T H Tse deliver a robust treatment of up to date techniques tools and essential issues in software fault localization The authors offer collective discussions of fault localization strategies with an emphasis on the most important features of each approach The book also explores critical aspects of software fault localization like multiple bugs successful and failed test cases coincidental correctness faults introduced by missing code the combination of several fault localization techniques ties within fault localization rankings concurrency bugs spreadsheet fault localization and theoretical studies on fault localization Readers will benefit from the authors straightforward discussions of how to apply cost effective techniques to a variety of specific environments common in the real world They will also enjoy the in depth explorations of recent research directions on this topic Handbook of Software Fault Localization also includes A thorough introduction to the concepts of software testing and debugging their importance typical challenges and the consequences of poor efforts Comprehensive explorations of traditional fault localization techniques including program logging assertions and breakpoints Practical discussions of slicing based program spectrum based and statistics based techniques In depth examinations of machine learning data mining and model based techniques for software fault localization Perfect for researchers professors and students studying and working in the field Handbook of Software Fault Localization Foundations and Advances is also an indispensable resource for software engineers managers and software project decision makers responsible for schedule and budget control

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Fritzson,2015-01-06 Fritzson covers the Modelica language in impressive depth from the basic concepts such as cyber physical equation base object oriented system model and simulation while also incorporating over a hundred exercises and their solutions for a tutorial easy to read experience The only book with complete Modelica 3.3 coverage Over one hundred exercises and solutions Examines basic concepts such as cyber physical equation based object oriented system model and simulation

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Smart Computing Paradigms: New Progresses and Challenges Atilla Elçi,Pankaj Kumar Sa,Chirag N. Modi,Gustavo Olague,Manmath N. Sahoo,Sambit Bakshi,2019-11-30 This two volume book focuses on both theory and applications in the broad areas of communication technology computer science and information security It brings together contributions from scientists professors scholars and students and presents essential information on computing networking and informatics It also discusses the practical challenges encountered and the solutions used to overcome them the goal being to promote the translation of basic research into applied research and of applied research into practice The works presented here will also demonstrate the importance of

basic scientific research in a range of fields **Model Driven Engineering Languages and Systems** Gregor Engels, Bill Opdyke, Douglas C. Schmidt, Frank Weil, 2007-09-12 This book constitutes the refereed proceedings of the 10th International Conference on Model Driven Engineering Languages and Systems formerly the UML series of conferences MODELS 2007 held in Nashville USA September 30 October 5 2007 The 45 revised full papers were carefully reviewed and selected from 158 initial submissions The papers are organized in topical sections

Reviewing **Generalized Algorithmic Debugging**: Unlocking the Spellbinding Force of Linguistics

In a fast-paced world fueled by information and interconnectivity, the spellbinding force of linguistics has acquired newfound prominence. Its capacity to evoke emotions, stimulate contemplation, and stimulate metamorphosis is actually astonishing. Within the pages of "**Generalized Algorithmic Debugging**," an enthralling opus penned by a very acclaimed wordsmith, readers set about an immersive expedition to unravel the intricate significance of language and its indelible imprint on our lives. Throughout this assessment, we shall delve into the book's central motifs, appraise its distinctive narrative style, and gauge its overarching influence on the minds of its readers.

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