

GENETIC ALGORITHM BASED SOLUTION FOR FINAL EXAM SCHEDULING

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ABSTRACT

The automatic generation of schedules has been in focus of researches for decades. Since small changes in the input have exponential impact on the tested state space, methods based on heuristics and artificial intelligence are the most successful.

In our paper we analysed the opportunities of automatic generation of the academic final exam scheduling, which is a special subtask of schedule generation. We examined the problem with the genetic algorithm approach. We created a point system, wherewith the goodness of the generated schedules is measurable and comparable. We analysed the effect on achievable results caused by the different changes on our algorithm. We evaluated the algorithms on a real test set of 100 students.

Our results show that for this complexity there is an acceptable solution, and with some improvements on our algorithm we will be able to give solutions, which are better and fairer, than the manually compiled schedules.

INTRODUCTION

Final examination takes place at the end of the degree course in most universities. One current form of this is the oral examination, where at one time in one room only one student takes the exam in front of a board of examiners. All of these instructors have a special role, and only some particular people can fill in these places.

The scheduling of the final exams may be done manually, but the non-automated process can cause human errors, and it is hard to see through the whole scheduling, whether all requirements are realized and the timing is appropriate for everyone.

The complexity of this problem can be approached on two levels. The scheduling problem in itself is NP-complete [1], as there are too many possible combinations for scheduling people. In addition, many final-exam specific conditions must be satisfied during the scheduling and some of them contradict each other easily. For example, we may want to distribute the load among the examiners equally, but to perform certain tasks, such as filling the position of the president or examination from some subjects, only certain academics are suitable. Some teachers may have much more students than others, and it is also possible that not every necessary instructor is available at the same time.

Final Exam And Solution For Genetic Algorithm

**Viktor M. Kureichik, Sergey P.
Malioukov, Vladimir V.
Kureichik, Alexander S. Malioukov**

Final Exam And Solution For Genetic Algorithm

Solving Examination Timetabling Problem By Using Genetic Algorithm Obaid Omar Ibrahim, Mohammed Mazin Abed, Bin Ahmad Sharifuddin, 2015-07-22 Many researchers over the last decade have established numerous researches and used many methods to handle universities final examination timetabling problem such as simulated annealing tabu search and genetic algorithms In this Book Genetic Algorithm GA is used to solve the College of Graduate Studies CoGS final examination timetabling problem as it is capable of solving many complex problems This problem belongs to a class of scheduling problems which is highly constrained and known to be NP hard The algorithm has been adapted to solve the research problem whose procedure is different from the common algorithm The Book attempts to find the best solution best timetable for CoGS to help UNITEN reduce time and effort for creating examination timetables New approaches to some of the GAs operators are introduced These operators include Adaptive Mutation operator that tackles the stasis problem and a crossover scheme called Scattered Crossover to enhance the GA s ability to produce better solutions with best fitness value in lesser generations

The Practical Handbook of Genetic Algorithms Lance D. Chambers, 2019-09-17 The mathematics employed by genetic algorithms GAs are among the most exciting discoveries of the last few decades But what exactly is a genetic algorithm A genetic algorithm is a problem solving method that uses genetics as its model of problem solving It applies the rules of reproduction gene crossover and mutation to pseudo organism

Genetic Algorithms and Application in Examination Scheduling Dang Xuan Tho, 2010-06 Research Paper undergraduate from the year 2009 in the subject Computer Science Applied language English abstract Abstract In this thesis we present an introduction about genetic algorithms GAs Genetic algorithms are not too hard to program or understand since they are biologically based This thesis also shows scheduling problems especially examination scheduling problems We provide a way that can be easily used to apply the evolutionary principle to the problem solutions Furthermore these are the program s applications in reality as well as in science Keyword Genetic Algorithms Scheduling Problems Examination Scheduling Problems

Solving the Modular Exam Scheduling Problem with Genetic Algorithms Dave Corne, Hsiao-Lan Fang, Christopher S. Mellish, 1993 Abstract Scheduling exam timetables for large modular courses is a complex problem which often has to be solved in university departments This is usually done by hand taking several days or weeks of iterative repair after feedback from students complaining that the timetable is unfair to them in some way We describe an effective solution to this problem involving the use of an appropriately configured genetic algorithm GA Using real student data from a large multi departmental modular degree scheme the method we describe never failed to find a significantly better timetable than those that were actually employed produced by hand always taking less than half an hour

Practical Handbook of Genetic Algorithms Lance Chambers,1995-08-15 The mathematics employed by genetic algorithms GAs are among the most exciting discoveries of the last few decades But what exactly is a genetic algorithm A genetic algorithm is a problem solving method that uses genetics as its model of problem solving It applies the rules of reproduction gene crossover and mutation to pseudo organisms so those organisms can pass beneficial and survival enhancing traits to new generations GAs are useful in the selection of parameters to optimize a system s performance A second potential use lies in testing and fitting quantitative models Unlike any other book available this interesting new text reference takes you from the construction of a simple GA to advanced implementations As you come to understand GAs and their processes you will begin to understand the power of the genetic based problem solving paradigms that lie behind them

Genetic Algorithms + Data Structures = Evolution Programs Zbigniew Michalewicz,2013-03-09 Genetic algorithms are founded upon the principle of evolution i e survival of the fittest Hence evolution programming techniques based on genetic algorithms are applicable to many hard optimization problems such as optimization of functions with linear and nonlinear constraints the traveling salesman problem and problems of scheduling partitioning and control The importance of these techniques has been growing in the last decade since evolution programs are parallel in nature and parallelism is one of the most promising directions in computer science The book is self contained and the only prerequisite is basic undergraduate mathematics It is aimed at researchers practitioners and graduate students in computer science and artificial intelligence operations research and engineering This second edition includes several new sections and many references to recent developments A simple example of genetic code and an index are also added Writing an evolution program for a given problem should be an enjoyable experience this book may serve as a guide to this task

Genetic Algorithms and Fuzzy Multiobjective Optimization Masatoshi Sakawa,2012-12-06 Since the introduction of genetic algorithms in the 1970s an enormous number of articles together with several significant monographs and books have been published on this methodology As a result genetic algorithms have made a major contribution to optimization adaptation and learning in a wide variety of unexpected fields Over the years many excellent books in genetic algorithm optimization have been published however they focus mainly on single objective discrete or other hard optimization problems under certainty There appears to be no book that is designed to present genetic algorithms for solving not only single objective but also fuzzy and multiobjective optimization problems in a unified way *Genetic Algorithms And Fuzzy Multiobjective Optimization* introduces the latest advances in the field of genetic algorithm optimization for 0 1 programming integer programming nonconvex programming and job shop scheduling problems under multiobjectiveness and fuzziness In addition the book treats a wide range of actual real world applications The theoretical material and applications place special stress on interactive decision making aspects of fuzzy multiobjective optimization for human centered systems in most realistic situations when dealing with fuzziness The intended readers of this book are senior undergraduate students graduate students researchers and practitioners in the fields of operations research computer science industrial engineering management science systems engineering and other engineering disciplines that deal with the subjects of multiobjective programming for discrete or other hard optimization problems under fuzziness Real world research applications are used throughout the book to illustrate the presentation These applications are drawn from complex problems Examples include flexible scheduling in a machine center operation planning of district heating and cooling plants and coal purchase planning in an actual electric power plant

Genetic Algorithms as a Viable Method of Obtaining Branch Coverage Jason Frier, 2017 Finding a way to automate the generation of test data is a crucial aspect of software testing Testing comprises 50% of all software development costs Korel90 Finding a way to automate testing would greatly reduce cost and labor involved in the task of software testing One of the ways to automate software testing is to automate the generation of test data inputs For example in statement coverage creating test cases that will cover all of the conditions required when testing that program would be costly and time consuming if undertaken manually Therefore a way must be found that allows the automation of creating test data inputs to satisfy all test requirements for a given test One such way of automating test data generation is the use of genetic algorithms Genetic algorithms use the creation of generations of test inputs and then choose the most fit test inputs or those test inputs that are most likely to satisfy the test requirement as the test inputs that will be passed to the next generation of inputs In this way the solution to the test requirement problem can be found in an evolutionary fashion Current research suggests that comparison of genetic algorithms with random test input generation produces varied results While results of these studies show promise for the future use of genetic algorithms as an answer to the issue of discovering test inputs that will satisfy branch coverage what is needed is additional experimental research that will validate the performance of genetic algorithms in a test environment This thesis makes use of the EvoSuite plugin tool which is a software plugin for the IntelliJ IDEA Integrated Development Environment that runs using a genetic algorithm as its main component The EvoSuite tool is run against 22 Java classes and the EvoSuite tool will automatically generate unit tests and will also execute those unit tests while simultaneously measuring branch coverage of the unit tests against the Java classes under test The results of this thesis experimental research are that just as the literature indicates the EvoSuite tool performed with varied results In particular Fraser s study of the EvoSuite tool as an Eclipse plugin was accurate in depicting how the EvoSuite tool would come to perform as an IntelliJ plugin namely that the EvoSuite tool would perform poorly for a large number of classes tested

An Introduction to Genetic Algorithms Melanie Mitchell, 1998-03-02 Genetic algorithms have been used in science and engineering as adaptive algorithms for solving practical problems and as computational models of natural evolutionary systems This brief accessible introduction describes some of the most interesting research in the field and also enables readers to implement and experiment with genetic algorithms on their own It focuses in depth on a small set of important and interesting topics particularly in machine learning scientific modeling and artificial life and reviews a broad span of research including the work of Mitchell and her colleagues The descriptions of applications and modeling projects stretch beyond the strict boundaries of computer science to include dynamical systems theory game theory molecular biology ecology evolutionary biology and population genetics underscoring the exciting general purpose nature of genetic algorithms as search methods that can be employed across disciplines An Introduction to Genetic Algorithms is accessible to students and researchers in any scientific discipline It includes many thought and computer exercises that build on and reinforce the reader s understanding of the text The first chapter introduces genetic algorithms and their terminology and describes two provocative applications in detail The second and third chapters look at the use of genetic algorithms in machine learning computer programs data analysis and prediction neural networks and in scientific models interactions among learning evolution and culture sexual selection ecosystems evolutionary activity Several approaches to the theory of genetic algorithms are discussed in depth in the fourth chapter The fifth chapter takes up implementation and the last chapter poses some currently unanswered questions and surveys prospects for the future of evolutionary computation

Information Systems and Technologies to Support Learning Álvaro Rocha, Mohammed Serrhini, 2018-10-24 This book features a selection of articles from the second edition of the conference Europe Middle East B education in science technology engineering and Mathematics C emerging technologies in education learning innovation in the digital age D software systems architectures applications and tools E multimedia systems and applications F computer communications and networks G IOT smart cities and people wireless sensor and ad hoc networks H organizational models and information systems and technologies I human computer Interaction J computers K health informatics and medical informatics security l information and knowledge management m big data analytics and applications intelligent data systems and machine learning n artificial intelligence high performance computing o mobile embedded and ubiquitous systems p language and image processing computer graphics and vision and q the interdisciplinary field of fuzzy logic and data mining

Grouping Genetic Algorithms Michael Mutingi, Charles Mbohwa, 2016-10-04 This book presents advances and innovations in grouping genetic algorithms enriched with new and unique heuristic optimization techniques These algorithms are specially designed for solving industrial grouping problems where system entities are to be partitioned or clustered into efficient groups according to a set of guiding decision criteria Examples of such problems are vehicle routing problems team formation problems timetabling problems assembly line balancing group maintenance planning modular design and task assignment A wide range of industrial grouping problems drawn from diverse fields such as logistics supply chain management project management manufacturing systems engineering design and healthcare are presented Typical complex industrial grouping problems with multiple decision criteria and constraints are clearly described using illustrative diagrams and formulations The problems are mapped into a common group structure that can conveniently be used as an input scheme to specific variants of grouping genetic algorithms Unique heuristic grouping techniques are developed to handle grouping problems efficiently and effectively Illustrative examples and computational results are presented in tables and graphs to demonstrate the efficiency and effectiveness of the algorithms Researchers decision analysts software developers and graduate students from various disciplines will find this in depth reader friendly exposition of advances and applications of grouping genetic algorithms an interesting informative and valuable resource

Practice and Theory of Automated Timetabling Edmund Burke, Peter Ross, 1996-10-02 Provides detailed information about the signal transduction pathways used by interferons to activate gene transcription In addition this book discusses how the same pathways are used by many other cytokines and thus provide a forum for cross talk among these important biological response modifiers Additionally the book introduces the interferon system and describes the interferon inducible genes whose products are responsible for the cellular actions of interferons The nature of the interferon receptors and how the transcriptional signals are transmitted from the receptors on the cell surface to the genes in the nucleus are discussed in detail Finally the use of similar pathways of signal transduction by other cytokines is highlighted

Modern Information Technology and IT Education Vladimir Sukhomlin, Elena Zubareva, 2020-05-11 This book constitutes the refereed proceedings of the 13th International Conference on Modern Information Technology and IT Education held in Moscow Russia in November December 2018 The 30 full papers and 1 short papers were carefully reviewed and selected from 164 submissions The papers are organized according to the following topics IT education methodology methodological support e learning and IT in education educational resources and best practices of IT education research and development in the field of new IT and their applications scientific software in education and science school education in computer science and ICT economic informatics

Genetic Algorithms for Applied CAD Problems Viktor M. Kureichik, Sergey P. Malioukov, Vladimir V. Kureichik, Alexander S. Malioukov, 2009-07-09 New perspective technologies of genetic search and evolution simulation represent the kernel of this book The authors wanted to show how these technologies are used for practical problems solution This monograph is devoted to specialists of CAD intellectual information technologies in science biology economics sociology and others It may be used by post graduate students and students of specialties connected to the systems theory and system analysis methods information science optimization methods operations investigation and solution making

Applications of Evolutionary Computation Cecilia Di Chio, Anthony Brabazon, Gianni DI CARO, Marc Ebner, Muddassar Farooq, Andreas Fink, Jörn Grahl, Gary Greenfield, Penousal Machado, Michael O'Neill, Ernesto Tarantino, Neil Urquhart, 2010-03-25 This book constitutes the refereed proceedings of the International Workshops on the Applications of Evolutionary Computation EvoApplications 2010 held in Istanbul Turkey in April 2010 colocated with the Evo 2010 events Thanks to the large number of submissions received the proceedings for EvoApplications 2010 are divided across two volumes LNCS 6024 and 6025 The present volume contains contributions for EvoCOMNET EvoENVIRONMENT EvoFIN EvoMUSART and EvoTRANSLOG The 47 revised full papers presented were carefully reviewed and selected from a total of 86 submissions This volume presents a careful selection of relevant EC examples combined with a thorough examination of the techniques used in EC The papers in the volume illustrate the current state of the art in the application of EC and should help and inspire researchers and professionals to develop efficient EC methods for design and problem solving

Global Optimization 1 Brian T. Luke, 2009-09-25 Finding the best solution to a combinatorial problem can be difficult due to the extremely large number of possible solutions This book describes the application of Genetic Methods to one such problem the 0 1 Knapsack Problem Part I presents an overview of several combinatorial problems and different solution methods It then gives a detailed description of two search strategies Genetic Algorithms and Evolutionary Programming Both of these search strategies are population based methodologies that use one or two members of the current population of solutions to generate a new solution and a heuristic survival of the fittest strategy to improve the performance of the population Procedures are described for selecting parent solutions generating new solutions and processing these offspring Part II examines the performance of these algorithms on the 0 1 Knapsack Problem and describes how software can be obtained and run to test other parameters

Parallel Problem Solving from Nature - PPSN IX Thomas Philip Runarsson, Hans-Georg Beyer, Edmund Burke, Juan J. Merelo-Guervós, L. Darrell Whitley, Xin Yao, 2006-10-06 This book constitutes the refereed proceedings of the 9th International Conference on Parallel Problem Solving from Nature PPSN 2006 The book presents 106 revised full papers covering a wide range of topics from evolutionary computation to swarm intelligence and bio inspired computing to real world applications These are organized in topical sections on theory new algorithms applications multi objective optimization evolutionary learning as well as representations operators and empirical evaluation

An Investigation of Genetic Algorithm Approach to Solve University Examination Timetabling Problems Shanmugam Nanthinee, 2014

Practice and Theory of Automated Timetabling VI Edmund Burke,Hana Rudová,2007-11-25 Complete with online files and updates
this fascinating volume has everything you need to know about the latest developments in automated timetabling It constitutes the
refereed post proceedings of the 6th International Conference on Practice and Theory of Automated Timetabling PATAT 2006 The 25
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NASA Tech Briefs ,1995

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