

IFIP Technical Committee 7

System Modeling and Optimization

A historical note

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Abstract. Technical Committee 7 of IFIP was created first to establish a bridge between group of mathematicians and engineers working in modeling and optimization in the east and west countries. With changing world it became an important scientific group stimulating research in modeling and optimization. This note is trying to summarize activities of the Technical Committee over the last 50 (and more) years.

1. Early years of TC7 and TC7 in present time

The idea to create TC7 appeared for the first time during IFIP meeting in 1967 in Rome, where A.V. Balakrishnan, J. L. Lions and M. Marchuk were thinking about forming a research coalition devoted to Modeling and Optimization. Officially IFIP TC7 was founded in 1972 by A.V. Balakrishnan, J. L. Lions and M. Marchuk.

The aims of this Technical Committee were formulated as follows (and there are still actual):

- To provide an international clearing house for computational as well as related theoretical aspects of optimization problems in diverse areas and to share computing experience gained on specific applications,
- To promote the development of necessary high-level theory to meet the needs of complex optimization problems and establish cooperation with the international Mathematical Union and similar organizations,
- To foster interdisciplinary activity on optimization problems spanning the various areas such as Economics (including Business Administration and Management), Biomedicine, Meteorology etc., in cooperation with associated international bodies.

Generally at that time it was important to create a research bridge between West and East. IFIP TC7 for a long time played this role. Geopolitical changes in Europe improved channels of scientific cooperation and stimulated further development of TC7.

All members of TC7, in particular chairmen had strong impact on its activities.

The list of chairmen of IFIP TC7 looks as follows:

A.V. Balakrishnan, Los Angeles, US 1972-1979

J. Stoer, Würzburg, D 1979-1985

M. Lucertini, Rome, I 1985-1988

P. Thoft-Christensen, Aalborg, DK 1988-1995

P. Kall, Zurich, S 1995-2001

I. Lasiecka, Charlottesville, US 2001-2008

J. Henry, Bordeaux, F 2008-2012

F. Tröltzsch, Berlin, D 2013-2018

Ł. Stettner, Warsaw, PL 2018-

Current list of members of TC7 consists of the chair:

Prof. Dr. Lukasz STETTNER, PL, Polish Academy of Sciences, Institute of Mathematics

and two vice chairs: Prof. Dr. Dietmar HÖMBERG, DE, WIAS Weierstraß-Institut

and Prof. Irena LASIECKA, ACM, The University of Memphis, Department of Mathematical Sciences

as well as (where with * we denote honorary members while with ** the members recommended by TC7):

Barbara Kaltenbacher AT, Philippe Toint BE, Edmundo de Souza e Silva BR, Hector Cancela CLEI, Jiri Outrata CZ, Josef Stoer* DE, Arnd Rösch** DE, Fredi Tröltzsch* DE, Iain Larsen DK, Josep Casanovas ES, Luis Alberto Fernández** ES, Grégoire Allaire FR, Stefan Scholtes GB, Istvan Maros HU, Maria C. Calzavara IT, Hisao Kameda JP, Junho Song KR, Adrie J.M. Beulens NL, Jose Antonio Oliveira PT, Vyacheslav Maksimov RU, Lidija Zadnik Stirn SI.

2. Scope of the activities of TC7 and working groups

Generally speaking the scope of TC7 is two-fold: to foster the theoretical foundation for problems of the TC's concern and, based thereon, to develop or improve corresponding solution methods and their implementations. This broad scope of the TC7 is studied by a number of Working Groups which are involved both in the progress of theoretical research and in the growth of practical needs.

The scope of TC7 consists in computational aspects of optimization problems arising in such areas as Aerospace, Biomedicine, Economics, Meteorology, and Public Services (Health, Environment, Police, Fire, Transportation, etc.).

Some specific examples are:

- on-line and off-line computational techniques in modeling and control of dynamic systems;
- trajectory analysis and computation;
- optimization of decentralized systems (macro-economic systems) and systems with multicriteria;
- optimization of resource allocation in urban systems;
- optimization of pollution-control systems;
- optimization of man-machine systems;
- optimization of power systems operation;
- risk management in particular in mathematical finance and insurance;
- development of machine learning techniques,
- optimization and control under uncertainty.

There are 8 Working Groups being active within TC7, which we list below (in brackets we write year of foundation and the name of the first chair at foundation) with named chairs of them:

WG7.1 Modeling and Simulation (1972, W.A. Karplus, USA), temporarily suspended since 2018

WG7.2 Computational Techniques in Distributed Systems (1973, J.L. Lions, F),
Chaired by Dietmar Hömberg

WG7.3 Computer System Modeling (1973, P.E. Green, USA), Chaired by Mark S. Squillante

WG7.4 Discrete Optimization (1983, M. Padberg, USA), changed in 2014 to Inverse Problems and Imaging, Chaired by Christian Clason

WG7.5 Reliability and Optimization of Structural Systems (1986, P. Thoft-Christensen, DK), Chaired by Junho Song

WG7.6 Optimization-Based Computer-Aided Modeling and Design (1989, H.-J. Sebastian, D), Revised in 1999, Chaired by Janusz Granat

WG7.7 Stochastic Optimization (1989, P. Kall, CH), changed in 2018 to Stochastic Control and Optimization, Chaired by Jan Palczewski

WG7.8 Nonlinear Optimization, (2018, Radu Ioan Bot)

Working groups used to organize workshops and seminars. Periodically they publish proceedings of their activities. We present below a list of proceedings of such workshops:

Modelling and Optimization of Complex System, Proceedings of the IFIP-TC 7 Working Conference Novosibirsk, USSR, 3–9 July, 1978, Ed. Guri Ivanovich Marchuk,

Global Modelling, Proceedings of the IFIP-WG 7/1 Working Conference Dubrovnik, Yugoslavia, Sept. 1–5, 1980, Ed. Slobodan Krčevinac,

Advances in Filtering and Optimal Stochastic Control, Proceedings of the IFIP-WG 7/1 Working Conference Cocoyoc, Mexico, February 1–6, 1982, Ed. Wendell H. Fleming, Luis G. Gorostiza,

Recent Advances in System Modelling and Optimization, Proceedings of the IFIP-WG 7/1 Working Conference Santiago, Chile, August 27–31, 1984, Ed. Luis Contesse B., Rafael Correa F., Andrés Weintraub P.,

Stochastic Modelling and Filtering, Proceedings of the IFIP-WG 7/1 Working Conference Rome, Italy, December 10–14, 1984, Ed. Alfredo Germani,

Control Problems for Systems Described by Partial Differential Equations and Applications, Proceedings of the IFIP-WG 7.2 Working Conference Gainesville, Florida, February 3–6, 1986, Ed. Irena Lasiecka, Roberto Triggiani,

Stochastic Differential Systems, Proceedings of the IFIP-WG 7/1 Working Conference Eisenach, GDR, April 6–13, 1986, Ed. Hans Jürgen Engelbert, Wolfgang Schmidt,

Reliability and Optimization of Structural Systems, Proceedings of the First IFIP WG 7.5 Working Conference Aalborg, Denmark, May 6–8, 1987, Ed. P. Thoft-Christensen,

Boundary Control and Boundary Variations, Proceedings of the IFIP WG 7.2 Conference Nice, France, June 10–13, 1987, Ed. J. P. Zolésio,

Control of Partial Differential Equations, Proceedings of the IFIP WG 7.2 Working Conference Santiago de Compostela, Spain, July 6–9, 1987, Ed. Alfredo Bermúdez,

Control of Boundaries and Stabilization, Proceedings of the IFIP WG 7.2 Conference Clermont Ferrand, France, June 20–23, 1988, Ed. Jacques Simon,

Stochastic Systems and Optimization, Proceedings of the 6th IFIP WG 7.1 Working Conference Warsaw, Poland, September 12–16, 1988, Ed. Jerzy Zabczyk,

Reliability and Optimization of Structural Systems '88, Proceedings of the 2nd IFIP WG7.5 Conference London, UK, September 26–28, 1988, Ed. P. Thoft-Christensen,

Modelling and Inverse Problems of Control for Distributed Parameter Systems, Proceedings of IFIP (W.G.7.2)-IIASA Conference, Laxenburg, Austria, July 24–28, 1989, Ed. Alexander Kurzhanski, Irena Lasiecka,

Reliability and Optimization of Structural Systems '90, Proceedings of the 3rd IFIP WG 7.5 Conference Berkeley, California, USA, March 26–28, 1990, Ed. A. Der Kiureghian, P. Thoft-Christensen,

Optimal Control of Partial Differential Equations, Proceedings of the IFIP WG 7.2 International Conference Irsee, April 9–12, 1990, Ed. Karl-Heinz Hoffmann, Werner Krabs,

Control Theory of Distributed Parameter Systems and Applications, Proceedings of the IFIP WG 7.2 Working Conference Shanghai, China, May 6–9, 1990, Ed. Xunjing Li, Jiongmin Yong,

Boundary Control and Boundary Variation, Proceedings of IFIP WG 7.2 Conference Sophia Antipolis, France, October 15 – 17, 1990, Ed. Jean Paul Zolésio,

Stochastic Partial Differential Equations and Their Applications, Proceedings of IFIP WG 7/1 International Conference University of North Carolina at Charlotte, NC June 6–8, 1991, Ed. Boris L. Rozovskii, Richard B. Sowers,

Reliability and Optimization of Structural Systems '91, Proceedings of the 4th IFIP WG 7.5 Conference Munich, Germany, September 11–13, 1991, Ed. Rüdiger Rackwitz, Palle Thoft-Christensen,

Optimization-Based Computer-Aided Modelling and Design, Proceedings of the First Working Conference of the IFIP TC 7.6 Working Group The Hague, The Netherlands, 1991, Ed. Adriaan Jacobus Maria Beulens, Hans-Jürgen Sebastian.

3. General Conferences

One of the main activities of TC7 are general conferences, which in fact started before creation of TC7. The conferences had different names but starting from 1981 it was fixed to System Modeling and Optimization. TC7 general conferences played an important role in research activities. They gathered usually a number of leading specialists. Plenary lectures were delivered by mathematicians and engineers working in theoretical and practical aspects of various applications.

We list below general IFIP conferences, mainly the list of their proceedings (with few exceptions), which usually (starting from 7th Conference) are organized every two years.

Colloquium on Methods of Optimization, Novosibirsk, June 1968,

Computing Methods in Optimization Problems, San Remo, September 1968,

Symposium on Optimization, Nice June 1969,

Techniques of optimization : 4th IFIP Colloquium on Optimization Techniques, held at Los Angeles, California on October 19 - 22, 1971, Ed. A.V. Balakrishnan, V. Alampallan,

5th Conference on Optimization Techniques Rome 1973, Ed. R. Conti, A. Ruberti,

Optimization Techniques IFIP Technical Conference Novosibirsk, July 1–7, 1974, Ed. G.I. Marchuk,

Optimization Techniques Modeling and Optimization in the Service of Man, 7th IFIP Conference Nice, September 8–12, 1975, Ed. J. Cea,

Optimization Techniques: Proceedings of the 8th IFIP Conference on Optimization Techniques, Würzburg, 1977 Sept. 5-9, Ed. J. Stoer,

Optimization Techniques: Proceedings of the 9th IFIP Conference on Optimization Techniques Warsaw, September 4–8, 1979, Ed. K. Iracki, K. Malanowski, S. Walukiewicz,

System Modeling and Optimization, Proceedings of the 10th IFIP Conference New York City, USA, August 31–September 4, 1981, ed. Drenick, R.F., Kozin, F.,

System Modelling and Optimization, Proceedings of the 11th IFIP Conference Copenhagen, Denmark, July 25–29, 1983, Ed. Thoft-Christensen, P.,

System Modelling and Optimization, Proceedings of 12th IFIP Conference, Budapest, Hungary, September 2–6, 1985 ed. A. Prékopa, J. Szelezsáan, B. Strazicky,

System Modelling and Optimization, Proceedings of the 13th IFIP Conference Tokyo, Japan, August 31 – September 4, 1987, Ed. Masao Iri, Keiji Yajima,

System Modelling and Optimization, Proceedings of the 14th IFIP-Conference Leipzig, GDR, July 3–7, 1989, Ed. H. -J. Sebastian, K. Tammer,

System Modelling and Optimization, Proceedings of the 15th IFIP Conference Zurich, Switzerland, September 2–6, 1991, Ed. L. D. Davisson, A. G. J. MacFarlane, H. Kwakernaak, J. L. Massey, Ya Z. Tsytkin, A. J. Viterbi, Peter Kall,

System Modelling and Optimization, Proceedings of the 16th IFIP-TC7 Conference, Compiègne, France — July 5–9, 1993, Ed. Jacques Henry, Jean-Pierre Yvon,

System Modelling and Optimization, Proceedings of the Seventeenth IFIP TC7 Conference on System Modelling and Optimization, 1995 Ed. Jaroslav Dolezal and Jifi Fidler,

18th annual IFIP TC7 Conference on Systems Modelling and Optimization held in July 1997, Ed. Michael P. Polis, Asen I Dontchev, Peter Kall, Irena Lasiecka, Andrew W Olbrot,

System Modelling and Optimization Methods, Theory and Applications. 19th IFIP TC7 Conference on System Modelling and Optimization July 12–16, 1999, Cambridge, UK, Ed. M. J. D. Powell, S. Scholtes,

System Modeling and Optimization XX, IFIP TC7 20th Conference on System Modeling and Optimization July 23–27, 2001, Trier, Germany, Ed. E. W. Sachs, R. Tichatschke,

System Modeling and Optimization, Proceedings of the 21st IFIP TC7 Conference held in July 21st–25th, 2003, Sophia Antipolis, France, Ed. John Cagnol, Jean-Paul Zolésio,

Systems, Control, Modeling and Optimization, Proceedings of the 22nd IFIP TC7 Conference held from July 18–22, 2005, in Turin, Italy, Ed. F. Ceragioli, A. Dontchev, H. Furuta, K. Marti, L. Pandolfi,

System Modeling and Optimization, 23rd IFIP TC 7 Conference, Cracow, Poland, July 23-27, 2007, Adam Korytowski, Kazimierz Malanowski, Wojciech Mitkowski, Maciej Szymkat,

24th IFIP TC7 Conference, Buenos Aires, Argentina July 27-31, 2009, organizer: Hugo Scolnik,

System Modeling and Optimization, 25th IFIP TC 7 Conference, CSMO 2011, Berlin, Germany, September 12-16, 2011, Ed. Dietmar Hömberg, Fredi Tröltzsch,

System Modeling and Optimization, 26th IFIP TC 7 Conference, CSMO 2013, Klagenfurt, Austria, September 9-13, 2013, Ed. Christian Pötzsche, Clemens Heuberger, Barbara Kaltenbacher, Franz Rendl,

System Modeling and Optimization, 27th IFIP TC 7 Conference, CSMO 2015, Sophia Antipolis, France, June 29 - July 3, 2015, Ed. Lorena Bociu, Jean-Antoine Désidéri, Abderrahmane Habbal,

28th IFIP TC 7 Conference on System Modelling and Optimization, Essen, July 23-27, 2018, Org. C. Clason,

29th IFIP TC7 Conference on System Modelling and Optimization, Quito, August 30-Sept. 3, 2021, Org. Juan Carlos de los Reyes, Pedro Merino, Luis Miguel Torres, Tuomo Valkonen,

There was no proceeding of the 24th Conference held in Buenos Aires. Because of the swine flue epidemics the usual attendance of the conference from Europe and North America was under represented and he had relatively small number of participants (about 119).

The proceedings of the 28th Conference is not published yet. The 28th Conference was primary scheduled in Ankara 2017 but due to unstable political situation there was cancelled and moved in 2018 to Essen. Due to coronavirus pandemic the 29th IFIP Conference in Quito has been postponed to 2021. The chairs of TC7 despite of postponing 29th IFIP TC7 Conference to 2021 are planning to organize the 30th Conference in 2022, possibly in Warsaw, to continue general conferences every two years in average.

4. TC7 future activities

Modeling and optimization seems to be still important in various applications. Recent interest in machine learning techniques in particular in reinforcement learning and quality learning stimulate applicability of the research works of TC7. Another area is big data, large scale problems, the problem to find adequate methods as well as sufficiently efficient implementations. Together with an increase of the power of computers we need to develop suitable mathematical tools to handle such problems.

Modeling of coronavirus pandemic is another hot problem in the area of interest of TC7. Consequently there are a lot of to be done in modeling and optimization and therefore we are looking optimistically to the near future.