in this issue

Editorial

Welcome to the fifth volume of SIGEVOlution. It was May 2006 when the first issue came out and back then I did not anticipate such a long and exciting ride. But here we are 16 issues later! GECCO-2010 is just seven weeks away and as June is approaching with its huge load of grading (in Italy, finals take place in June and July), the thought of meeting my old-time friends, attending interesting presentations, and roaming around Portland is very refreshing!

And while GECCO-2010 is approaching, as some of you may have noticed, the GECCO-2011 team is already up and running, and that we should expect some surprises soon. So, stay tuned and check your email.

This new issue brings you a very nice article by Peter M. Kruse, Joachim Wegener and Stefan Wrappler from Berner & Mattner regarding a tool for testing embedded systems using evolutionary algorithms. Next, Christian Gagné, the competition chair of GECCO-2010, takes us through the four exciting competitions hosted by GECCO-2010. All the four competitions are still open and the deadlines are more than a month away. So hurry up! Then, David Pelta tells us about what happened during the Fourth International Workshop on Nature Inspired Cooperative Strategies for Optimization (NICSO-2010) which was held May 12-14, 2010 in Granada, Spain. At the end, the columns provide information about a new dissertation available, new issues of journals, and forthcoming events.

And, as usual, I thank the people who made this possible: Peter M. Kruse, Joachim Wegener, Stefan Wrappler, Christian Gagné, David Pelta, Prasanna Balaprakash, Martin Butz, Xavier Llorà, Kumara Sastry, Cristiana Bolchini, Francesco Amigoni, Mario Verdicchio, Viola Schiaffonati, and board members Dave Davis and Martin Pelikan.

The cover is a shot of Dublin, by Mike Thirkell. More photos are available on Mike's flickr page and on his personal page.

Pier Luca
May 28th, 2010

Contents

A Cross-Platform Test System for Evolutionary Black-Box Testing of Embedded Systems

Peter M. Kruse, Joachim Wegener, Stefan Wappler
Berner & Mattner Systemtechnik GmbH, Berlin, Germany
{peter.kruse|joachim.wegener|stefan.wappler}@berner-mattner.com

When developing an electronic control unit (ECU) in a domain like the automotive industry, tests are performed on several test platforms, such as model-in-the-loop, software-in-the-loop and hardware-in-the-loop in order to find faults in early development stages. Test cases must be specified to verify the properties demanded of the developed system on these platforms. This is an expensive and non-trivial task. Evolutionary black-box testing, a recent approach to test case generation, can perform this task completely automatically. This paper describes our test system that implements evolutionary black-box testing and how to apply it to test functional and non-functional properties of an embedded system. Our test system supports the aforementioned test platforms and allows reuse of the generated test cases across them. We demonstrate the functioning of the test system in a case study with an antilock braking system.

Introduction

A great number of today's products are based on the deployment of embedded systems. In industrial applications, embedded systems are predominantly used for controlling and monitoring technical processes. There are examples in nearly all industrial areas, for example in aerospace technology, railway and automotive technology, process and automation technology, communication technology, process and power engineering, as well as in defense electronics. In order to achieve a high quality of an embedded system, analytical quality assurance, and in particular testing, is crucial. The aim of testing is to detect errors in the system, and, if no errors are found during comprehensive testing, to convey confidence in the correct functioning of the system.

In order to find faults in the embedded control system before its deployment into the target environment, tests are usually carried out on various test platforms in the development phase. These include model-in-the-loop, software-in-the-loop and hardware-in-the-loop test platforms. In-the-loop means there is a bidirectional interaction between the embedded system and its environment: the environment stimulates the sensors of the system and in turn the system affects the environment using its actuators. With model-in-the-loop (MiL) tests, the implementation model of the system is examined in with the modeling software running on development hardware and a simulated environment. Model-in-the-loop tests are performed when model-based development is applied. With software-in-the-loop (SiL) tests, the software implementing the system behavior is examined in a simulation environment where development hardware is used and the system environment is simulated. With model-based development, the code generated from the model can be tested on the SiL platform. With hardware-in-the-loop (HiL) tests, the software integrated into the target hardware (e.g. an embedded controller) is examined in a simulation environment.

Test cases must be created to verify the specified properties of the developed system on the different test platforms. The creation of relevant test cases is a resource-consuming and challenging task when done manually. To increase the effectiveness and efficiency of the test, and thus to reduce the overall development costs for an embedded system, automatic test case generation is highly desirable. Evolutionary testing is a promising approach for fully automating test case design for various test objectives that has been shown to be effective for various domains and development paradigms [5].

In this paper, we describe the integration of our testing tool MESSINA [1] and the evolutionary testing framework ETF in order to enable evolutionary black-box testing of embedded systems on the MiL, SiL and HiL platform.

Evolutionary Testing

Evolutionary testing is based on evolutionary algorithms. An evolutionary algorithm (EA) is an optimization technique based on the principles of the Darwinian theory of evolution. The algorithm starts with a set of candidate solutions, typically selected randomly, called individuals. Then the EA evaluates the fitness of each candidate solution by executing a problem-specific fitness function. The fitness function rewards candidate solutions that solve the optimization problem (represented by the fitness function) better than the other candidate solutions and penalizes poor solutions by assigning lower fitness values to them. Crossover is applied to the individuals that the EA selects for offspring production. Afterwards, mutation is applied to the offspring individuals. The pool of individuals is updated by inserting the offspring individuals and eliminating already contained individuals. The process of evaluation, selection, crossover, mutation and population update is iteratively repeated unless a termination criterion applies, such as that the ideal solution is found.

Evolutionary testing transforms the test objective into an optimization problem. The input domain of the test object forms the search space in which an evolutionary algorithm searches for test data that fulfils the test objective. The fitness function for functional testing must be manually defined as it is problem-specific and not generally definable. In previous work, fitness functions for the test of various automotive systems, such as a parking controller, have been implemented, e.g. in [8], [10], [11] and [12].

Our Evolutionary Test System

The industrial MESSINA tool [1] supports the test of an embedded system during its development on the MiL, SiL and HiL platform. For the latter, MESSINA communicates with the MESSINA-HiL system [2]. The ECU, consisting of the embedded software and hardware, is directly connected to MESSINA-HiL. MESSINA controls MESSINA-HiL and provides the test cases and the calculations from the integrated environment models.

Figure 1 shows the general composition of the tools and their interaction which will be described in the following sections.

MESSINA-Hil

MESSINA-HiL [2] is a modular, general-purpose hardware-in-the-loop test system developed by Berner & Mattner. MESSINA-HiL provides the ECU physically connected to it with the corresponding input signals and reads the output signals. MESSINA-HiL offers flexible signal conditioning and uses open industry standards. It is possible to link several MESSINA-HiL systems together using optical networking technology, thereby establishing a test environment for integration testing.

MESSINA

MESSINA [1] is a testing tool allowing the implementation of hardware and software-independent test sequences specified in different notations, such as UML, Java, or TPT [7]. Using abstraction layers, it allows test execution on different platforms. One of these layers is the signal pool containing all system signals provided by the connected hardware or software devices. For MiL and SiL testing, MESSINA supports software devices like Simulink models, ASCET models, and AUTOSAR software components. Multiple models and software components can be run in parallel to perform virtual system integration. For HiL testing, MESSINA is directly connected to MESSINA-HiL. MESSINA downloads tests to MESSINA-HiL where the tests are executed in real-time (Figure 3 system under test). Tests implemented in MESSINA can be used seamlessly for MiL tests, SiL tests and HiL tests. As the tests are defined hardware-independently, MESSINA enables these tests to be portable across the various test platforms. Hence, the only difference between HiL, MiL and SiL testing from MESSINA's point of view is the usage of different environment models. Therefore test cases can be used for MiL, SiL, and HiL testing without any further adaptation.

Evolutionary Testing Framework

The EvoTest project [5] developed an extensible and open automated evolutionary testing framework that provides general components and interfaces to facilitate the automatic generation, execution, monitoring and evaluation of test cases using evolutionary computation.

The evolutionary testing framework (ETF) [4] creates an evolutionary algorithm suitable for the system under test using the algorithm configuration and generation tool GUIDE [3, 6]. During the optimization process the evolutionary testing framework provides the individuals, representing the test data for the system under test, and expects the fitness values for each individual in return. We also integrated the ETF signal generator [13] to create and optimize continuous signals.

Putting it all together

We integrated ETF with MESSINA for the automatic generation of test cases as shown in Figure 1. We developed a MESSINA plug-in to configure and run the evolutionary tests. The signals of the system under test held in MESSINA's signal pool contain type information, value range information and other metadata. These are passed to the evolutionary testing framework as a specification of an individual. The evolutionary testing framework then creates a specific evolutionary algorithm conforming to this specification. Both MESSINA and ETF support mixed data types, allowing a one-to-one transformation of individuals to test data in many cases. After the transformation of an individual to test data, MESSINA executes the test on the target system. Generic test cases are parameterized with the individual data. For MiL and SiL tests, MESSINA calls the system under test directly with the parameterized test cases. For HiL testing MESSINA downloads the tests to MESSINA-HiL.

The fitness calculation is based on an analysis of the behavior of the system under test during test execution. MESSINA records the behavior through a monitoring interface. The generic test case calculates the fitness, which MESSINA passes back to ETF.

With the implemented solution search-based testing is available for thorough model-based ECU testing.

Case Study

We applied the MESSINA-ETF integration to the test of an industrial antilock brake system. As this system is already in serial production, we did not expect to find real faults. The test focuses on the verification of a particular safety requirement relating to the distance a vehicle continues to move after the actuation of its brake.
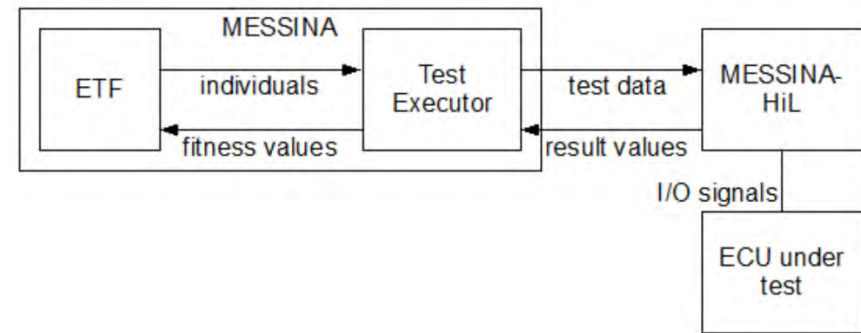

Fig. 1: Structure of the test system.

Anti-lock braking system

The anti-lock braking system (ABS) is a system which prevents the wheels of a vehicle from locking while braking, in order to allow the driver to maintain steering control under heavy braking conditions and, in most situations, to shorten the braking distance. When an ABS brake is depressed hard, like in an emergency braking situation, the ABS pumps the brakes several times per second. If the angle speed of the wheels decreases rapidly, the electronic control system reports blocking danger. The pressure of the brake hydraulics is then reduced immediately and raised again to just under the blocking threshold. This process can be repeated several times per second. The goal of the anti-locking control system is to maintain the slip of the wheels at a level which guarantees the highest braking power and the highest steerability of the vehicle. Figure 2 shows the components of the simulation environment implemented.

Evolutionary Testing of the ABS

We set up the hardware-in-the-loop test environment as previously described. We implemented a complex simulation environment integrating a commercial brake model, a vehicle dynamics model, and a wheel speed sensor model [9]. The setup of the evolutionary test system is shown in Figure 3. In the first phase of the study, we specified a generic test case to expose improper system behavior.

The generic test case consists of a set of pre-actions (e.g. accelerate up to 20 m/s), the actual test action, and the check of some postconditions. The test case in MESSINA was written in Java. For the initial tests, we set the car speed as the optimization parameter. We defined the fitness function in terms of the resulting braking distance. In the second phase, we extended our setup to optimize the friction and performed measurements of wheel slip on all four wheels during a braking maneuver to calculate the fitness. This fitness function takes into account more detailed aspects of a braking maneuver.

We configured the ETF as follows:

- Mutation rate of 0.1,

- Crossover rate of 0.85,

- Population size of 100 individuals per generation, (20 individuals for initial tests)

- Elitism of 0.15, using strong elitism,

- Fertility of 0.85;

- Number of genitors 1.0;

- Selection by Deterministic Tournament of 2.0;

- Surviving Offspring 1,0;

- Surviving Parents 0.25;

- Evolutionary Programming Tournament with a selective pressure of 2.0 for Reductor Parent and Offspring;

- Sequential final redactor with a pressure of 2.0;

- Maximal number of generation of 500.

If there is no progress in the optimization process, e.g. the best fitness value found does not improve for several generations or all fitness values in one generation have a defined minimal variation, the optimization process terminates. In initial runs, these settings turned out to be suitable.
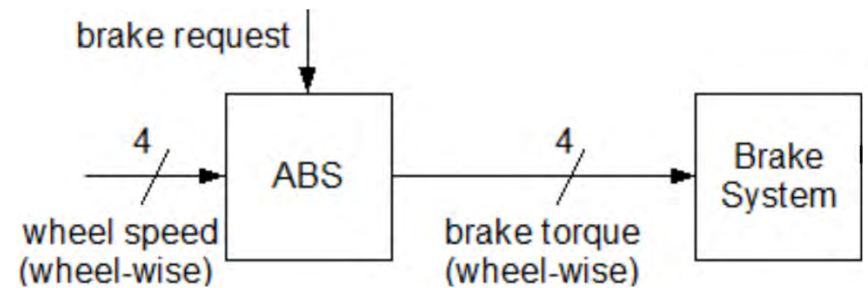

Fig. 2: Interface of the ABS system.

Test Results

For the initial tests, we disabled the ABS functionality and performed simple brake maneuvers. After 10-12 generations with 20 individuals each, a maximum braking distance of 43 meters was found. The vehicle velocity at this point was 25m/s, the fastest possible speed in our model. Execution of one individual took about 40 seconds; the total execution time for all generations of one test run was about 90 minutes. In the first phase of the case study, we enabled the ABS functionality without changing the parameters and repeated our experiment. The resulting maximum braking distance was 39 meters. In the second phase, we applied the advanced setup for a more realistic test of the ABS system using the wheel slip sensor values for the fitness function calculation. Furthermore, individuals were transformed into curve traces for the input signals of the ABS system using the signal generator of the ETF. For each of the four wheels, a waveform is generated by the signal generator representing the friction scaling (μ) of the wheel in a range of [0.5, 1.2]. To cope with the higher complexity of this search the population size was set to 100 individuals per generation, which leads to longer total execution time of the test runs. A typical optimization needed up to 37 generations. Total execution time of one run was typically around 8 hours.

Figure 3 shows a screenshot of MESSINA while execution is in progress. The lower part shows the friction scaling per wheel; the middle part shows the resulting slip values per wheel. As opposed to using the wheel slip sensor values for fitness function calculation, using the braking distance, the optimization always ran into very low frictions. To shorten total execution time of these tests, we reduced the target speed to a fixed value of 20 m/s. This reduced the test execution time of the system under test by 20% without losing any important information or characteristics, since the optimization focused on the friction scaling.

Results from these later tests are therefore not directly comparable with results from earlier tests.

Conclusion and Outlook

We presented a test system based on MESSINA, MESSINA-HiL, and the research system Evolutionary Testing Framework. This system allows full automation of black-box tests on different testing platforms (MiL, SiL, HiL) by applying search-based testing techniques. The test automation framework supports the application of evolutionary testing in very common industrial settings: testing models and software in simulation environments as well as the examination of ECUs in a hardware-in-the-loop test environment driven by a software frontend for the definition and implementation of tests. To demonstrate the application of the test system, the test of an antilock braking system was described. Test cases were generated using the evolutionary testing framework and executed in both SiL and HiL test environments. Driving maneuvers with long braking distances were found automatically.

When compared with traditional testing, the additional effort required to apply the test system with its evolutionary testing integration is relatively low in our opinion. Users only need to generalize their existing test cases by a declaration of optimization parameters and to provide a fitness function. However, the definition of a suitable fitness function remains a challenging and non-trivial task as the knowledge about the system and its constraints must be transformed into it.

Future work will be contributed to an investigation of how to configure the evolutionary testing system so as to reduce the number of pre-tests that are usually performed for parameter adjustment. Furthermore, we want to exploit the configurability of the MESSINA-HiL system for integration testing of networks of ECUs.

Bibliography

[1] Berner & Mattner Systemtechnik GmbH MESSINA. http://berner-mattner.com/en/berner-mattner-home/products/messina

[2] Berner & Mattner Systemtechnik GmbH modularHiL. http://berner-mattner.com/en/berner-mattner-home/products/modularhil

[3] Da Costa, L.; Schoenauer, M.: GUIDE, a Graphical User Interface for Evolutionary Algorithms. GECCO Workshop on Open-Source Software for Applied Genetic and Evolutionary Computation (SoftGEC), 2007.

[4] Dimitar, M.; Dimitrov, I. M.; Spasov, I.: Evotest - Framework for customizable implementation of Evolutionary Testing. International Workshop on Software and Services, October 2008, Sofia, Bulgaria.

[5] EvoTest http://www.evotest.eu/

[6] GUIDE. http://guide.gforge.inria.fr/

[7] PikeTec GmbH TPT. http://www.piketec.com

[8] Sthamer, H.-H.: The Automatic Generation of Software Test Data Using Genetic Algorithms. PhD Thesis, University of Glamorgan, Pontyprid, Wales, Great Britain, 1996.

[9] Tesis veDYNA. http://www.tesis.de/en/index.php?page=544

[10] Wegener, J. and Grochtmann, M.: Verifying Timing Constraints of Real-Time Systems by Means of Evolutionary Testing. Real-Time Systems, 15, pp. 275-298, 1998.

[11] Wegener, J., Baresel, A., Sthamer H.: Evolutionary Test Environment for Automatic Structural Testing. Information and Software Technology, vol. 43, pp. 841-854, 2001.

[12] Wegener, J.: Evolutionärer Test des Zeitverhaltens von Realzeit-Sytemen. Shaker Verlag, 2001.

[13] Windisch, A.: Search-Based Testing of Complex Simulink Models containing Stateflow Diagrams. Proceedings of the 1st International Workshop on Search-Based Software Testing, Lillehammer, Norway, 2008.
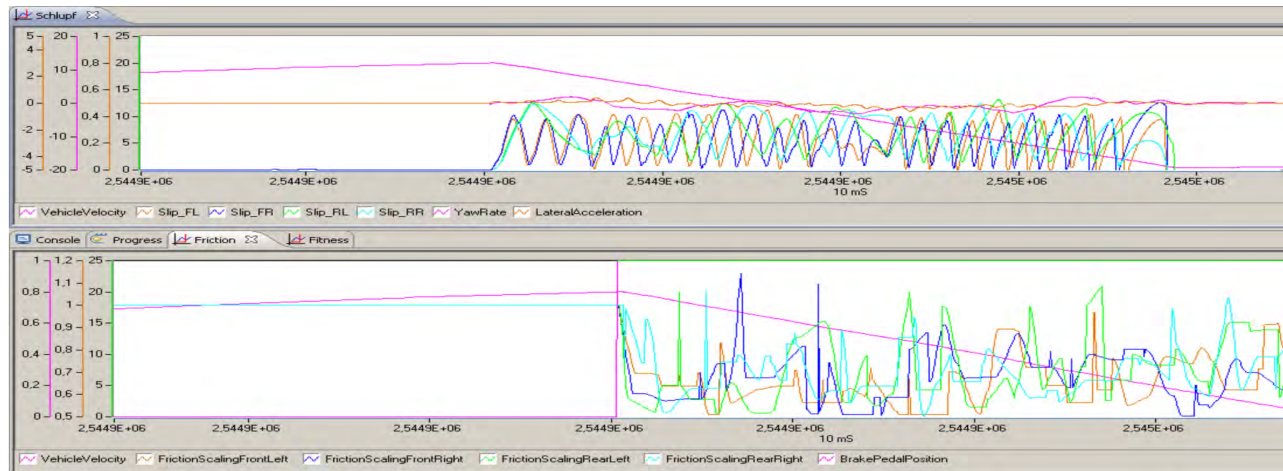
Fig. 3: Visualization of ABS signals during search.

Company Profile

Berner & Mattner Systemtechnik GmbH is a Germany-based development and consulting partner for the automotive, aerospace, defence, rail and healthcare industries. Berner & Mattner's main competencies are model-based development and quality assurance for embedded systems. The company's services range from consultancy and design to the running of complete testing and integration labs.

Berner & Mattner offers specification and testing products such as MESSINA-HiL (a hardware- in-the-loop test system for component and integration testing of electronic control units), MESSINA (a test software for defining and executing tests for embedded systems), MODENA (a test system for testing infotainment systems), CTE XL (a graphical editor for functional test case design), PowerDiff (a tool for model comparisons) as well as the DOORS extension toolbox MERAN offering extended functionalities for text-based specifications, e.g. variant management.

In order to offer efficient and innovative test automation solutions, Berner & Mattner has performed extensive research into various automation techniques, e.g. test case generation for the Classification-Tree Method, from model-based specifications or for statistical testing. Another important test case generation approach is evolutionary testing (ET) with its many facets, such as evolutionary functional testing, evolutionary structural testing, evolutionary real-time testing and evolutionary safety testing. Evolutionary testing is able to find bugs in the system under test fully automatically which other testing techniques could not find. It can create a large number of goal-oriented test cases used to examine critical aspects of the system under test. Berner & Mattner was an important industrial partner of the EU-funded EvoTest project, which looked into evolutionary testing for complex systems. Berner & Mattner's evolutionary testing research has resulted in new approaches to automatic test case generation and delivered successful results for the test of various automotive embedded systems, such as an anti-lock brake system, an active brake system, an adaptive headlight system and an electric window control. The results have been published in journals and scientific conferences, such as GECCO.

With the integration of ET into the MESSINA test automation framework, Berner & Mattner can offer the first industrial evolutionary testing environment enabling automatic test case generation across various test platforms like hardware-in-the-loop, model-in-theloop and software-in-the-loop.

The contact for ET research and products is Dr. Joachim Wegener (Joachim.Wegener@berner-mattner.com)

About the authors

Peter M. Kruse studied computer science at Otto-von-Guericke-University of Magdeburg. He has extensive experience in software engineering and is an expert of the Eclipse tool platform. In his diploma thesis he wrote about using ontologies to improve searches in metadata. Within EvoTest he worked at the definition of the EvoTest software architecture. He is leading the current CTE XL development and programming. Additionally, he is supervising students' activities as well as diploma theses.

Dr. Joachim Wegener studied Computer Science at the Technical University Berlin and obtained his PhD on the evolutionary testing of real-time systems at the Humboldt University of Berlin. This work gained him the Software Engineering Prize 2002, awarded by the Ernst Denert Foundation and the German Informatics Society. Dr. Wegener is the local representative of Berner and Mattner in Berlin, where he leads the automotive department. He previously worked for Daimler AG, where he led the development of the world's first Industrial Evolutionary Testing System. Joachim Wegener is a pioneer of Search Based Testing and has been the first program chair for the GECCO Search Based Software Engineering track. Furthermore, he played a central role in the development of the test system TESSY and the classification-tree editor CTE. He is coordinating the "Embedded Systems Testing" research group of the German Informatics Society, and is a member of the industrial advisory board of King's College.

Dr. Stefan Wappler holds a master's degree in software engineering from the University of Potsdam, Germany, and a PhD degree in engineering from the Technical University of Berlin, Germany. During his studies, Stefan Wappler focused on the development of embedded systems. He has over 5 years of experience in the field of search-based testing and researched search-based testing of object-oriented systems. Stefan Wappler is working for Berner & Mattner as a consultant specialised in testing and managing the test of various customer vehicle systems under development.

Company webpage: www.berner-mattner.com

Competitions @ GECCO-2010

Christian Gagné

Competitions at GECCO are great opportunity to demonstrate ones' technical, scientific or artistic capabilities in a friendly context. For the 2010 edition, four competitions are organized on various topics: evolutionary arts, GPUs for GEC, simulated racing cars, and a demolition derby.

Evolutionary Art Competition

Evolutionary algorithms are unique in the artificial intelligence field for their Darwinian creativity capabilities. So why not taking advantage of this for creating innovative pieces of arts? For the second year, an evolutionary art competition will be held at GECCO, connecting the artistic community with more technically oriented peoples traditionally attending the conference. Sciences and arts have a lot in common; this evolutionary art competition will be a great opportunity to demonstrate that again.

GPUs for Genetic and Evolutionary Computation

Since a few years, GPUs have been more and more used for general purposes computations. Indeed, these units are able of massive computation power for repetitive operations at a reduced cost. The embarrassingly parallel nature of evolutionary computations make them good candidate for exploiting GPUs. The GPUs competition focuses on that, allowing participants to expose their technical ability to parallelize EC in efficient and elegant ways.

Simulated Car Racing Championship

GECCO will host the American leg of the 2010 Simulated Car Racing Championship. This championship consists in designing an intelligent controller of racing cars competing against the clock and against other competitors. Videogames are fun, car racing is exciting and artificial intelligence is fascinating, so why not combining all these three into a fascinating challenge, where you should not forget to breath.

Demolition Derby

There is the official, well funded and widely publicized elite car racing championships. But there is also the less glamorous, yet very fun and sensational demolition derby events, held in events such as county fairs and festival. The objective is simple: wreck the other cars before being wrecked yourself. For the first year at GECCO, such an event is organized, using simulated cars of course. No doubt it will be a very spectacular event!

These competitions are open to anyone who will attend the conference. There are still several weeks before the submission deadline for these competitions, so interested participants are warmly invited to submit an entry to these events.

See you in Portland!

Christian Gagné
GECCO-2010 Competitions Chair

Evolutionary Art Competition

2010 Genetic and Evolutionary Computation Conference
## Wednesday – Sunday July 7 –11, 2010 Portland, Oregon, USA

This competition invites conference participants to demonstrate that genetic and evolutionary computation can be applied to create impressive and provocative works of art. The competition will identify the best work, be it an image, a sculpture, a music score, a video, an interactive online experience, or a system that exhibits some form of independent creativity.

Entry Submission

Entrants must submit: (1) a brief artistic statement illustrating the concept, (2) a short paper describing the technical details, and (3) a set of multimedia files to illustrate the result of the evolutionary process. Artists can either submit five still images, or a video of up to 5 minutes, or a sound file of up to 5 minutes. All submissions should be sent to christian.gagne@gel.ulaval.ca by June 18, 2010.

Evaluation

The submissions will be evaluated by a jury of researchers from the evolutionary computation and the technological arts communities, who will evaluate the submissions on the following criteria: originality (50 %), technical quality (30 %), and relevance to evolutionary art and the goals of the competition (20 %).
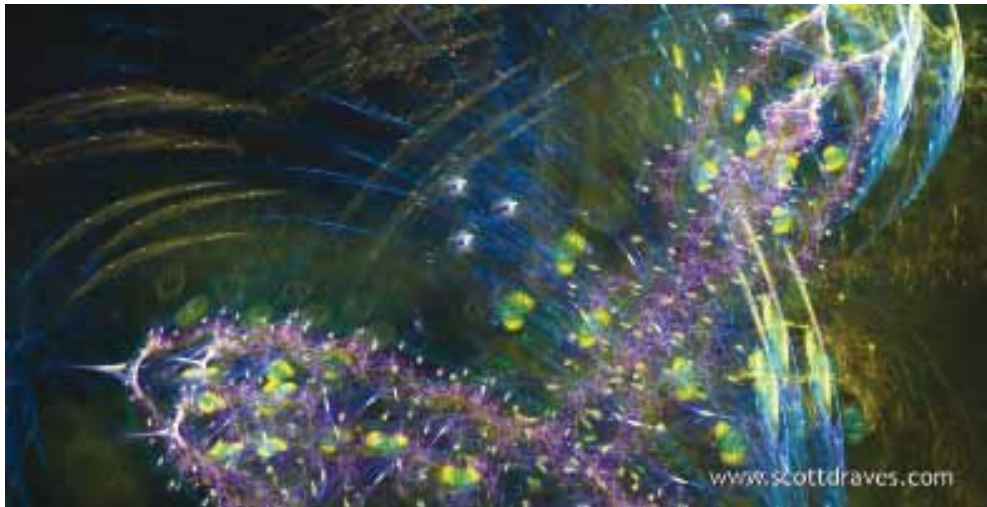
Presentation

Finalists selected by the jury will be invited to present their submission at the competition session, held during the GECCO conference. The winner of the competition will be announced at the SIGEVO meeting ceremony, on July 11, 2010.

IJART Special Issue

Best submissions to the competition will be invited to propose a paper on their artwork for a special issue in the International Journal of Arts and Technology (IJART).

Important Dates

  * Submission deadline: June 18, 2010
  * Conference: July 7-11, 2010
  * Journal paper submission
    (on invitation): November 1, 2010
  * Expected issue: September 2011

Organizers

  * Scott Draves, Electric Sheep
  * Christian Gagné, Université Laval
  * Jeffrey Ventrella, independent
    artist/researcher

Evaluation Committee

  * Bruce Damer, Contact Consortium and Biota.org
  * Simon Penny, UC Irvine
  * Craig Reynolds, Sony Computer
    Entertainment (US R&D)
  * Hiroko Sayama, Binghamton University
  * Karl Sims
  * Osher Yadgar, SRI International

www.scottdraves.com

Clade of Electric Sheep by Scott Draves, 2009 Critic's Award
Self Portraits by Jeffrey Ventrella, 2009 Critic's Award

GPUs for Genetic and Evolutionary Computation

2010 Genetic and Evolutionary Computation Conference
Wednesday – Sunday July 7 –11, 2010 Portland, Oregon, USA

We are pleased to announce the official start of the GPU competition of GECCO-2010 with the publication of the competition rules and the scoring system.

The Goal

This competition focuses on the applications of genetic and evolutionary computation that can maximally exploit the parallelism provided by low-cost consumer graphical cards. The competition will award the best applications both in terms of degree of parallelism obtained, in terms of overall speed-up, and in terms of programming style.

Rules and Regulations

Entrants must submit (1) the application sources with the instructions to compile it and (2) a two page description of the application. Submissions will be reviewed by a committee of researchers from the evolutionary computation community and from industry. Each reviewer will score the submission according to 12 criteria concerning the submitted algorithm, the speed-up it achieves, and its impact on the evolutionary computation community. The total score will be obtained as the weighted sum of the 12 separate scores.

Submissions should be mailed to gecco2010@gpgpgpu.com no later than June 23rd, 2010. The final scores will be announced during GECCO.

Important Dates

Submission deadline: June 23rd 2010
Conference: July 7th-11th 2010

Organizers

Simon Harding, Memorial University of Newfoundland, Canada
David Luebke, NVIDIA
Pier Luca Lanzi, Politecnico di Milano
Edmondo Orlotti, NVIDIA
Antonino Tumeo, Pacific Northwest National Laboratory, USA

Sponsor of the GECCO-2010 competitions.

Scoring

Submissions will be reviewed by a panel of researchers from the evolutionary computation community and from industry who will score each submission according to the following criteria.

Algorithm (50% of the total score)

Novelty	10%	Does the algorithm exploit the GPU in a novel way? (e.g., not just for fitness evaluation?)
Efficiency	10%	Does the algorithm efficiently use the GPU?
GPU-side	10%	How much of the algorithm is implemented GPU side?
Elegance	5%	Is the algorithm simple, easy to understand?
Portability	5%	Is the code parameterized for different GPU architectures and/or across vendors?
Suitability	10%	Does it use features of the GPU architecture logically and to the advantage of the program?

Speed (20% of the total score)

Speedup	10%	How much is the speed up compared to a well coded CPU version?
Resources	5%	What is the resource utilization? (Ideally a program should use the 100% of the GPU).
Scalability	5%	Will it scale? E.g. to new hardware, multiple GPUs, GPUs with fewer/more processors?

Evolutionary Computation (30% of the total score)

Utility	10%	Do the results benefit the EC/GA/GP community?
Practicality	10%	Were the results practically obtainable without GPU acceleration?
Science	10%	Is the system used to generate better quality science? For example, increasing statistical significance, increasing coverage of test cases or demonstrating greater generalization.

2010 Simulated Car Racing Championship

2010 Genetic and Evolutionary Computation Conference
Wednesday – Sunday July 7 – 11, 2010 Portland, Oregon, USA

We are pleased to announce the start of the 2010 Simulated Car Racing Championship, an event joining three simulated car racing competitions held at:

* ACM GECCO-2010, Portland (USA), July 7th - 11th
* IEEE WCCI-2010, Barcelona (Spain), July 18th - July 23rd
* IEEE CIG-2010, Copenhagen (Denmark), August 18th - August 21st

The Goal

The goal of the championship is to design a controller for a racing car that will compete on a set of unknown tracks first alone (against the clock) and then against other drivers. The controllers perceive the racing environment through a number of sensors that describe the relevant features of the car surroundings, of the car state, and the game state.The controller can perform the typical driving actions (clutch, changing gear, accelerate, break, steering the wheel, etc.)

New Features

The 2010 Championship introduces several innovations in comparison with the 2009 edition:

* the range of the proximity sensors have been increased from 100m to 200m
* the position of the range finders can be customized by users
* new focus sensor provides accurate sensing of the road ahead
* noise is introduced to range and proximity sensors
* drivers now control the clutch
* a new warm-up stage allows drivers to learn about track properties before the qualifying

Previous competitors can enter the competition with only small additional effort since the 2010 APIs are very similar to the ones used for the 2009 edition.

Rules and Regulations

The championship consists of nine races on nine different tracks divided into three legs, one for each conference, involving three Grand Prix competitions each. Teams will be allowed to submit a different driver to each leg. Each Grand Prix consists of three stages: the warm-up, the qualifying, and the race.

Sponsor of the GECCO-2010 competitions.

During the warm-up, drivers race alone to collect useful information about the tracks and tune their behaviors. During the qualifying, drivers races alone on the tracks; the eight fastest drivers participate in the main race. The main event consists of eight three lap races on each of the three tracks. At the end of each race, the drivers are scored using the F1 system. The driver performing the fastest lap in the race will get two additional points. The driver completing the race with the smallest amount of damage will also get two extra points.

As in the previous edition, the tracks used in each leg are unknown to the competitors.

Championship Legs

Each leg will focus on a specific track type and will involve a different number of laps:
* American Leg (GECCO-2010), three motor speedways and 50 laps.
* Formula Leg (WCCI-2010), three technical (F1-like) tracks and 15 laps.
* Dusty Leg (CIG-2010), three dirt tracks (non-asphalt streches and bumps) and 25 laps.

Important Dates

American Leg (GECCO-2010):   Submission deadline June 27th 2010
                               Conference: July 7th-11th 2010

Formula Leg (WCCI-2010):   Submission deadline: July 7th 2010
                               Conference: July 18th-23rd 2010

Dusty Leg (CIG-2010):   Submission deadline: August 8th 2010
                               Conference: August 18th-21st 2010

Competition Software

The competition software, including servers for Linux & Windows, and C++ and Java clients, can be downloaded from the competition webpage: http://cig.dei.polimi.it/?page_id=134

For inquiries send an email to scr2010@sigevolution.org

Organizing Commitee

Daniele Loiacono (Politecnico di Milano)
Luigi Cardamone (Politecnico di Milano)
Martin V. Butz (University of Würzburg)
Pier Luca Lanzi (Politecnico di Milano)

GECCO
2010

GECCO-2010 Demolition Derby

2010 Genetic and Evolutionary Computation Conference
Wednesday – Sunday July 7 –11, 2010 Portland, Oregon, USA

We are pleased to announce the GECCO-2010 Demolition Derby Competition.

The Goal

The goal of Demolition Derby is simple: wreck all opponent cars by crashing into them without getting wrecked yourself.

To provide spectacular and entertaining non-stop action, Demolition Derby takes place on a very small circular track (surface: asphalt, length: 640m, width: 90m, number of laps: 1000) and includes special changes in comparison to the regular racing competition:

1. The range of the 36 opponent sensors has been increased to 300m.

2. Cars do not take any damage when colliding with walls.

3. Cars do not take any damage in the front when colliding with each other.

4. Cars do take the doubled amount of damage in the rear when colliding with each other.

5. The last car standing is declared winner of the match.

All racing controllers participating in Demolition Derby have to qualify for the final showdown match by competing with each other in preliminary 1-vs-1-matches. The best eight controllers then fight each other at the same time in the final match. The last car standing in the final match is declared Winner of the GECCO-2010 Demolition Derby Competition.

Rules and Regulations

The competition is split into two phases: the preliminary 1-vs-1-matches and the final all-vs-all-match of the best eight controllers.

In the preliminary 1-vs-1-matches, every controller drives against every other controller, one at a time. After each match, the car with less damage is declared winner and earns one point. The sum of points earned in all 1-vs-1-matches determines a controller's ranking. Each match has a maximum duration of 15.000 ingame timesteps (5min simulated time).

The best eight controllers according to this ranking compete with each other in the final all-vs-all-match. All eight controllers are placed on the track at the same time and, therefore, have to deal with multiple opponents at once. Every time a car gets wrecked, the damage of all other cars is reset to zero.

Winner is the last car standing in the final match, ranking of the other seven cars is determined by the sequence of retirement.

Important Dates

There will be two Demolition Derby competitions, one at GECCO-2010 (Genetic and Evolutionary Computation Conference) and another at CIG-2010 (Symposium on Computational Intelligence and Games):

GECCO-2010   Submission deadline: June 27th 2010

                 Conference: July 7th-11th 2010

CIG-2010   Submission deadline: August 8th 2010

                 Conference: August 18th-21st 2010

Competition Software

More information on rules, procedure, and submission dates please are available at the official Demolition Derby website:

        http://www.coboslab.psychologie.uni-wuerzburg.de/competitions/

For inquiries send an email to dd2010@sigevolution.org

Organizing Commitee

Martin V. Butz (University of Würzburg)
Matthias J. Linhardt (University of Würzburg)
Daniele Loiacono (Politecnico di Milano)
Luigi Cardamone (Politecnico di Milano)
Pier Luca Lanzi (Politecnico di Milano)

Sponsor of the GECCO-2010 competitions.

GECCO 2010

David Pelta, University of Granada, Spain
Conference webpage: http://www.nicso2010.org

The IV International Workshop on Nature Inspired Cooperative Strategies for Optimization (http://www.nicso2010.org) was held in Granada, Spain during May 12-14, 2010. The event brought together leading researchers from academia and industry to present recent advances and to explore future directions in the application of cooperative and hybrid methods for solving complex problems.

As in past editions, the main features of the workshop were the high level of the plenary speakers, the quality of the selected contributions, which were published as volume 284 in Springer's series "Studies in Computational Intelligence" and the time available in the schedule to have discussions, meetings and explore collaboration opportunities amongst participants.

In this edition, three plenary talks were given.

The first one by Prof. Julian Francis Miller, from the Bio-Inspired Architectures Lab, Department of Electronics, University of York, UK. His talk on "Evolving the brain inside the brain" showcased the interplay between neuroscience and a new sophisticated model of artificial neuron that give rise to an artificial neural network showing features beyond those in classical models.

The second plenary talk, by Prof. Pier Luca Lanzi from the Dipartimento di Elettronica e Informazione, Politecnico di Milano, Italy, versed on the application of computational intelligence techniques in games. After stating the interest and economic relevance of the video game industry, Prof. Lanzi discussed the opportunities available in the field where the application of well known techniques from other areas can help to improve games. Prof. Lanzi also devoted part of his talk to discuss his experience as organizer of the Simulated Car Racing competition.

Finally, Prof. Alan FT Winfield, from the Faculty of Environment and Technology at the University of the West of England, UK, presented results emanating from several projects in the field of robotics. In particular he emphasized current research in swarms of robots that while governed by only local interactions, were nonetheless able to complete complex tasks through self organized cooperation.

NICSO 2010 accepted 32 contributions after a review process performed by an international programme committee. These contributions are published in the book "Nature Inspired Cooperative Strategies for Optimization (NICSO 2010)", in Volume 284 of the Series Studies in Computational Intelligence, by Springer, Berlin. Contributions included several flavours of Evolutionary Algorithms, Ant and Bee Colonies, Swarm Intelligence approaches, Neural Networks, several models of cooperation, Agents Models, Social Interactions, as well as new algorithms based on the behavior of fireflies or bats.

It was noticeably the important number of contributions addressing some kind of "automatic design" by means of evolutionary techniques. For example, papers on the automatic design of MEMS, hyper-heuristics, olive oil price predictors, Mastermind strategies, software testing units, etc., gathered considerable attention, thus suggesting an upcoming trend in the research community.

As in previous editions, an accompanying special issue on the journal of Memetic Computing will be edited and NICSO's participants will be invited to submit substantially extended versions of their Workshop's contributions. More information will be published soon in NICSO's website.

Our experience after four editions of NICSO demonstrates that there is an emerging and thriving community of scholars doing research, and practitioners applying, bio-inspired cooperative or hybrid techniques that goes beyond "classical" optimization problems. Due to the availability of ever more powerful and interconnected computer architectures, "cooperativity" as a strategic leverage in optimization, data mining, machine learning, robotics, etc is gaining momentum. We observe a clear tendency for using these robust and efficient techniques in novel problems where dynamism and/or noise and/or uncertainties are inherent features that must be addressed. As a consequence, these aspects would be promoted in future editions of the Workshop.

NICSO Steering Committee

- David A. Pelta, University of Granada, Spain
- Natalio Krasnogor, University of Nottingham, UK

NICSO 2010 Organizing Committee

- Carlos Cruz, University of Granada, Spain
- Juan R. González, University of Granada, Spain
- Germán Terrazas, University of Nottingham, UK

Additional Information

- NICSO 2006: http://decsai.ugr.es/ dpelta/NICSO
  Proceedings available here.
- NICSO 2007: http://www.dmi.unict.it/nicso2007/index.html
  Proceedings available here.
- NICSO 2008: http://www.gci.org.es/nicso2008
  Proceedings available here.
- NICSO 2010: http://www.nicso2010.org
  Proceedings available here.

Call for Papers

Eighth International Conference on
Simulated Evolution And Learning (SEAL-2010)
01 - 04 December 2010
Indian Institute of Technology Kanpur, India

About SEAL
SEAL-2010 is the eighth biennial conference in the highly successful conference series* that aims at exploring evolution and learning as two forms of adaptation and their roles and interactions in adaptive systems.

Program Tracks
Original work in the form of papers of maximum length 10 pages are invited in the following broad topics:
- Evolutionary Optimization
- Evolutionary Learning
- Hybrid Learning
- Adaptive Systems
- Theoretical Issues in Evolutionary Computation
- Real-World Applications of Evolutionary Computation and Learning Techniques

Review Process & Proceedings
All submitted papers will be reviewed on the basis of relevance, originality, significance, soundness and clarity by at least three referees. Accepted papers presented at the conference will be published as a volume of the **Lecture Notes in Computer Science** (LNCS, Springer) series.

Important Deadlines:
Initial paper submission: **05 July, 2010**
Notification of acceptance: **16 August, 2010**
Camera-ready papers: **03 September, 2010**

Tutorials and Workshops
A number of eminent EC and machine learning researchers will present tutorials on various state-of-the-art methodologies. A few workshops and an industry session are also planned. To date, the following speakers have agreed to deliver tutorial sessions:
B. Yegnanarayana: ANN applications in optimization
D. Goswami: Quantum computing

Organizers
General Chair: Kalyanmoy Deb
Program Chairs: Arnab Bhattacharya, Ashu Jain, Joydeep Dutta, Nirupam Chakraborti, Partha Chakroborty, Swagatam Das
Technical Co-Chairs: J. Branke, K.C. Tan, S.J. Louis
Industrial Session Chair: V. Aggarwal

International Advisory Committee
Hans-Paul Schwefel (Germany), Kim Jong-Hwan (Korea), Xin Yao (UK)

Keynote Speakers
Manindra Agrawal: Primes are in P.
Narendra K. Karmarkar: Fundamental recent advances in optimization.
Toshio Fukuda: Intelligent robot for multi-mode locomotion.

International Program Committee

Adam Berry, Australia	Dan Dumitrescu, Romania	Jacques Periaux, France	Nikhil Padhye, India	S Tiwari, USA
Ah King Robert, Mauritius	Deepak Sharma, France	Jesper Genri Hattel, Denmark	N. Chakraborti, India	Saxena Dhish, UK
Amiram Moshaiov, Israel	Dilip Datta, India	Julian Molina, Spain	P V M Rao, India	S Chaudhuri, India
Amos Ng, Sweden	Dilip Pratihar, India	Karthik Sindhya, Finland	Paolo Di Barba, Italy	S Wang, China
Andrew Lewis, Australia	DDasgupta, USA	Kou Gang, China	Pawan Nain, India	Silvia Poles, Italy
Andy Tyrrell, United Kingdom	Eckart Zitzler, Switzerland	Laetitia Jourdan, France	Peter Fleming, United Kingdom	Sunith Bandaru, India
Arjun Chandra, United Kingdom	El-Ghazali Talbi, France	Lam Thu Bui, Australia	Pier Luca Lanzi, Italy	Swagatam Das, India
Ashutosh Tiwari, United Kingdom	Fransisco Ruiz, Spain	Lothar Thiele, Switzerland	P Suganthan, Singapore	Tapabrata Ray, Australia
Bob Mckay, Korea	Gary Lamont, USA	Luis Marti, Spain	Qingfu Zhang, United Kingdom	V. Aggarwal, India
Byoung-Tak Zhang, Korea	Gaspar Cunha, Portugal	Madan Dabbeeru, India	Ranjan Ganguli, India	Vineet Khare, India
Carlos C Coello, Mexico	Hans-G Beyer, Austria	March Schoenauer, France	S N Singh, India	Vipin Tripathi, India
Carlos Fonseca, Portugal	Henrik Saxen, Finland	Matthias Ehrgott, New Zealand	Salvatore Greco, Italy	Weihang Zhu, USA
Christie Myburgh, Australia	Hisao Ishibuchi, Japan	M Raghuvanshi, India	Sanaz Mostaghim, Germany	Yaochu Jin, Germany
Clarisse Dhaenens, France	Hussein Abbass, Australia	Nicola Beume, Germany	S Bandyopadhyay, India	

About the Venue
Currently celebrating its Golden Jubilee, Indian Institute of Technology Kanpur is one of the premier research institutes in India. A limited number of guest rooms are available within campus on first come first serve basis.

*Previous SEAL Conferences: SEAL-2008 (Melbourne, Australia), SEAL-2006 (Hefei, China), SEAL-2004 (Busan, Korea), SEAL-2002 (Singapore), SEAL-2000 (Nagoya, Japan), SEAL-1998 (Canberra, Australia), SEAL-1996 (Taejon, Korea).

For further details, please visit **www.iitk.ac.in/kangal/seal10**. For any queries please contact us at **seal10@iitk.ac.in**.

Estimation-based Metaheuristics for Stochastic Combinatorial Optimization: Case Studies in Stochastic Routing Problems

Doctoral Thesis by Prasanna Balaprakash

In stochastic combinatorial optimization, problem parameters are affected by uncertainty; however, probability distributions describing the uncertainty are known or can be estimated. Stochastic routing problems, a prominent class of stochastic combinatorial optimization problems, involve finding an efficient way to distribute or collect goods across a logistic network. In order to tackle these problems, I considered a typical setting in which the cost of each solution is a random variable, and the goal is to find the solution with the minimum expected cost. It has been shown that, for some problems and for known probability distributions, the expectation can be computed analytically. Unfortunately, this typically involves complex analytical developments and computationally expensive procedures. Moreover, computing the expectation through the analytical computation approach is a highly problem-specific issue and it requires a deep understanding of the underlying probabilistic model. An alternative approach is empirical estimation, which estimates the expectation through Monte Carlo simulation. The main advantage of the empirical estimation approach over the analytical computation one is generality: a sample estimate of the expected cost of a given solution can be obtained by simply averaging sample cost estimates over a number of realizations of the random variable.

To tackle stochastic routing problems, stochastic local search algorithms such as iterative improvement algorithms and metaheuristics are quite promising because they offer effective strategies to tackle the combinatorial nature of these problems. However, a crucial factor that determines the success of these algorithms in a stochastic setting is the trade-off between the computation time needed to search high quality solutions and the computation time needed for computing the cost of the solutions obtained during the search.

In previous research on stochastic routing problems, most commonly the analytical computation approach was used to design iterative improvement algorithms and metaheuristics. This is particularly the case for prototypical examples of stochastic routing problems, such as the probabilistic traveling salesman problem (PTSP) and the vehicle routing problem with stochastic demands and customers (VRPSDC). It was even conjectured that for the PTSP an estimation-based approach is less effective. The main contribution of my thesis is to show that the estimation-based approach is actually a viable approach even for the simple, prototypical stochastic routing problems, outperforming by quite a substantial margin previously proposed algorithms. In particular, I show this for the PTSP and the VRPSDC. In the thesis, I have developed effective estimation-based iterative improvement and metaheuristic algorithms for the PTSP and the VRPSDC. I have applied a systematic, bottom-up design process for obtaining new state-of-the-art algorithms for both problems. This design process has been done in four stages, the first three being focused on the PTSP and the fourth one on the VRPSDC.

In the first stage, I developed a new, fast estimation-based iterative improvement algorithm for the PTSP. A key novelty of the proposed algorithm is that the cost difference between two neighboring solutions is estimated by delta evaluation. Moreover, the proposed algorithm exploits the well known TSP neighborhood reduction techniques to speed up the algorithm. I empirically assessed the performance of the proposed iterative improvement algorithm and provided in-depth analyses of each algorithmic component that was used. A comparison of the newly developed algorithm with previous state-of-the-art iterative improvement algorithms showed that the estimation-based algorithms are by two to three orders of magnitude faster in reaching the same solution quality. Only for very specific instances, which are characterized by a high variability in the solution cost, the previous state-of-the-art algorithms were finding solutions of slightly better quality.

In the second stage, to address the aforementioned issue, I integrated two procedures to increase the effectiveness of the estimation-based iterative improvement algorithm. The first one is an adaptive sample size procedure that selects an appropriate number of realizations to be used in the estimation of the cost difference between two solutions; the second one is a variance reduction technique called importance sampling that, when applied to the PTSP, artificially increases the probability values of some nodes such that they appear more frequently in realizations. The adoption of the two procedures introduced several parameters for the algorithm. These parameters are fine tuned using a recently developed automatic tuning procedure called Iterated F-Race. Experimental results showed that a particular, heuristic customization of the two procedures increases significantly the effectiveness of the basic variant. The improved variant completely dominated the previous state-of-the-art algorithms.

In the third stage, I focused on developing high performing metaheuristics to tackle the PTSP. I engineered algorithms based on iterated local search, memetic algorithms, and ant colony optimization, which are known to have very good performance on the deterministic traveling salesman problem. This process consists in adopting the estimation-based approach to evaluate the solution cost, exploiting the developed estimation-based iterative improvement algorithm as local search, and tuning the metaheuristics parameters. I compared the effectiveness of the proposed algorithms against the so far best performing metaheuristics for the PTSP. The experimental results clearly established that the new metaheuristic algorithms are the new state-of-the-art for the PTSP. These algorithms are more than two to three orders of magnitude faster in obtaining the same or even better quality solutions than the previous state-of-the-art. The observed high performance was due to the adoption of the effective local search and to the parameter tuning by Iterated F-Race.

In the fourth stage, I extended the PTSP metaheuristics to the VRPSDC. The proposed extension comprises the customization of the PTSP cost evaluation procedure to take into account the stochastic demands and fine tuning the parameters of the algorithms for the VRPSDC instances using Iterated F-Race. The estimation-based iterative improvement algorithm developed for the PTSP is used as a local search inside all metaheuristic algorithms. The best performing algorithm for the VRPSDC is re-implemented and used for an experimental comparison. I conducted systematic, empirical studies which showed that the proposed estimation-based algorithms define the new state-of-the-art for the VRPSDC.

Prasanna Balaprakash received his Bachelor degree in computer science engineering from the Periyar University, Salem, India, Master degree in computer science from the Otto-von-Guericke Universität, Magdeburg, Germany, DEA, and PhD from the Institut de Recherches Interdisciplinaires et de Développements en Intelligence Artificielle (IRIDIA), Université Libre de Bruxelles, Brussels, Belgium. His doctoral research was supervised by Prof. Marco Dorigo, Dr. Mauro Birattari, and Dr. Thomas Stützle. His main research interest is in the field of heuristic algorithms for computationally hard problems. His recent research activities in this research field have focused on two research areas. The first is the design, development, and analysis of heuristic algorithms for large-scale stochastic combinatorial optimization problems. The second is the design and development of effective tools for automated algorithm tuning and their exploitation in computer-aided design of high performing algorithms.

Email: prasanna@iridia.ulb.ac.be
Homepage: http://iridia.ulb.ac.be/~prasanna
Dissertation: http://iridia.ulb.ac.be/~prasanna/PB.PhDThesis.pdf

FOGA 2011 - Foundations of Genetic Algorithms

January 5-9, 2011, Schwarzenberg, Austria

http://www.sigevo.org/foga-2011

Enquiries and Submissions: foga@fhv.at

Deadline Monday July 5, 2010

We invite submissions of extended abstracts for the eleventh Foundations of Genetic Algorithms workshop. FOGA is only held every two years and focuses on theoretical foundations of all flavors of evolutionary computation. It will next be held in the Gasthof Hirschen hotel in Schwarzenberg in Austria from Wednesday, January 5 to Sunday January 9, 2011. Prof. Dr. Karl Sigmund has agreed to deliver a keynote lecture. Attendance is limited to people who submitted papers, or those requesting attendance in advance. Students are particularly encouraged to participate.

Submissions should address theoretical issues in evolutionary computation. Papers that consider foundational issues, place analysis in the wider context of theoretical computer science, or focus on bridging the gap between theory and practice are especially welcome. This does not prevent the acceptance of papers that use an experimental approach, but such work should be directed toward validation of suitable hypotheses concerning foundational matters.

Extended abstracts should be between 10-12 pages long. To submit, please email a compressed postscript or a PDF file to foga@fhv.at no later than Monday, July 5, 2011. In your email, also include the title of the paper, and the name, address and affiliation of all the authors. To ensure the reviews are double-blind authors are asked to remove references to themselves from their paper.

Important Dates

Extended abstracts due	July 5, 2010
Notification to authors	September 13, 2010
Registration and room booking deadline	October 8, 2010
Pre-proceedings camera ready manuscript due	December 6, 2010
FOGA workshop	January 5–9, 2011
Post workshop proceedings	February 21, 2011

Organizers

Prof. Dr. habil. Hans-Georg Beyer	www2.staff.fh-vorarlberg.ac.at/ hgb/
Dr. W. B. Langdon	www.dcs.kcl.ac.uk/staff/W.Langdon/

FOGA 2011

Foundation of Genetic Algorithms 11
Wednesday, January, 5 – Sunday, January, 9
Schwarzenberg, Austria

Double blind *Submissions*
by **5 July 2010**
to foga@fhv.at
Hans-Georg Beyer or W. B. Langdon

http://www.sigevo.org/foga-2011

New Issues of Journals

Evolutionary Computation 18(2) (www)

- **Geometrical Recombination Operators for Real-Coded Evolutionary MCMCs**, Mădălina M. Drugan, Dirk Thierens, pp 157—198 (pdf)

- **Enabling the Extended Compact Genetic Algorithm for Real-Parameter Optimization by Using Adaptive Discretization**, Ying-ping Chen and Chao-Hong Chen, pp 199—228 (pdf)

- **Static and Dynamic Selection Thresholds Governing the Accumulation of Information in Genetic Algorithms Using Ranked Populations**, John Milton and Paul J. Kennedy, pp 229—254 (pdf)

- **On Potential Energy Models for EA-based Ab Initio Protein Structure Prediction**, Milan Mijajlovic, Mark J. Biggs, and Dusan P. Djurdjevic, pp 255–275 (pdf)

- **Interactive EC Control of Synthesized Timbre**, James McDermott, Michael O'Neill, and Niall J. L. Griffith, pp 277—303 (pdf)

- **Bloat Control Operators and Diversity in Genetic Programming: A Comparative Study**, E. Alfaro-Cid, J. J. Merelo, F. Fernández de Vega, A. I. Esparcia-Alcázar, K. Sharman, pp 305—332 (pdf)

Genetic Programming and Evolvable Machines 11(2) (www & blog)

- **Guest editorial: special issue on parallel and distributed evolutionary algorithms, part two**, Marco Tomassini and Leonardo Vanneschi pp 129-130 (pdf)

- **An ensemble-based evolutionary framework for coping with distributed intrusion detection**, Gianluigi Folino, Clara Pizzuti and Giandomenico Spezzano pp 131-146 (pdf)

- **Deployment of parallel linear genetic programming using GPUs on PC and video game console platforms**, Garnett Wilson and Wolfgang Banzhaf pp 147-184 (pdf)

- **Simdist: a distribution system for easy parallelization of evolutionary computation**, **Boye Annfelt Høverstad** pp 185-203 (pdf)

- **Variable population size and evolution acceleration: a case study with a parallel evolutionary algorithm**, Ting Hu, Simon Harding and Wolfgang Banzhaf pp 205-225 (pdf)

- **EvAg: a scalable peer-to-peer evolutionary algorithm**, J.L.J. Laredo, A.E. Eiben, M. van Steen, and J. J. Merelo pp 227-246 (pdf)

Calls and Calendar

July 2010

GECCO 2010 - Genetic and Evolutionary Computation Conference
July 7-10, 2010, Portland, Oregon, USA
Homepage: http://www.sigevo.org/gecco-2010

The Genetic and Evolutionary Computation Conference (GECCO-2010) will present the latest high-quality results in the growing field of genetic and evolutionary computation.

Topics include: genetic algorithms, genetic programming, evolution strategies, evolutionary programming, real-world applications, learning classifier systems and other genetics-based machine learning, evolvable hardware, artificial life, adaptive behavior, ant colony optimization, swarm intelligence, biological applications, evolutionary robotics, coevolution, artificial immune systems, and more.

Organizers

General Chair:	Martin Pelikan
Editor-in-Chief:	Jürgen Branke
Local Chair:	Kumara Sastry
Publicity Chair:	Pier Luca Lanzi
Tutorials Chair:	Una-May O'Reilly
Workshops Chair:	Jaume Bacardit
Competitions Chairs:	Christian Gagné
Late Breaking Papers Chair:	Daniel Tauritz
Graduate Student Workshop	Riccardo Poli
Business Committee:	Erik Goodman
	Una-May O'Reilly
EC in Practice Chairs:	Jörn Mehnen
	Thomas Bartz-Beielstein,
	David Davis

Important Dates

Paper Submission Deadline	January 13, 2010
Decision Notification	March 10, 2010
Camera-ready Submission	April 5, 2010

Venue

The Portland Marriott Downtown Waterfront Hotel, located in downtown Portland, is near the Portland Riverplace Marina, restaurants, shopping & performing arts venues. Hotel room conference rate $179 includes complimentary in-room high-speed Internet access.

More Information

Visit www.sigevo.org/gecco-2010 for information about electronic submission procedures, formatting details, student travel grants, the latest list of tutorials and workshop, late-breaking papers, and more.

For technical matters, contact Conference Chair Martin Pelikan at pelikan@cs.umsl.edu.

For conference administration matters contact Primary Support Staff at gecco-admin@tigerscience.com.

GECCO is sponsored by the Association for Computing Machinery Special Interest Group for Genetic and Evolutionary Computation.

2010 IEEE World Congress on Computational Intelligence

July 18-23, 2010, Barcelona, Spain

Homepage: WWW

The 2010 IEEE World Congress on Computational Intelligence (IEEE WCCI 2010) is the largest technical event in the field of computational intelligence. It will host three conferences: the 2010 International Joint Conference on Neural Networks (IJCNN 2010), the 2010 IEEE International Conference on Fuzzy Systems (FUZZ-IEEE 2010), and the 2010 IEEE Congress on Evolutionary Computation (IEEE CEC 2010). IEEE WCCI 2010 will be held in Barcelona, a Mediterranean city located in a privileged position on the northeastern coast of Spain. Barcelona combines history, art, architecture, and charm within a pleasant, and efficient urban environment where meet old friends, and make new ones. The congress will provide a stimulating forum for scientists, engineers, educators, and students from all over the world to discuss and present their research findings on computational intelligence.

For more information visit http://www.wcci2010.org/call-for-papers

August 2010

IEEE Conference on Computational Intelligence and Games (CIG-2010)

August 18-21, 2010, Copenhagen, Denmark

Homepage: http://game.itu.dk/cig2010

Competition papers submission deadline: June 14, 2010

Aim and Scope

Games have proven to be an ideal domain for the study of computational intelligence as not only are they fun to play and interesting to observe, but they provide competitive and dynamic environments that model many real-world problems. Additionally, methods from computational intelligence promise to have a big impact on game technology and development, assisting designers and developers and enabling new types of computer games. The 2010 IEEE Conference on Computational Intelligence and Games brings together leading researchers and practitioners from academia and industry to discuss recent advances and explore future directions in this quickly moving field.

Topics of interest include, but are not limited to:

- Learning in games
- Coevolution in games
- Neural-based approaches for games
- Fuzzy-based approaches for games
- Player/Opponent modeling in games
- CI/AI-based game design
- Multi-agent and multi-strategy learning
- Applications of game theory
- CI for Player Affective Modeling
- Intelligent Interactive Narrative
- Imperfect information and non-deterministic games
- Player satisfaction and experience in games

- Theoretical or empirical analysis of CI techniques for games

- Comparative studies and game-based benchmarking

- Computational and artificial intelligence in:

  - Video games

  - Board and card games

  - Economic or mathematical games

  - Serious games

  - Augmented and mixed-reality games

  - Games for mobile platforms

The conference will consist of a single track of oral presentations, tutorial and workshop/special sessions, and live competitions. The proceedings will be placed in IEEE Xplore, and made freely available on the conference website after the conference.

Conference Committee

General Chairs:	Georgios N. Yannakakis and Julian Togelius
Program Chair:	Michael Mateas, Risto Miikkulainen, and Michael Young
Proceedings Chair:	Pier Luca Lanzi
Competition Chair:	Simon Lucas
Local Chairs:	Anders Drachen, Paolo Burelli, & Tobias Mahlmann

Important Dates

Competition papers submission:	14th June 2010
Decision Notification:	28th June 2010
Camera-ready:	5th July 2010

For more information please visit: http://game.itu.dk/cig2010/

September 2010

SSBSE 2010 - 2nd International Symposium on Search Based Software Engineering

September 7-9, 2010, Benevento, Italy

Homepage: www.ssbse.org

We are pleased to announce SSBSE 2010, the second edition of the annual symposium dedicated to Search Based Software Engineering (SBSE). The symposium's objective is to build on the recent flourishing of interest in SBSE by not only creating a welcoming forum for discussion and dissemination, but also by establishing a regular event that will strengthen the rapidly growing international community.

Organizing Committee

- General Chairs: Massimiliano Di Penta, Simon Poulding

- Program Chairs: Lionel C. Briand, John Clark

- PhD Forum Chair: Phil McMinn

- Fast Abstracts Chair: Gerardo Canfora

- Submissions Chair: Andrea Arcuri

- Web & Publicity Chair: Jan Staunton

PPSN 2010 – International Conference on Parallel Problem Solving From Nature

September 11-15, 2010, Cracow, Poland
Homepage: http://home.agh.edu.pl/ppsn

The Eleventh International Conference on Parallel Problem Solving from Nature (PPSN XI) will be held at the AGH University of Science and Technology in Cracow, Poland on 11-15 September 2010. This biennial meeting aims to bring together researchers and practitioners in the field of natural computing. Natural Computing is the study of computational systems, which use ideas and get inspiration from natural systems, including biological, ecological, physical, chemical, and social systems. It is a fast-growing interdisciplinary field, in which a range of techniques and methods are studied for dealing with large, complex, and dynamic problems with various sources of potential uncertainties.

PPSN XI will be a showcase of a wide range of topics in Natural Computing including, but not restricted to: Evolutionary Computation, Neural Computation, Molecular Computation, Quantum Computation, Artificial Life, Swarm Intelligence, Artificial Ant Systems, Artificial Immune Systems, Self-Organizing Systems, Emergent Behaviors, and Applications to Real-World Problems. PPSN XI will also feature workshops and tutorials covering advanced and fundamental topics in the field of natural computation.

All accepted papers will be presented during poster sessions and will be included in the proceedings. Following the tradition of PPSN, proceedings will be published in the Series Lecture Notes in Computer Science (LNCS) by Springer.

Paper Presentation Following the now well-established tradition of PPSN conferences, all accepted papers will be presented during small poster sessions of about 16 papers. Each session will contain papers from a wide variety of topics, and will begin by a plenary quick overview of all papers in that session by a major researcher in the field. Past experiences have shown that such presentation format led to more interactions between participants and to a deeper understanding of the papers. All accepted papers will be published in the Proceedings.

General Chair

Robert Schaefer (AGH, Cracow, PL)

Honorary Chair

Hans-Paul Schwefel (Tech. Universität Dortmund, DE)

Program Co-Chairs

Carlos Cotta (University of Malaga, ES)
Joanna Kolodziej (University of Bielsko-Biala, PL)
Günter Rudolph (Tech. Universität Dortmund, DE)

Tutorials Chair

Krzysztof Cetnarowicz (AGH, Cracow, PL)

Workshop Chair

Aleksander Byrski (AGH, Cracow, PL)

Seventh International Conference on Swarm Intelligence

September 8-10, 2010. Brussels, Belgium

Homepage: http://iridia.ulb.ac.be/ants2010

Deadline February 28, 2010

Swarm intelligence is a relatively new discipline that deals with the study of self-organizing processes both in nature and in artificial systems. Researchers in ethology and animal behavior have proposed many models to explain interesting aspects of social insect behavior such as self-organization and shape-formation. Recently, algorithms and methods inspired by these models have been proposed to solve difficult problems in many domains.

An example of a particularly successful research direction in swarm intelligence is ant colony optimization, the main focus of which is on discrete optimization problems. Ant colony optimization has been applied successfully to a large number of difficult discrete optimization problems including the traveling salesman problem, the quadratic assignment problem, scheduling, vehicle routing, etc., as well as to routing in telecommunication networks.

Another interesting approach is that of particle swarm optimization, that focuses on continuous optimization problems. Here too, a number of successful applications can be found in the recent literature. Swarm robotics is another relevant field. Here, the focus is on applying swarm intelligence techniques to the control of large groups of cooperating autonomous robots.

ANTS 2010 will give researchers in swarm intelligence the opportunity to meet, to present their latest research, and to discuss current developments and applications.

The three-day conference will be held in Brussels, Belgium, on September 8-10, 2010. Tutorial sessions will be held in the mornings before the conference program.

Relevant Research Areas

ANTS 2010 solicits contributions dealing with any aspect of swarm intelligence. Typical, but not exclusive, topics of interest are:

- Behavioral models of social insects or other animal societies that can stimulate new algorithmic approaches.

- Empirical and theoretical research in swarm intelligence.

- Application of swarm intelligence methods, such as ant colony optimization or particle swarm optimization, to real-world problems.

- Theoretical and experimental research in swarm robotics systems.

Publication Details As for previous editions of the ANTS conference, proceedings will be published by Springer in the LNCS series (to be confirmed). The journal Swarm Intelligence will publish a special issue dedicated to ANTS 2010 that will contain extended versions of the best research works presented at the conference.

Best Paper Award

A best paper award will be presented at the conference.

Further Information

Up-to-date information will be published on the web site http://iridia.ulb.ac.be/ants2010/. For information about local arrangements, registration forms, etc., please refer to the above-mentioned web site or contact the local organizers at the address below.

Conference Address

ANTS 2010	
IRIDIA CP 194/6	Tel +32-2-6502729
Université Libre de Bruxelles	Fax +32-2-6502715
Av. F. D. Roosevelt 50	http://iridia.ulb.ac.be/ants2010
1050 Bruxelles, Belgium	email: ants@iridia.ulb.ac.be

Important Dates

Submission deadline	March 28, 2010
Notification of acceptance	April 30, 2010
Camera ready copy	May 14, 2010
Conference	September 8–10, 2010

December 2010

Simulated Evolution And Learning (SEAL-2010)

July 1-4, 2010, Indian Institute of Technology Kanpur, India

Homepage: http://www.iitk.ac.in/kangal/seal10/

Deadline July 5, 2010

Simulated Evolution and Learning (SEAL-2010) is the eighth biennial conference in the highly successful conference series that aims at exploring these two forms of adaptation and their roles and interactions in adaptive systems. Any paper involving evolution as a vehicle for adaptive and artificial problem solving tasks and any form of computational and machine learning procedure for developing and analyzing adaptive or artificial systems will be of interest to this conference. Cross-fertilisation between evolutionary learning and other machine learning approaches, such as neural network learning, reinforcement learning, decision tree learning, fuzzy system learning, etc., are encouraged by the conference. The other major theme of the conference is optimization problem solving by evolutionary approaches or hybrid evolutionary approaches.

The topics of interest to this conference include but are not limited to the following:

- **Evolutionary Optimization:** Numerical/Function Optimization, Combinatorial Optimization, Hybrid Optimization Algorithms, Comparison of Algorithms, Multi-objective optimization and decision making, Nature-Inspired Algorithms (ant colony optimisation, particle swarm optimisation, memetic algorithms, differential evolution, simulated annealing, etc.)

- **Evolutionary Learning:** Fundamental Issues in Evolutionary Learning, Co-Evolutionary Learning, Modular Evolutionary Learning Systems, Classifier System, Collective Intelligence, Representation Issues in Evolutionary Learning, Artificial Immune Systems, Interactions Between Learning and Evolution, Credit Assignment, Swarm Intelligence, Comparison between Evolutionary Learning and Other Learning Approaches

- **Hybrid Learning:** Evolutionary Artificial Neural Networks, Evolutionary Fuzzy Systems, Evolutionary Reinforcement Learning, Evolutionary Clustering, Evolutionary Decision Tree Learning, Evolutionary Unsupervised Learning, Genetic Programming, Other Hybrid Learning Systems, Developmental Processes

- **Adaptive Systems:** Complexity in Adaptive Systems, Evolutionary Robotics, Evolvable Hardware and Software, Artificial Ecology, Evolutionary Games, Self-Repairing Systems, Evolutionary Computation Techniques in Economics, Finance and Marketing

- **Theoretical Issues in Evolutionary Computation:** Computational Complexity of Evolutionary Algorithms Self-Adaptation in Evolutionary Algorithms Convergence and Convergence Rate of Evolutionary Algorithms

- **Real-World Applications of Evolutionary Computation and Learning Techniques**

All accepted papers which are presented at the conference will be included in the conference proceedings, published as a volume of the series Lecture Notes in Computer Science, Springer. Selected best papers will be invited for further revisions and extensions for possible publications by evolutionary computing related journals.

Important Dates

- Submission deadline: July 5, 2010 (Full papers <=10 pages, Springer's LNCS style)

- Notification of paper acceptance: August 16, 2010

- Camera ready submission: September 3, 2010

- SEAL-2010 Conference: December 1-4, 2010

Manindra Agrawal: "Primes in P". Prof. Agrawal is the first to propose prime number testing in polynomial time in 2002.

Toshio Fukuda: "Intelligent Robot for multi-mode locomotion". Prof. Fukada ground-breaking work on learning locomotion from animals is unparallel.

Narendra Karmarkar: "Fundamental Recent Advances in Optimization". Prof. Karmarkar's algorithms are known to anyone working in LP and optimization.

Tutorials on fundamental areas of neural networks, quantum computing, and other topics of EAs are also planned.

For further details visit http://www.iitk.ac.in/kangal/seal10/ or email at seal10@iitk.ac.in

Please note the deadline for submitting papers is 5 JULY 2010. Mark your calender for a visit to IIT Kanpur in India during 1-4 December 2010. Professional travel agents are being contacted to facilitate and combine your conference trip with an exciting sight-seeing experience in India.

Early December is very pleasant in northern India (around 20 degC) with practically no rainfall. Please see the website for more information.

January 2011

FOGA 2011 - Foundations of Genetic Algorithms
January 5-9, 2011, Schwarzenberg, Austria
Homepage: http://www.sigevo.org/foga-2011
Enquiries and Submissions: foga@fhv.at
Deadline Monday July 5, 2010

We invite submissions of extended abstracts for the eleventh Foundations of Genetic Algorithms workshop. FOGA is only held every two years and focuses on theoretical foundations of all flavors of evolutionary computation. It will next be held in the Gasthof Hirschen hotel in Schwarzenberg in Austria from Wednesday, January 5 to Sunday January 9, 2011. Prof. Dr. Karl Sigmund has agreed to deliver a keynote lecture. Attendance is limited to people who submitted papers, or those requesting attendance in advance. Students are particularly encouraged to participate.

Submissions should address theoretical issues in evolutionary computation. Papers that consider foundational issues, place analysis in the wider context of theoretical computer science, or focus on bridging the gap between theory and practice are especially welcome. This does not prevent the acceptance of papers that use an experimental approach, but such work should be directed toward validation of suitable hypotheses concerning foundational matters.

Extended abstracts should be between 10-12 pages long. To submit, please email a compressed postscript or a PDF file to foga@fhv.at no later than Monday, July 5, 2011. In your email, also include the title of the paper, and the name, address and affiliation of all the authors. Submitted papers should use standard spacing and margins, with 11pt or 12pt font for the main text. Authors using LaTeX should either use the standard article style file or the FOGA style file which can be found at the conference web-site. To ensure the reviews are double-blind authors are asked to remove references to themselves from their paper.

Notification will be September 13, 2011 and drafts of the full paper will be needed by December 6, 2010. These drafts will be distributed as part of a preprint to participants at FOGA. Authors of papers presented at the FOGA workshop will be asked to contribute final versions of their papers (based on discussion/feedback at the meeting) as part of the final volume.

Important Dates

Extended abstracts due	July 5, 2010
Notification to authors	September 13, 2010
Registration and room booking deadline	October 8, 2010
Pre-proceedings camera ready manuscript due	December 6, 2010
FOGA workshop	January 5–9, 2011
Post workshop proceedings	February 21, 2011

Organizers

Prof. Dr. habil. Hans-Georg Beyer	www2.staff.fh-vorarlberg.ac.at/ hgb/
Dr. W. B. Langdon	www.dcs.kcl.ac.uk/staff/W.Langdon/

Further Information

Enquiries and submissions: foga@fhv.at

About the Newsletter

SIGEVOlution is the newsletter of SIGEVO, the ACM Special Interest Group on Genetic and Evolutionary Computation.

To join SIGEVO, please follow this link [WWW]

Contributing to SIGEVOlution

We solicit contributions in the following categories:

Art: Are you working with Evolutionary Art? We are always looking for nice evolutionary art for the cover page of the newsletter.

Short surveys and position papers: We invite short surveys and position papers in EC and EC related areas. We are also interested in applications of EC technologies that have solved interesting and important problems.

Software: Are you are a developer of an EC software and you wish to tell us about it? Then, send us a short summary or a short tutorial of your software.

Lost Gems: Did you read an interesting EC paper that, in your opinion, did not receive enough attention or should be rediscovered? Then send us a page about it.

Dissertations: We invite short summaries, around a page, of theses in EC-related areas that have been recently discussed and are available online.

Meetings Reports: Did you participate in an interesting EC-related event? Would you be willing to tell us about it? Then, send us a short summary, around half a page, about the event.

Forthcoming Events: If you have an EC event you wish to announce, this is the place.

News and Announcements: Is there anything you wish to announce? This is the place.

Letters: If you want to ask or to say something to SIGEVO members, please write us a letter!

Suggestions: If you have a suggestion about how to improve the newsletter, please send us an email.

Contributions will be reviewed by members of the newsletter board.

We accept contributions in LaTeX, MS Word, and plain text.

Enquiries about submissions and contributions can be emailed to editor@sigevolution.org.

All the issues of SIGEVOlution are also available online at www.sigevolution.org.

Notice to Contributing Authors to SIG Newsletters

By submitting your article for distribution in the Special Interest Group publication, you hereby grant to ACM the following non-exclusive, perpetual, worldwide rights:

- to publish in print on condition of acceptance by the editor
- to digitize and post your article in the electronic version of this publication
- to include the article in the ACM Digital Library
- to allow users to copy and distribute the article for noncommercial, educational or research purposes

However, as a contributing author, you retain copyright to your article and ACM will make every effort to refer requests for commercial use directly to you.