Numer Algor
DOI 10.1007/s11075-007-9114-2

Preface

Stefano De Marchi · Michela Redivo-Zaglia · Marco Vianello

Received: 6 June 2007 / Accepted: 6 June 2007

The first Dolomites workshop on Constructive Approximation Theory and its Applications (DWCAA06) took place from September 8th to September 12th, 2006 hosted by the dependance of the University of Verona in the wonderful mountain village called Alba di Canazei, at the foot of the *Queen of the Dolomites*, the *Marmolada*.

The meeting was dedicated to one of the most respected researcher in numerical mathematics and approximation theory: *Prof. Walter Gautschi*, Emeritus of Purdue University. The main reason for this celebration was the 50th anniversary of his very first appointment as Research Mathematician at the National Bureau of Standards in 1956.

Walter was accompanied by his wife Erika and there he had the opportunity to meet many old and new friends, all very pleased to celebrate him, his work and contributions to mathematics. Indeed, many from the approximation theory community benefit from his research which has connections with almost all of the works presented at the conference especially on special functions, quadrature, orthogonal polynomials or interpolation just to name a few. Most of the speakers at the conference mentioned explicitly in which way Walter's contributions touched upon their own work. The conference thereby really

S. De Marchi
University of Verona
e-mail: stefano.demarchi@univr.it

M. Redivo-Zaglia (✉)
University of Padova
e-mail: Michela.RedivoZaglia@unipd.it

M. Vianello
University of Padova
e-mail: marcov@math.unipd.it

provided a complete overview of approximation theory and computational mathematics in the last decades.

The invited speakers at this workshop were

B. Bojanov (University of Sofia, BG)
L. Bos (University of Calgary, CA)
M. Bozzini (University of Milan, I)
C. Brezinski (University of Lille, F)
M. Buhmann (University of Giessen, D)
C. de Boor (University of Wisconsin-Madison, USA)
G. Fasshauer (Illinois Institute of Technology, Chicago, USA)
A. Iske (University of Hamburg, D)
J. Levesley (University of Leicester, UK)
L. Montefusco (University of Bologna, I)
T. Sauer (University of Giessen, D)
R. Schaback (University of Goettingen, D)
I. H. Sloan (University of New South Wales, Sydney, AU)
H. Wendland (University of Dresden, D)
Y. Xu (University of Oregon, Eugene, USA)

and each of them delivered a 45 minutes talk on subjects of approximation theory and applications. Some of them were more of a review character, some of them more of a research character.

Claude Brezinski's invited talk was the opening lecture summarizing at the onset of the meeting Walter Gautschi's contributions to the many areas of mathematics. This was certainly not an easy talk to give and prepare, as Walter has nearly 200 publications. But Claude's summary was done in a very effective and expert way (hopefully with Walter's help).

The areas covered by the other invited talks were: recent results on polynomial interpolation and approximation (Bojanov, Bos, de Boor, Sauer), radial basis functions and applications to surface reconstruction (Buhmann, Montefusco), polyharmonic B-splines (Bozzini), applications of radial basis functions to the numerical solutions of differential equations and scattered data problems (Fasshauer, Wendland), kernel methods (Schaback), approximations on spheres and optimal point placement on the sphere, error estimates for quadrature formulae (Sloan), applications to physical problems (Iske, Levesley) and to image reconstruction from Radon data (Xu).

In addition, there were two parallel sessions that hosted 40 contributed talks, a poster session with 8 very well designed posters and a special afternoon session on "Approximation methods in finance".

This special volume of *Numerical Algorithms* collects some of the papers presented at the workshop. In particular in the paper written by himself and titled *A guided tour trough my bibliography*, Walter Gautschi summarizes his many contributions to the various areas of mathematics and numerical analysis. We believe that this was certainly not an easy paper to think and to write, as Walter has so many publications. On the other hand, we all appreciated the

afford done by him for sharing with the mathematical community the results he obtained so far.

Many papers took inspiration from Gautschi's work on univariate quadrature. We mention the papers by M. R. Capobianco and G. Criscuolo, D. Fasino and L. Gemignani, D. Laurie, P. Leopardi, W. Gautschi and P. Leopardi, T. Hasegawa et al., and O. Salazar Celis at al.. Other papers discuss problems related to rational interpolation, another field of interest of Prof. Gautschi, as the paper by J. Van Deun, or estimation of moments as in the paper by C. H. Rohwer or again error estimation of finite sinc-interpolation on finite interval as discussed in the short note by J.-P. Berrut.

Among the main topics of the workshop there was *Approximation by Multivariate Polynomials* w.r.t. interpolation and orthogonal polynomials. The papers devoted to multivariate interpolation are the papers by Carl de Boor, and T. Sauer, both providing new overviews on interpolation in the multivariate setting. Multivariate orthogonal polynomials were used instead in the papers by M. Alvarez de Morales et al., F. Costabile and F. Dell'Accio, G. Mantica, and S. Waldron.

An emerging topic of growing interest in the last decades for the mathematical community, used in the constructions of meshless methods or in their broad applications, is represented by radial basis functions. The paper by G. Fasshauer and J. G. Zhang presents new results in the choice of shape parameters for the so-called cross-validation method. A. Mazzia and co-authors make a comparison of meshless methods for finite element method approximations; C. Drioli and D. Rocchesso use kernel-based methods for sound synthesis while S. Müller and S. Hubbert provided new computational ideas for thin-plate splines in the unit interval. All these papers represent an overview of the recent developments in this area.

In applications of approximation theory in, what we can call, "real life problems", two papers are worth to mention. The first one is the work by Y. Xu et al., in which image reconstruction problems for MR and CT are solved by means of a new orthogonal polynomial expansion on the disk algorithm. The second one is the paper by J. Levesley and his co-authors in which they study new regularisers for lattices Boltzmann computational models based on the Ehrenfests' coarse-graining ideas.

Finally, the papers by I. Caraus, E. A. Karatsuba, even if more theoretical than numerical, present interesting new ideas in classical topics of approximation theory while the paper by G. Jaklič et al., presents new approaches on the construction of lattices on triangulations.

To discuss mathematics and other things less formally, to share reminiscences for example, several social events were organized. Among them we recall the conference dinner where Walter Gautschi related some of his experiences as an academic, for instance remembrances of his famous Ph.D. supervisor A. M. Ostrowski at the University of Basel (and of Walter's work for him as an assistant), and his part in the proof by Louis de Branges of the Bieberbach conjecture. Gene Golub, whose enthusiasm is well-known but

made bigger by the presence of his old friend, gave a speech on Walter and asked several other colleagues to add their own short stories about Walter to make that evening a really remarkable event to remember.

The workshop ran in the Dolomites so excursions in the mountains were also planned and much enjoyed by all the participants. On Sunday 10th September, it was organized an excursion such that everybody could participate, easier ones for the less experienced mountain-walkers and one *solo per esperti* (i.e. only for experts) for the professionals. Incidentally, Walter, being of Swiss descent, is also keen of hiking in the mountains and so from his point of view this was a good place for the conference as well.

We are grateful to all 85 participants coming from 5 continents and 23 different nations. Firstly, because Alba di Canazei is in a fairly remote place not so easy to reach. Nonetheless, no speaker was lost and indeed there were no cancellations, which is quite unusual in mathematical meetings, and we believe that emphasizes the high importance the participants attributed to attending this meeting.

We also would like to thank all those who contributed to the success of this meeting or helped us by some means or other support. Among them, we are grateful to Prof. Martin Buhmann for his nice report, published in the AT-net Bull. no. 136, who was the inspiration for this preface.

This meeting, organized for the first time, gave the opportunity to mathematicians to communicate and exchange ideas about their mathematical research especially with respect to Walter Gautschi's work. Walter, through his work and his being, gives a shining but great example in how to approach and solve mathematical problems: a good and ideal reason for us to propose such a conference.

Thank you, Walter!

The organizers

List of participants

Walter Gautschi
Department of Computer Sciences
Purdue University, Indiana (USA)
e-mail: wxg@cs.purdue.edu

Eman Al-Aidarous
Mathematics Department
King Abdul Aziz University
Jeddah (Saudi Arabia)
e-mail: ealaidarous@kau.edu.sa

Guido Andaloro
Department of Mathematics
University of Messina (Italy)
e-mail: guandalo@dipmat.unime.it

Battista Benciolini
Department of Civil
and Environmental Engineering
University of Trento (Italy)
e-mail: battista.benciolini@ing.unitn.it

Elena Berdysheva
Institute for Applied Mathematics
and Statistics University of Hohenheim
Stuttgart (Germany)
e-mail: elena.berdysheva@unihohenheim.de

Jean-Paul Berrut
Department of Mathematics
University of Fribourg (Switzerland)
e-mail: jean-paul.berrut@unifr.ch

Roberto Bertelle
Department of Pure
and Applied Mathematics
University of Padua (Italy)
e-mail: bertelle@math.unipd.it

Borislav Bojanov
Department of Mathematicsand Informatics
University of Sofia (Bulgaria)
e-mail: boris@fmi.uni-sofia.bg

Len Bos
Department of Mathematics and Statistics
University of Calgary (Canada)
e-mail: lpbos@math.ucalgary.ca

Tina Bosner
Department of Mathematics
University of Zagreb (Croatia)
e-mail: tinab@math.hr

Mira Bozzini
Department of Mathematics and Applications
University of Milan-Bicocca (Italy)
e-mail: mira.bozzini@unimib.it

Claude Brezinski
Laboratory Paul Painlevé
University of Lille (France)
e-mail: Claude.Brezinski@univlille1.fr

Martin Buhmann
Institute of Mathematics
Justus-Liebig-University
Giessen (Germany)
e-mail: martin.buhmann@math.unigiessen.de

Marco Caliari
Department of Pure
and Applied Mathematics
University of Padua (Italy)
e-mail: mcaliari@math.unipd.it

Maria Rosaria Capobianco
CNR-IAC "Mauro Picone" Naples (Italy)
e-mail: r.capobianco@na.iac.cnr.it

Iurie Caraus
Department of Computer Science
K.U. Leuven (Belgium)
e-mail: iurie.caraus@cs.kuleuven.be

Loredana Chieppa
Department of Mathematics
University of Bari (Italy)
e-mail: chieppa@dm.uniba.it

Giuliana Criscuolo
Department of Mathematics and Applications
University of Naples "Federico II" (Italy)
e-mail: giuliana.criscuolo@unina.it

Annie Cuyt
Department of Mathematics
and Computer Science
University of Antwerp (Belgium)
e-mail: annie.cuyt@ua.ac.be

Lucia De Biase
Department of Environmental
Sciences
University of Milan-Bicocca (Italy)
e-mail: lucia.debiase@unimib.it

Shayne Waldron
Department of Mathematics
University of Auckland,
(New Zealand)
e-mail: waldron@math.auckland.ac.nz

Ben Waterhouse
School of Mathematics and Statistics
University of New South Wales
Sydney (Australia)
e-mail: benjw@maths.unsw.edu.au

André Weideman
Department of Mathematical Sciences
University of Stellenbosch
(South Africa)
e-mail: weideman@dip.sun.ac.za

Holger Wendland
Department of Mathematics
University of Sussex, Brighton
(England)
e-mail: H.Wendland@sussex.ac.uk

Yuan Xu
Department of Mathematics
University of Oregon (USA)
e-mail: yuan@uoregon.edu

Zvi Ziegler
Department of Mathematics
Technion,
Israel Institute of Technology
Haifa (Israel)
e-mail: ziegler@techunix.technion.ac.il