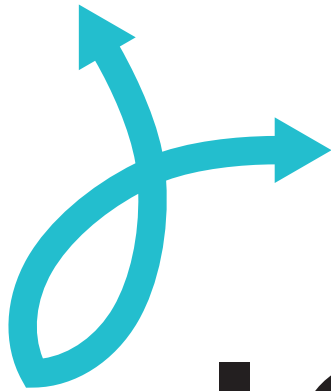# Annual Report 2011

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ICE-TCS

Icelandic Centre of Excellence
in Theoretical Computer Science

Contents

1 Introduction

The Icelandic Centre of Excellence in Theoretical Computer Science (ICE-TCS) will celebrate its seventh birthday on 29 April 2012. This sixth annual report is meant to give the (Theoretical) Computer Science community in Iceland and elsewhere, our sponsors and funding agencies, and our scientific advisory board a bird's eye view of the activities of the centre in 2011. It will also allow us to evaluate our achievements vis-a-vis our original aims in setting up this centre, and to set ourselves goals for the future.

For the sake of completeness, we remind our readers that the aim of the centre is to establish in Iceland important areas of basic research in the mathematical foundations of Computer Science, notably Algorithmic Program Verification, Mathematical Logic in Computer Science, Models and Logics for Reactive Systems, Semantics of Computation and Systems Biology, alongside existing activities in Algorithmics, Bioinformatics, Applied and Discrete Mathematics and Machine Learning.

ICE-TCS aims at exploiting the available scientific strength in order to

- focus the research efforts, and establish synergies amongst the active researchers in Iceland,

- attract outstanding researchers in Theoretical Computer Science to Iceland for short- or long-term visits leading to collaborations with local researchers and to improvements in the Icelandic research environment,

- organize international conferences and workshops in Theoretical Computer Science in Iceland to put the country firmly on the map as a recognized conference location for high quality events in the field, and

- attract young, outstanding students from Iceland to this research area.

The research centre initially started as a collaboration between the Department of Computer Science, Faculty of Engineering, University of Iceland, and the School of Computer Science, Reykjavik University. From 2011, the centre is based solely at Reykjavik University and has some affiliated members from the University of Iceland. However, it is fair to say that all the activities of the centre take place at Reykjavik University

Further information is available from the centre's web page at:

http://www.icetcs.ru.is.

2 Executive Summary and Highlights for the Reporting Period

The calendar year 2011 has been a very active one for ICE-TCS, both nationally and internationally. ICE-TCS members have organized a number of international conferences and workshops at Reykjavik University, served as PC chairs of high-profile conferences, started a new Bachelor program in Discrete Mathematics and Computer Science at Reykjavik University, and contributed to their research communities with their scientific work. In December 2011, ICE-TCS also graduated its second doctoral student, Matteo Cimini, who was the second student ever to graduate with a PhD in Computer Science from an Icelandic institution.

The following subsections survey briefly what the centre has achieved in the reporting period.

Events

During 2011, ICE-TCS members organized a large number of scientific events, both in Iceland and abroad. To wit, ICE-TCS members organized five international conferences or workshops at Reykjavik University, one national conference, three informal one-day workshops at Reykjavik University and one public talk. In addition, three members of ICE-TCS served as PC chairs for three major international conferences, viz. ESA, FSEN and ICALP. Below we list the main events in reverse chronological order. See

http://www.icetcs.ru.is/events.html

for more details.

- 12–13 November 2011: Henning Úlfarsson organized the conference Mathematics in Iceland (the biennial conference of the Icelandic Mathematical Society). The event featured talks by ICE-TCS members Luca Aceto, Bjarni V. Halldórsson and Henning Úlfarsson.

- Magnús M. Halldórsson was the PC chair for the 19th Annual European Symposium on Algorithms (ESA 2012), which was held in Saarbrücken, Germany.

- On Friday, 22 July 2011, Magnús M. Halldórsson organized an informal day of short seminars, within the broad theme of 'distributed computing'. The event featured talks by Lelia Blin (University of Evry, France), Pierre Fraigniaud (Paris Diderot, France), Magnús M. Halldórsson (ICE-TCS), Páll Melsted (University of Iceland), Pradipta Mitra (ICE-TCS) and Ýmir Vigfússon (ICE-TCS).

- Luca Aceto was the PC chair for the track B of ICALP 2011, the 38th International Colloquium on Automata, Languages and Programming, which was held in Zürich, Switzerland.

- 30 June–1 July 2011: Magnús M. Halldórsson organized the second Workshop on Realistic Models for Algorithms in Wireless Networks. The workshop, which was supported by a grant from Reykjavik University's Development Fund, was held at Reykjavik University.

- 13–17 June 2011: Sergey Kitaev and Henning Úlfarsson were members of the organizing committee for FPSAC 2011, the 23rd International Conference on Formal Power Series and Algebraic Combinatorics, which took place in Reykjavik.

- 6–9 June 2011: Marjan Sirjani was the general chair of DisCoTec 2011, 6th International Federated Conferences on Distributed Computing Techniques, which was held at Reykjavik University.

- Luca Aceto co-chaired the workshop Process Algebra and Coordination (PACO) 2011. This event was a satellite workshop of DisCoTec 2011 and was held at Reykjavik University.

- 26 May 2011: Georges Gonthier (Microsoft Research, Cambridge, UK) delivered a public talk entitled *Verifying the Four Colour Theorem*. The talk was organized jointly by ICE-TCS and the Icelandic Mathematical Society.

- 23–27 May 2011: ICE-TCS hosted the yearly meeting of the IFIP Working Group 2.1 on Algorithmic Languages and Calculi. The event took place at Reykjavik University.

- Friday, 20 May 2011: The ICE-TCS Theory Day for 2011 was held on that day. The event featured a session celebrating Leslie Valiant's Turing Award.

- 28 April 2011: Luca Aceto and Anna Ingólfsdóttir organized a one-day thematic workshop on Structural Operational Semantics and the Equational Logic of Processes. The workshop, which was partly supported by a grant from Reykjavik University's Development Fund, featured invited presentations by Wan Fokkink (VU Amsterdam, NL), Bas Luttik (TU Eindhoven, NL), MohammadReza Mousavi (TU Eindhoven, NL) and Michel Reniers (TU Eindhoven, NL), as well as contributions by some ICE-TCS members.

- 20–22 April 2011: Marjan Sirjani co-chaired FSEN 2011, Fundamentals of Software Engineering, which was held in Tehran, Iran.

As in previous years, 'regular' events, such as talks in our seminar series, have been advertised locally and on our ever-increasing mailing lists, which include well over 100 individuals at the time of writing. Events that are appealing to a general audience have also been advertised in the local newspapers, and on the mailing lists of Reykjavik University as a whole, of the mathematics society and of the computer science society. In all cases, ICE-TCS events have been a large fraction (if not the majority) of advertised events. In fact, it is fair to say that the ICE-TCS Research Seminar series continues to be the only regular seminar series in Computer Science

in Iceland, and one of the very few seminar series in the country that have more than a handful of talks each year. During the reporting period, the ICE-TCS Research Seminar series hosted 17 seminars, not counting the talks delivered as part of the above-mentioned events.

Outreach

One of the goals of the centre is to foster an appreciation of discrete mathematics and theoretical computer science within a general scientifically-minded public and to attract students to these fields. As part of this effort, ICE-TCS member Bjarni V. Halldórsson has continued his involvement in the training of the Icelandic Maths Olympiad team. Moreover, ICE-TCS has started organizing joint events with the Icelandic Mathematical Society. The first joint event was a well attended public talk by Georges Gonthier (Microsoft Research, Cambridge, UK) entitled *Verifying the Four Colour Theorem*. The slides and audio of the talk are available at http://www.ru.is/kennarar/luca/TALKS/Gonthier.avi.

Some educational initiatives during the reporting period were aimed at BSc. and MSc. students. Of particular note is the development of a new Bachelor program in Discrete Mathematics and Computer Science at Reykjavik University. The prime movers behind this new study program are Anna Ingólfsdóttir and Henning Úlfarsson. The program started without formal advertisement in Fall 2011, and has been highly successful in attracting talented and motivated students. As an alternative way of attracting more theoretically-minded students to discrete mathematics and theoretical computer science, we have also designed an 'emphasis line' in theoretical computer science as part of the BSc. degree in computer science at Reykjavik University. Moreover, ICE-TCS members continue to play a leading role in the design and running of novel courses such as *Problem Solving* for first-year students in Computer Science, *Effective Programming and Problem Solving* for BSc. students, *Algorithmic Game Theory* for BSc. students, *The Structure of Social and Information Networks* (intensive summer course for BSc. students) and *Logic in Computer Science* for third-year BSc. students and MSc. students.

ICE-TCS events have managed to attract a sizable attendance. Beyond members of the centre, nearly every meeting is attended by some researcher from fields with areas of contact with theoretical computer science. We also continue to host a small number of talks by researchers from sister fields like mathematics and physics, with the aim to explore possible synergies

between their work and the research carried out within the centre. As mentioned above, ICE-TCS has strengthened its connections with the Icelandic Mathematical Society. In particular, two members of ICE-TCS are on the board of the Icelandic Mathematical Society and ICE-TCS has organized several joint events with that society from 2011.

ICE-TCS research continues to involve students and other young researchers. The number of students affiliated with the centre is still small, but will grow in 2012. During the reporting period, members of ICE-TCS have supervised 3 MSc. students in computer science and eight PhD. students (seven in computer science and one in bioinformatics). Two PhD. students will join the centre in August 2012 to work with Magnús M. Halldórsson on the newly-funded project *Design of Ad-Hoc Wireless Networks.*

Research Highlights

The reporting period has seen the centre pass the milestone of 300 publications overall. At the time of writing, according to our records that are available at http://www.icetcs.ru.is/publications.pdf, ICE-TCS members have a total of 339 publications since the establishment of the centre: two books, 20 edited volumes, six book chapters, 175 journal papers, 129 conference and workshop papers and seven abstracts in peer-reviewed ISI-indexed journals. By way of comparison, the overall number of publications was 297 at the time of writing our annual report for 2010. Since that time, ICE-TCS researchers have published one book, two edited volumes, 14 journal papers and 24 conference and workshop papers.

The centre still has substantially more journal publications than conference publications. However, the difference between the two figures is decreasing. We expect that this trend will continue in the coming years, but we will strive to continue publishing in journals a substantial percentage of our scientific work.

Below, we limit ourselves to pointing out a few highlights of the research work carried out within the centre in the reporting period.

- The algorithms group had papers on wireless algorithmics in several top-level conferences in 2011 including SODA, INFOCOM and ICALP. The first of these has already accumulated over 20 citations in Google Scholar. Additionally, work on more traditional algorithmics appeared (or were accepted) to ACM Transactions on Algorithms, Theory of Computing Systems, and SIAM Journal of Computing.

- The bioinformatics group continued work on various aspects of DNA

sequence analysis resulting in seven publications.

- The main highlight of the research carried out within the combinatorics group is the publication of the book *Patterns in permutations and words* by Sergey Kitaev, published by Springer Verlag in the series EATCS monographs in Theoretical Computer Science. This is the first monograph devoted to the topic of permutation patterns.

- The concurrency group within ICE-TCS has contributed two journal papers to a special issue of *Theoretical Computer Science* devoted to Jan Bergstra's 60th birthday. In addition, Luca Aceto, Anna Ingólfsdóttir, Paul B. Levy and Joshua Sack have developed a general framework for developing characteristic formulae for simulation-based process semantics over labelled transition systems, which is reported in a paper that has recently appeared in the journal *Mathematical Structures in Computer Science*.

- The formal methods for software engineering group developed the timed extension of the modelling language Rebeca. Moreover, the group contributed to the developing of the coordination language Reo by studying the symbolic execution of Reo circuits using constraint automata.

3 Current Members and Their Research Areas

ICE-TCS has now eight permanent members (all at Reykjavik University) and four affiliated members (two at the University of Iceland, one at the University of Strathclyde and one at Université de Lyon 1). The present members of the centre are: Luca Aceto (Scientific Co-director), Eyjólfur Ingi Ásgeirsson, Yngvi Björnsson, Bjarni V. Halldórsson, Magnús M. Halldórsson (Scientific Director), Anna Ingólfsdóttir (Scientific Co-director), Marjan Sirjani and Ýmir Vigfússon (who joined ICE-TCS in December 2011). As announced in our previous annual report, Sergey Kitaev left the centre on July 1, 2011, to take up a readership at the Department of Computer and Information Sciences, University of Strathclyde, UK.

In addition, at the time of writing, the centre hosts four postdoctoral researchers: Matteo Cimini (concurrency theory, structural operational semantics), Dario Della Monica (temporal logics), Pradipta Mitra (algorithmics, auctions) and Henning Úlfarsson (algebraic geometry and algebraic combinatorics).

The centre has five PhD. students (four in Computer Science and one in Bioinformatics). Three of those students are from outside Iceland. Two more doctoral students will be hired in 2012 to work on the project *Design of Ad-Hoc Wireless Networks*, with Magnús M. Halldórsson as principal investigator, which was awarded an excellence grant by the Icelandic Research Fund in December 2011.

At present, the members of ICE-TCS carry out research in the following main areas of Theoretical Computer Science and Discrete Mathematics: Algorithms and Complexity, Bioinformatics, Combinatorics, Computer-aided Verification, Concurrency Theory, Formal Methods in Software Engineering, Machine Learning, Search Methods in Artificial Intelligence and Structural Operational Semantics. With the recent addition of Ýmir Vigfússon, ICE-TCS has gained research presence also in the fields of distributed systems, cloud computing, mathematical modelling, data mining, computer security, randomized algorithms and epidemiology.

Algorithms group The majority of recent efforts of the algorithms group has been within a subgroup on wireless networking. That subgroup has included Eyjólfur I. Ásgeirsson, Pradipta Mitra and Magnús M. Halldórsson, with recent additions of Henning Úlfarsson and Ýmir Vigfússon. Additionally, Sverrir Ólafsson (from RU School of Business) has collaborated with the group. The main research effort has been on giving efficient and effective algorithms for link scheduling and capacity in generic wireless networks. More recently, studies have included connectivity and aggregation capacity, as well as connections with game theory and stability of networks. With the expansion of the efforts in 2012, the group will additionally explore spectrum auctions, testbed operation and higher-level distributed computing problems.

Other efforts on algorithms included streaming algorithms and online algorithms motivated by distributed computing.

Bioinformatics group The bioinformatics group continued its work on algorithms for analyzing DNA sequence reads, the analysis of DNA sequences. The group also ventured into developing clinical information systems and analysis of zebra fish behavioural data.

Combinatorics Research in combinatorics has focused on the study of permutation patterns and of their connections to Schubert varieties, on the

new notion of marked mesh patterns, on inversion statistics on permutations and on word representability for classes of graphs.

Concurrency theory group   The research efforts within the concurrency theory group have mainly focused on negative and positive results in the equational logic of process algebras, on the meta-theory of structural operational semantics, with emphasis on rule formats for guaranteeing the validity of certain algebraic properties of processes, and on modal characterizations of process semantics.

Software engineering group   The software engineering group has focused on the further development of the theory and applications of the actor-based language Rebeca, and of its associated tool suite.

4   Funding

Despite the increasingly hard competition and the decrease in the available funding, ICE-TCS researchers continue to be fairly successful in obtaining grants from the Icelandic Fund for Research. In the latest round of applications for projects starting in January 2012, Magnús M. Halldórsson obtained a three-year excellence grant from the Icelandic Research Fund for the project *Design of Ad-Hoc Wireless Networks* of total amount of 56,530,000 ISK (about 342,600 euros) This was the only such grant (over all fields) awarded in response to the call issued in 2011. Moreover, in June 2011, Eugen-Ioan Goriac received a competitive PhD scholarship from the Icelandic Research Fund. The grant amounts to 6,720,000 ISK (about 40,435 euros) over a period of two years. There were 114 applications and only 11 were funded. Eyjólfur I. Ásgeirsson and Bjarni V. Halldórsson were part of an application to the Icelandic Research Fund that received 11,000,000 ISK (about 65,910 euros) to buy a computer cluster.

In addition, the following project grants were still ongoing during the reporting period:

- *Algorithms for wireless networks* (PI: Magnús M. Halldórsson),

- *General Intelligence Problem-Solving Agents* (PI: Yngvi Björnsson),

- *Meta-Theory of Algebraic Process Theories* (PI: Luca Aceto),

- *Processes and Modal Logics* (PI: Anna Ingólfsdóttir).

We remark that these grants, however, can only be used to support project specific activities, and *not* for activities related to the centre as such. Whatever success ICE-TCS might have had so far has therefore been achieved with minimal financial support for centre-building. Indeed, the only centre-building funding we had in 2011 was a small grant from Reykjavik University's Development Fund, which was used to support in part the organization of two one-day workshops. We believe that the quantity and quality of the centre's activities, and its impact on research and education in computer science in Iceland, could be increased substantially if ICE-TCS had more funding.

5 Activities in 2011

5.1 Guests

During the reporting period, we received 20 guests from foreign institutions for short stays. These are listed in Table 1 in reverse chronological order. All the guests delivered seminars and/or contributed (mini-)courses organized by the centre.

5.2 Organization of Conferences, Symposia and Workshops

Members of the centre have served as organizers and PC members for the following events.

- Luca Aceto: *Fourth FSEN: IPM International Conference on Fundamentals of Software Engineering (FSEN11)*, April 20–22, 2011 Tehran, Iran. (PC member)

- Luca Aceto: *The 38th International Colloquium on Automata, Languages and Programming (ICALP 2011)*, 4–8 July 2011, Zürich, Switzerland. (PC chair for track B)

- Luca Aceto: Structural Operational Semantics 2011, August 2011, Aachen, Germany. (PC member)

- Luca Aceto: Process Algebra and Coordination (PACO 2011), one-day workshop held on June 9, 2011, as a satellite event of DisCoTec 2011. (PC co-chair)

- Luca Aceto: 31st Foundations of Software Technology and Theoretical Computer Science, December 12–14, 2011, IIT Bombay, Mumbai, India. (PC member)

Wan Fokkink, Vrije Universiteit Amsterdam, The Netherlands. Period: 17–20 November, 2011.

MohammadReza Mousavi, Department of Mathematics and Computer Science, Eindhoven University of Technology, The Netherlands. Period: 17–19 November, 2011.

Matthew Hennessy, Computer Science Department at Trinity College Dublin, Ireland. Period: 16–19 November, 2011.

Ron Aharoni (Technion, Israel). Period: 2 September 2011.

Alejandro Russo (Chalmers University of Technology, Sweden). Period: 26 August 2011.

Pierre Fraigniaud (LIAFA, Universite Paris Diderot - Paris 7, France). Period: 18–30 July 2011.

Lelia Blin (Univ. d'Evry Val d'Essonne, France). Period: 18–30 July 2011.

Alexandra Silva (CWI, Amsterdam, NL). Period: 8–12 June 2011.

Mario Bravetti (University of Bologna, Italy). Period: 6–13 June 2011.

Daniele Catanzaro (Universite Libre de Bruxelles, Belgium). Period: 23 May–5 June 2011.

Joshua Sack. Period: 9–13 May, 2011.

Cristian Prisacariu, University of Oslo, Norway. Period: 9–11 May, 2011.

Ymir Vigfusson IBM Research, Haifa, Israel. Period: 6 May, 2011.

Wan Fokkink, Vrije Universiteit Amsterdam, The Netherlands. Period: 28 April–1 May, 2011.

MohammadReza Mousavi, Department of Mathematics and Computer Science, Eindhoven University of Technology, The Netherlands. Period: 27 April–1 May, 2011.

Michel Reniers, Department of Mathematics and Computer Science, Eindhoven University of Technology, The Netherlands. Period: 27 April–1 May, 2011.

Bas Luttik, Department of Mathematics and Computer Science, Eindhoven University of Technology, The Netherlands. Period: 27–29 April, 2011.

Emanuela Merelli (University of Camerino, Italy). Period: 21 February–4 March 2011.

Pierluigi Penna (University of Camerino, Italy). Period: 21 February–4 March 2011.

Nicola Paoletti (University of Camerino, Italy). Period: 21 February–4 March 2011.

Table 1: ICE-TCS Guests in 2011

- Bjarni V. Halldórsson: RECOMB 2011, Vancouver Canada. (PC member)

- Magnús M. Halldórsson: *International Symposium on Algorithms and Computation (ISAAC)*, December 2011, Tokyo, Japan. (PC member)

- Magnús M. Halldórsson: *International Symposium on Algorithms for Sensor Systems, Wireless Ad Hoc Networks and Autonomous Mobile Entities (Algosensors)*, September 2011, Saarbrücken, Germany. (PC member)

- Magnús M. Halldórsson: *European Symposium on Algorithms (ESA)*, September 2011, Saarbrücken, Germany. (PC chair for track A)

- Anna Ingólfsdóttir: CONCUR 2011. (PC member)

- Anna Ingólfsdóttir: FICS 2011. (PC member)

- Marjan Sirjani: ICFEM 2011. (PC member)

- Marjan Sirjani: ICTAC 2011. (PC member)

- Marjan Sirjani: FMICS 2011. (PC member)

- Marjan Sirjani: FACS 2011. (PC member)

- Marjan Sirjani: Coordination 2011. (PC member)

- Marjan Sirjani: FSEN 2011. (PC co-chair)

- Henning Úlfarsson: FPSAC 2011. (Member of the organizing committee)

5.3 Service and Honours

Members of ICE-TCS participate in the life of the international research community in Theoretical Computer Science at large. For instance, they hold positions in the steering committee of conferences and professional organizations, and act as (guest) editors of volumes and international journals. A sample of service activities contributed by members of the centre can be found in Table 2.

During the reporting period, Luca Aceto has stepped down from his roles as chairman of the IFIP TC1 Working Group 1.8 on Concurrency Theory and as editor of the Concurrency Column of the Bulletin of the European

Association for Theoretical Computer Science. Moreover, Anna Ingólfsdóttir resigned from her role of secretary of the IFIP TC1 Working Group 1.8 on Concurrency Theory.

5.4 ICE-TCS Seminar Series

One of the main aims of ICE-TCS is to foster a broad appreciation of the field of Theoretical Computer Science in Iceland, and to help improve the Icelandic research environment in Computer Science at large. To this end, during 2011, the centre has organized the following seminar series:

- Research Seminar Series, and

- Reading groups.

These two seminar series are supposed to cater for different types of audiences and of presentations. As its name suggests, the *Research Seminars Series* is used for technical presentations reporting on research that has reached a fairly complete stage of development. Overall, there have been 17 seminars in this series during the reporting period. (See http://www.icetcs.ru.is/rsem.html for details on these talks.) This should be contrasted with the 26 seminars we had in 2010. This decrease in the number of seminars has been balanced by the wealth of conferences and workshops that ICE-TCS organized in 2011. Overall, we think that the centre's contribution to the research environment in computer science and related fields has been substantial during the reporting period.

Reading groups are used by ICE-TCS to learn about topics that have the potential of creating synergies amongst the members of the centre, or as fora for the discussion of research in one of the core areas of the centre. An example of the former use of a reading group is provided by the weekly concurrency lunch meetings. The weekly meeting of the wireless networking subgroup has recently included a reading group on game theory and auctions. Moreover, Marjan Sirjani holds weekly lunches with students working on formal methods in software engineering on Fridays.

5.5 Courses and Students

As far as impact on the Icelandic Computer Science community is concerned, one of the main aims of ICE-TCS has always been to attract students to Theoretical Computer Science. Teaching, in the broad sense, plays a very important role in achieving this aim, and the members of ICE-TCS engage

Membership and Steering of Learned Bodies

- Luca Aceto is a member of the EATCS council.

- Luca Aceto is the chairman of the Publication Committee of the EATCS.

- Luca Aceto is a member of the ICALP Liaison Committee of the EATCS.

- Luca Aceto is a member of the advisory board of *Electronic Proceedings in Theoretic Computer Science (EPTCS)*.

- Luca Aceto is a member of the Scientific Board of the Doctoral Program in Computer Science and Engineering at IMT Lucca (October 2011 onwards).

- Magnús M. Halldórsson is a member of the steering committee for the Scandinavian Workshop on Algorithm Theory series. He is chair of that committee since March 2007.

- Magnús M. Halldórsson is a member of the steering committee for the European Symposium on Algorithms.

- Anna Ingólfsdóttir is a member of the steering committee for the Workshop on Fixed Points in Computer Science (FICS).

- Anna Ingólfsdóttir is a member of the board of the Icelandic Mathematical Society.

- Henning Úlfarsson is the chairman of the Icelandic Mathematical Society.

Membership of Editorial Boards

- Information and Computation, Elsevier. (Luca Aceto guest editor of a special issue devoted to ICALP 2011)

- Journal of Logic and Algebraic Programming, Elsevier. (Luca Aceto editor and Anna Ingólfsdóttir guest editor)

- Acta Cybernetica (a scientific journal published by the Department of Informatics of the University of Szeged, Szeged, Hungary). (Luca Aceto editor)

- Electronic Proceedings in Theoretic Computer Science (EPTCS). (Luca Aceto editor)

- Frontiers in Statistical Genetics and Methodology. (Bjarni V. Halldórsson editor)

- Discrete Mathematics and Theoretical Computer Science. (Magnús M. Halldórsson managing editor)

- Soft Computing Journal (to be published by University of Kashan). (Marjan Sirjani Editor-in-Chief)

Table 2: Service and Honours by Members of ICE-TCS

in course development and in student supervision. Apart from our dissemination activities related to the seminar series and the reading groups, ICE-TCS researchers have delivered classic courses on *Algorithmics* and *Theory of Computation*, at various levels, as well as more specialized courses on *Bioinformatics*, *Logic in Computer Science*, *Modelling and Verification*, *Problem Solving* and on *Semantics of Programming Languages* at Reykjavik University.

Members of the centre have supervised the following PhD students, five of which are affiliated with ICE-TCS.

- Georgiana Caltais (Reykjavik University), PhD student working on her thesis supervised by Luca Aceto and Anna Ingólfsdóttir.

- Matteo Cimini (Reykjavik University), who defended his thesis in November 2011, supervised by Luca Aceto and Anna Ingólfsdóttir.

- Hilmar Finnsson (Reykjavik University), PhD student working on his thesis supervised by Yngvi Björnsson, formally affiliated with the Center for Analysis and Design of Intelligent Agents.

- Eugen-Ioan Goriac (Reykjavik University), PhD student working on his thesis supervised by Luca Aceto and Anna Ingólfsdóttir.

- Stefán F. Gudmundsson (Reykjavik University), PhD student working on his thesis supervised by Yngvi Björnsson, formally affiliated with the Center for Analysis and Design of Intelligent Agents.

- Ali Jafari (Reykjavik University), PhD student supervised by Marjan Sirjani.

- Kristján Valur Jónsson (Reykjavik University), PhD student mentored by Magnús M. Halldórsson and from mid-2011 supervised by Ýmir Vigfússon.

- Jón Ingi Sveinbjörnsson (Reykjavik University), PhD student working on his thesis supervised by Bjarni Halldórsson.

6 Publications by Members of the Centre

We already mentioned some of the research highlights earlier in this report. Here we limit ourselves to mentioning that the work carried out by the members of our research groups in algorithmics and combinatorics has

been presented at some of the premiere conferences in those areas such as ICALP, SODA and FPSAC and in some of the top journals, such as the Journal of Combinatorics. Yngvi Björnsson's work on search-methods in artificial intelligence and on general game playing continues to have high visibility both nationally and internationally. Apart from being published in the top publication outlets in the area, some of that work has achieved wide recognition. Finally, ICE-TCS researchers published journal papers in outlets such as Mathematical Structures in Computer Science, Science of Computer Programming, Theoretical Computer Science and Information Processing Letters.

Since our last annual report, ICE-TCS researchers have published one book, two edited volumes, 14 journal papers and 24 conference and workshop papers. In comparison with the previous reporting period, there has been a noticeable drop in the number of journal papers, which went from 31 to 14. At the same time, the number of conference and workshop papers has increased by one. The substantial decrease in the number of journal publications can be partly explained by the loss of five very productive mathematicians, who have left ICE-TCS. It is remarkable that, despite the reduction in the number of its members, the centre has managed to maintain its level of output in conferences and workshops. However, the halving of the number of journal publications is something that we feel will need to be addressed in the coming years.

Full details on the publications by members of the centre since its inception may be found at

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http://www.icetcs.ru.is/publications.pdf.

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7   Forthcoming Activities

During 2012, we plan to continue our work with the aim of achieving the objectives stated in Section 1. Despite the available funding and staffing, the levels of ambition and activity remain high within ICE-TCS, and we hope that 2012 will be as successful as 2011 was.

In spite of the lack of funding, we intend to maintain a vibrant visitor program, taking full advantage of the attractiveness that Iceland has as a travel destination. The following visits, listed in reverse chronological order, have already taken place at the time of writing:

- Marijke Bodlaender (Utrecht University). Period: 5 March 2012.

- Leon Danon (Mathematics Institute, University of Warwick). Period: 30 January–2 February 2012.

- Zoltán Ésik (University of Szeged, Hungary). Period: 19–27 January 2012.

- Joshua Sack. Period: 9–13 January 2012.

We hope that a few more guests will visit ICE-TCS during 2012, but this will mostly depend on the availability of external funding.

The calendar year 2012 will be rich of events that see major involvement from ICE-TCS members. To begin with, ICE-TCS is contributing to the Alan Turing Year celebrations with its own program of events. See http://www.icetcs.ru.is/turingyear2012RU.html for details. The Alan Turing Year events at Reykjavik University give the centre an excellent opportunity to make the general public and potential students interested in computer science. We plan to keep the program of events running throughout 2012. The talks in the series are being recorded and the recordings are available from the above-mentioned web site.

So far, all the talks in the Alan Turing series have been given by members of the School of Computer Science at Reykjavik University. We hope to be in a position to invite a distinguished speaker from abroad, but this will depend on the availability of, as yet unsecured, external sponsorships.

The new Bachelor program in Discrete Mathematics and Computer Science at Reykjavik University is now being formally advertised and will start officially in the autumn 2012. It will be interesting to see how many students will enroll in this study line.

In the period 30 June–2 July 2012, Magnús M. Halldórsson will host the 19th International Colloquium on Structural Information and Communication Complexity (SIROCCO 2012) at Reykjavik University. Magnús M. Halldórsson is also PC co-chair for the event, which will keep ICE-TCS in the limelight within the international TCS community.

As usual, we will hold our annual ICE-TCS Theory Day, but the date for the event has not been set yet.

Marjan Sirjani will once more represent ICE-TCS in the grant evaluation panel for Science and Engineering of the Icelandic Research Fund in 2012.

At the time of writing, two of the three computer scientists inducted to the Icelandic Academy of Sciences are members of ICE-TCS. During 2012, we expect that a third member of ICE-TCS will become a member of that academy.

We still think that it would be useful for the centre to undergo an evaluation by a high-profile panel of experienced researchers. Such an evaluation would be used by the centre to obtain an objective evaluation of its achievements so far in relation to the available resources, as well as useful feedback for improving its activities and impact in the future.

8   Summary and Self-Evaluation

The reporting period has seen ICE-TCS continue to achieve a fair amount of visibility in the research community. The centre has been very active in organizing high-quality scientific events at Reykjavik University and some of its members have served as PC chairs of top-class conferences in theoretical computer science. We consider this a sign of recognition for the research work that has been carried out within the centre, and for the role that the centre as a whole has played in the theoretical-computer-science community since its inception.

Towards the end of 2011, Ýmir Vigfússon joined ICE-TCS and he has already started offering important contributions to the centre's research and outreach activities. In addition, Magnús M. Halldórsson received an excellent grant from the Icelandic Research Fund, which will support two new PhD. students. These end-of-year developments bode well for the centre's activities in 2012.

Scientifically, the centre has continued to play an important role in the computer-science and discrete mathematics communities in Iceland. As in previous years, the vast majority of the scientific events in those fields taking place in Iceland have been associated with the centre and, to the best of our knowledge, the ICE-TCS seminar series and guest program are pretty much unique in the country. Internationally, the centre has continued to contribute to the TCS community via its research output and its service activities. We feel that we can be proud of what has been achieved in 2011. However, as mentioned earlier, we believe that the centre should try to maintain a good rate of publications in journals and we are setting ourselves the goal of reaching the 200-journal-papers mark by the end of 2013. Of course, this should not be done at the expense of quality and we still have an external evaluation of the centre's research activities on our wish list. For the time being, we will have to content ourselves with a sober self-evaluation of the centre's research output.

During the reporting period, the centre has further extended its network of research collaborators, and we feel that we have taken good advantage of

all the ad hoc funding opportunities that we have had available. We will continue to try and attract research visitors to ICE-TCS using every avenue at our disposal. ICE-TCS members will also continue applying for visiting professorships abroad.

The centre would benefit by having more students. We hope that the new degree course in Discrete Mathematics and Computer Science will give us a chance to get talented students interested in the mathematical foundations of computer science from the start of their studies.

Overall, we feel that we can be pleased with the quality and the quantity of the research work carried out by our members, and with the ensuing publications. In keeping with the centre's ambitions, it will be a useful exercise for us to find ways to increase the influence and activities of ICE-TCS even further. However, growth in the centre's research activities will strongly depend on increasing the number of its permanent members and on the quality of the PhD. students and postdoctoral researchers that we will manage to attract. The main obstacles to attracting PhD. students and postdocs is the lack of funding, and we will have to do our best to be successful in grant-winning. We look forward to meeting the challenges ahead and to offering our contribution to the theoretical computer science community.