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.

Keywords: optimization, modeling, systems.

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, Allan Larsen DK, Josep Casanovas ES, Luis Alberto Fernández** ES, Grégoire Allaire FR, Stefan Scholtes GB, Istvan Maros HU, Maria C. Calzarossa IT, Yongbing Zhang 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 suspendesince 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 Stochast 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 the names of the workshops:

Modelling and Optimization of Complex System, IFIP-TC 7 Working Conference Novosibirsk, USSR, 3–9 July, 1978, see [1]

Global Modelling, IFIP-WG 7/1 Working Conference Dubrovnik, Yugoslavia, Sept. 1–5, 1980, see [2]

Advances in Filtering and Optimal Stochastic Control, IFIP-WG 7/1 Working Conference Cocoyoc, Mexico, February 1–6, 1982, see [3]

Recent Advances in System Modelling and Optimization, IFIP-WG 7/1 Working Conference Santiago, Chile, August 27–31, 1984, see [4]

Stochastic Modelling and Filtering, IFIP-WG 7/1 Working Conference Rome, Italy, December 10–14, 1984, see [5]

Control Problems for Systems Described by Partial Differential Equations and Applications, IFIP-WG 7.2 Working Conference Gainesville, Florida, February 3–6, 1986, see [6]

Stochastic Differential Systems, IFIP-WG 7/1 Working Conference Eisenach, GDR, April 6–13, 1986, see [7]

Reliability and Optimization of Structural Systems, IFIP WG 7.5 Working Conference Aalborg, Denmark, May 6–8, 1987, see [8]

Boundary Control and Boundary Variations, IFIP WG 7.2 Conference Nice, France, June 10–13, 1987, see [9]

Control of Partial Differential Equations, IFIP WG 7.2 Working Conference Santiago de Compostela, Spain, July 6–9, 1987, see [10]

Control of Boundaries and Stabilization, IFIP WG 7.2 Conference Clermont Ferrand, France, June 20–23, 1988, see [11]

Stochastic Systems and Optimization, 6th IFIP WG 7.1 Working Conference Warsaw, Poland, September 12–16, 1988, see [12]

Reliability and Optimization of Structural Systems '88, 2nd IFIP WG7.5 Conference London, UK, September 26–28, 1988, see [13]

Modelling and Inverse Problems of Control for Distributed Parameter Systems, IFIP (W.G.7.2)-IIASA Conference, Laxenburg, Austria, July 24–28, 1989, see [14]

Reliability and Optimization of Structural Systems '90, 3rd IFIP WG 7.5 Conference Berkeley, California, USA, March 26–28, 1990, see [15]

Optimal Control of Partial Differential Equations, IFIP WG 7.2 International Conference Irsee, April 9–12, 1990, see [16]

Control Theory of Distributed Parameter Systems and Applications, IFIP WG 7.2 Working Conference Shanghai, China, May 6–9, 1990, see [17]

Boundary Control and Boundary Variation, IFIP WG 7.2 Conference Sophia Antipolis, France, October 15 – 17, 1990, see [18]

Stochastic Partial Differential Equations and Their Applications, IFIP WG 7/1 International Conference University of North Carolina at Charlotte, NC June 6–8, 1991, see [19]

Reliability and Optimization of Structural Systems '91, 4th IFIP WG 7.5 Conference Munich, Germany, September 11–13, 1991, see [20]

Optimization-Based Computer-Aided Modelling and Design, First Working Conference of the IFIP TC 7.6 Working Group The Hague, The Netherlands, 1991, see [21]

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, which usually (starting from 7th Conference) are organized every two years.

Colloquium on Methods of Optimization, Novosibirsk, June 1968, see [22]

Computing Methods in Optimization Problems, San Remo, September 1968, see [23]

Symposium on Optimization, Nice June 1969, see [24]

Techniques of optimization : 4th IFIP Colloquium on Optimization Techniques, held at Los Angeles, California on October 19 - 22, 1971, see [25]

5th Conference on Optimization Techniques Rome 1973, see [26]

Optimization Techniques IFIP Technical Conference Novosibirsk, July 1–7, 1974, see [27]

6

Optimization Techniques Modeling and Optimization in the Service of Man, 7th IFIP Conference Nice, September 8–12, 1975, see [28]

Optimization Techniques: 8th IFIP Conference on Optimization Techniques, Würzburg, 1977 Sept. 5-9, see [29]

Optimization Techniques: 9th IFIP Conference on Optimization Techniques Warsaw, September 4–8, 1979, see [30]

System Modeling and Optimization, 10th IFIP Conference New York City, USA, August 31–September 4,1981, see [31]

System Modelling and Optimization, 11th IFIP Conference Copenhagen, Denmark, July 25–29, 1983, see [32]

System Modelling and Optimization, 12th IFIP Conference, Budapest, Hungary, September 2–6, 1985, see [33]

System Modelling and Optimization, 13th IFIP Conference Tokyo, Japan, August 31 – September 4, 1987, see [34]

System Modelling and Optimization, 14th IFIP-Conference Leipzig, GDR, July 3–7, 1989, see [35]

System Modelling and Optimization, 15th IFIP Conference Zurich, Switzerland, September 2–6, 1991, see [36]

System Modelling and Optimization, 16th IFIP-TC7 Conference, Compiègne, France — July 5–9, 1993, see [37]

System Modelling and Optimization, Seventeenth IFIP TC7 Conference on System Modelling and Optimization, 1995, see [38]

18th annual IFIP TC7 Conference on Systems Modelling and Optimization held in July 1997, see [39]

System Modelling and Optimization Methods, Theory and Applications. 19th IFIP TC7 Conference on System Modelling and Optimization July 12–16, 1999, Cambridge, UK, see [40]

System Modeling and Optimization XX, IFIP TC7 20th Conference on System Modeling and Optimization July 23–27, 2001, Trier, Germany, see [41]

System Modeling and Optimization, 21st IFIP TC7 Conference held in July 21st–25th, 2003, Sophia Antipolis, France, see [42]

Systems, Control, Modeling and Optimization, 22nd IFIP TC7 Conference held from July 18–22, 2005, in Turin, Italy, see [43]

System Modeling and Optimization, 23rd IFIP TC 7 Conference, Cracow, Poland, July 23-27, 2007, see [44]

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, see [45]

System Modeling and Optimization, 26th IFIP TC 7 Conference, CSMO 2013, Klagenfurt, Austria, September 9-13, 2013, see [46]

System Modeling and Optimization, 27th IFIP TC 7 Conference, CSMO 2015, Sophia Antipolis, France, June 29 - July 3, 2015, see [47]

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 we had relatively small number of participants (about 119). The 28th Conference was primary scheduled in Ankara 2017 but due to unstable political situation it was cancelled and moved in 2018 to Essen. Due to coronavirus pandemic the 29th IFIP Conference in Quito has been postponed to 2021 and will be held online. The 30th Conference will be on July 4th-8th 2022 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.

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10

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