

University of Texas
February 25-26, 2000

The first joint Finite Element Circus-Rodeo was held at the University of Texas with 66 attendees. After 10 talks Friday afternoon, members had dinner in the President's Dining Room at the Texas Club. Eight more talks were given Saturday morning. Following a lunch provided by the local hosts, seven more talks were given. Out-of-town attendees staying over Saturday night were invited to a cocktail party at the new home of Jim and Peggy Bramble on Saturday evening.

Poem contributed by R. Faek

Finite Elements Forever

When the Rodeo joins the Circus,
It's an event you shouldn't miss.
It's a time to learn of new results
And a chance to reminisce.

The Circus founders knew it
And were there just as long ago
To see Finite Elements still going strong.
Was there ever a doubt that would be so?

Attendees

Rick Fair
Douglas N Arnold

~~emp Douglas f~~
~~hu~~

Greg Rodin

Leszek DEMKOWICZ

J.N. Reddy

Susanne C. Brenner

~~Pabusha~~

Jinchun Xu

zhongxin chen

Jiehun Li
Craoquan Jiang

Bryan Li

Zhong Waei

Lin Jiahao

PER-GUNNAR MARTINSSON

Tim Waldh

Robert Kirby

Wang E.

Vin Cay

Alan Dembow

Xin Ye

Rob Marshall

Albert Romkes

Beatrice Riviere

Jeffrey Puft

Dana Brunson

Lin Zhang

KEVIN COPPS

Theofanis Strouboulis

Whatta

Tom Mugg

Brian Carnes

Serge Prudhomme

Dmitry Dushkevsky

Yuri Vassilevski

Vadim Vyadechko

Sergei Reivae

Vadym Aizinger

Potterice Henon

Johannes Tausch

Hao Lu

zhong

Stefan Tomov

Tzanko Kolev

Constantin Băcică

CHISUP KIM

Vicen Thomas

Leon Vardapetyan

Joe Pascual

Krzysztof Banasi

Jin Zhao

Victor Ginting

Xiaowen Wang

Olaf Steinbach

Jay Geopalakrishnan

PADMANABHAN SESHAIYER

Shangyou Zhang

Feder Abogoch

Andrew KNYA

Dick Ewing

Jim Bramble

Tinsley Oden

Graham F. Carey

Raycho Lazarov

Xicai Liu

Shen Rong Wu

Mary J. Whelan

Clint Dawson

John

Talks

Douglas Arnold: Approximation on quadrilateral meshes

Susanne C. Brenner: An additive convergence theory for the multigrid V-cycle algorithm

Zhangxin Chen on the relationship of various discontinuous Galerkin methods for second-order elliptic problems

Tim Wathen hp-BE modeling of the human ear canal acoustics

Alan Demlow Global L_2 Estimates for Mixed Methods Using BDM Elements

~~Xia~~ $\frac{1}{2}$

Revathi Narasimhan: Optimal stress points for a mixed FEM for incompressible elasticity

Sergey Nepomnyaschikh:
"Variable Additive Preconditioning Procedures".

Lin Zhang:

??- superconvergence of finite element solutions and error estimators

Kevin Copps: The Generalized Finite Element Method: Implementation and Examples.

Theofanis Strouboulis: Two important developments in the FEM: Guaranteed error estimation, and, the generalized finite element method.

DIBYENDU DATTA: Guaranteed upper & lower bound for the error in the quantity of interest

DMITRIY DASHEVSKIY: Generation of Locally Refined, Locally ~~fi~~ adapted meshes.

YURI KUZNETSOV: A new iterative method for the diffusion equation with big jumps in coefficients

Johannes Tausch: Wavelets for Manifolds with Complicated Geometry

Al. Schatz: Error Estimates for the finite element method on refined grids

Leon Vardepetyan: Full-Wave Analysis of Dielectric Waveguides at a given frequencies

Olaf Steinbach

Stability of the f_2 projection
in Sobolev spaces

Jay Gopalakrishnan

Overlapping Schwarz preconditioner for
Maxwell equations in lossless media

PADMANABHAN SESHAYER

A SUB-DOMAIN INVERSE FINITE ELEMENT
CHARACTERIZATION OF HYPERELASTIC MEMBRANES

Shangyou Zhang

Recovery of Neumann data and
two applications

ANDREW KNYAZEV Preconditioned Eigensolvers

Konstantin LIPNIKOV & YURI Kuznetsov, An efficient iterative
solver for a coupled 3D elasticity/
diffusion problem.

Wan-Xie Zhong Symplectic Mathematics
and Applied Mechanics.
Palian University of Tech, PRC

Andrzej Bajaj

Contact/Impact Problems, Energy Conservation
and Planetary Gear Trains

Rutgers University

October 20-21, 2000

The circus went back to Rutgers in the fall of 2000, hosted by Rick Falk (sometimes he acts like a Dean). There were 8 talks on Friday afternoon, a pleasant dinner at Charlie Brown's followed by a party at Dean Rick's, and

Election 2000

A numerical analyst named Bubba
Had considerable stability trouble

For some help he was sent

To a circus he went

at a campus named after George W.

To explain he was offered the floor

His ideas were splattered with gore
with his scheme inconsistent

His errors were persistent

at the end he was thrown out the door

A Attendees

Douglas N Arnold
 Arthur S. Fahn

Shangyou Zhang

Oren E. Livne

Ricardo H. Nochetto

Young-Ju Lee

Jinhae Park

Zhem'in Zhang

Sheng Zhang

Lars Wahlbin

Revathi Arasimhan

Bruce Kellogg

A.K. Ozg

Igor Shimansky

Pierre Grimaud

Peter Monk

Jie Shen

Jatun Ku

Dmitriy LEYKEKHMAN

Gula F. Cui, U.S.

Zhangxin Chen

Varis Lary

Alexander Alekseenko

Traian Iliescu

Nicolae Tarfulea

Jinbiao Wu

L. ZIKATANOV

Xiaohai Liao

Zhiqiang Cai

Blyue Liu

Tong Sun

Nathaniel Gilbert

Leon Vardapetyan

Omar Lakkis

Bernhard Hiesfeld

PAULO GOLDFELD

JOSE CAL NETO

MARCUS SARKIS

PYO, Jae-Hong

Chuan Demian

Hae-Soo Oh

Christos Xenophontos

Djordje Richter

Alexander D. Ward

Talks

Douglas Arnold: Mixed finite elements for elasticity in the stress-displacement formulation

Oren E. Livne (Weizmann Institute):

$O(N \log N)$ Multilevel Calculation of N eigenfunctions.

Ricardo H. Nochetto: Small Data Oscillation implies the saturation assumption.

Zhimin Zhang: Superconvergent Points of the Serendipity family for Harmonic Functions

Lars Wahlbin: Differences of error in FEM's (with Al Schatz)

Bruce Kellogg: singularly perturbed convection diffusion on an incoming sector

Igor Shomansky (University of Maryland and Emory Associates, Inc) An asymptotic expansion for the solution of convection-diffusion problem

Pierre A. Greenaard: Simulation of gravity flow of granular material (North Carolina State Univ.)

Traian Iliescu "Large Eddy Simulation for Turbulent Flows" (Argonne Nat'l Lab)

Z. Cai, A finite element method for the Poisson equation with corner singularity.

Leon Vardapetyan | Hp-Vector FEM for the Full-Wave Analysis of Waveguides at a Given Frequency

Omar Lakkis } A posteriori error estimate for the solutions of mean curvature flow of graphs.

MARCUS : } A Symmetrized Restricted Additive Schwarz Method
SARKIS

Alan Demlow Suboptimal Convergence in Mixed Finite Element Methods Using BDM Elements

Christos Xenophontos : Solution of Laplacian problems over L-shaped domains by a singular boundary integral method

Gerard Richter on the stability of a family of Finite element methods for hyperbolic problems

Guillaume Cary Conservation Properties of the Superconvergent Flux Extrusion Formula, & Model behavior

Joe-Ming Pao Gauge method for (Navier) Stokes equation

Zhangxin Chen Mixed Discontinuous Finite element methods

University of Delaware

March 30-31, 2001

ODE TO GORE HALL

The Rotunda gives the Big Top idea,
The Lecture Room is Top Notch, we agree,
What Perfect a Venue,
for a Circus Adventure;
for algorithms for DE in DE.

A Hendees

Douglas N Arnold
Richard Fack

Pedro Morin

Ricardo H. Nochetto

Georg Dolzmann

Lars B. Wahlbin

Tong Sun

Shangyou Zhang

Zhimin Zhang

A.K. Aziz

Gerard Richter

Susanne Brenner

Peter Me

Manil Suri

Alexandra G. Ward

Alex Hord

John Olson

John Olson

John Olson

John Olson

Alan Benson

Paul LLS

Arup Mukherjee

Pierre Germain

Josiah Miller

Xiaohai Liao

Al. Schatz

Wagner Muniz

Cliff Widup

Axel Klawns

Ja Eun Ku

Joseph Jerome

Paula GOWARD

MARCUS SARKIS

Jae-Hong YO

Jung-Han Kim

JING LI

Bernhard Huetzel

Cynthia Spade

Fionella Cohen

Tim Aren

Rich Braun

Alexander Merseenko

Sheng Zhang

Jason Kurtz

Christos Xenophontos

Rodrigo Ratto

Peter Onwald

Nilima Nigam

Talks

Pedro Morin: An Adaptive Uzawa FEM for Stokes:
Convergence Without the Inf-Sup.

Ricardo H. Nochetto: Pointwise a posteriori error control
for variational inequalities

Tong Sun: Long-time error estimation for
semi-linear parabolic equations

Shangyou Zhang: Multigrid Method for
Affine-Approximate Finite Elements

Gerard Richter: Stable finite element box
methods for hyperbolic equations

Matthias K. Gobbert: A Feature Scale Transport and Reaction
Model for Atomic Layer Deposition

Alan Demlow: Sharply Localized L_p Estimates for Mixed Methods

Carsten Carstensen: A posteriori error control — an advertisement
for averaging techniques

Pierre Greenaud: Similarity solutions for hopper flows

Joachim Schoeberl: Multigrid methods for
anisotropic edge refinement

Xiaohai Liao: Local a posteriori error estimates
and adaptive control of pollution
effects, Part II Stokes equations.

Al. Schatz, R. Nchetto, J. Xu L_∞ estimates for equations with discontinuous coefficients on polygonal domains with refined grids.

Olof Widlund, with Axel Klaworn and Maksymilian Dryja:
Recent Results on Dual-Primal FETI Methods.

Joseph Jerome: Ion Transport in Moving Electrolytes

Joe-Hong Pyo: Finite element Gauge-Uzawa
Method for the evolution Navier-
Stokes equations

Peter Oswald: One-to-two problems on constructing
projections for linear finite elements

North Carolina State University

November 2-3, 2001

The Fall Circus moved for the first time to N.C. State and was hosted by Pierre Bremond. Although the turnout was lower than usual, due to the tragedy of September 11, there was great enthusiasm.

With only 5 talks on Friday and 4 on Saturday, speakers were treated to the luxury of 30 minutes, instead of the usual 15. The usual Friday night dinner was held at the Warehouse.

a ~~terse~~
Wolfpack Song

Heeding the words of GWB,
Continuing on our path,
A reduced but still energetic group
We presented our latest math.

Maxwell, powder, fluid flow,
The applications swirled,
Then engineer Mareno gave
A glimpse of the real world.

Discontinuous elements
appeared at the circus again,
History is cyclical
and good ideas remain

Falk/Kellogg

Attendees

Doug Arnold

Peter Monk

Jie Shen

Tong Sun

Susanne Buerner

Kazufumi Ito

Olivier Besson

Pierre Gremaud

Jang, Bongsoo

Jason Holt

John Matthews

Kristy H. Coffey

Todd S. Coffey

Brian M. Adams

JASON D. MAREND

Zhilin Li

Hae-Soo Oh

Houssem HADDAR

Bruce Kellogg

Rich Faeh

Sheng Zhang

Jay Gopalakrishnan

Chisup Kim

Talks

Doug Arnold: DG methods for elliptic problems

Peter Monk: A simple proof of convergence for an edge element discretization of Maxwell's equations

Jie Shen Velocity-correction schemes for incompressible flows

Tong Sun Error estimates on Parabolic equations

Pierre Grenand Numerical simulation of powder consolidation

Bruce Kellogg Corner singularity for a compressible Stokes system

Sheng Zhang A linear shell theory based on variational principle

JASON MAREND CUSTOMIZATION OF THE ANSYS FE SOFTWARE FOR NON-SPECIALISTS.

Zhilin Li New Finite Element Methods for Interface Problem based on Cartesian Grids

UNIVERSITY OF MARYLAND

COLLEGE PARK

MARCH 8-9, 2002

A PLEASANT AFFAIR.

A Circus at Maryland
Is a pleasant affair
You walk to the Math Home
And climb up the stairs.

Mathematics will greet you
It's all in the air
Old and New Friends will meet you
Yes, it's that atmosphere.

If I were an M.D.
Healing Body and Soul:
A Circus at MD
Prescribed, makes you whole.

A Circus at Maryland
Is indeed a Most Pleasant Affair.

Participants

Doug Arnold

Peter Oswald

Constantin Bacuta

Bruce Kellogg

Richard Fied

Shangyou Zhang

Lars B. Wahlbin

Zhimin Zhang

Tony Rice

Jason Nelt

Bongsoo Jang

Hae An Oh

Gyory Dolomau

Ricardo H. Nochetto

Sonia M. F. Garcia

LUDMIL T. ZIKATANOV

Graham F. Carey

Jinbiao Wu

Young-Ju Lee

Alexandra L. Chailero

Kevin Allen

STEVEN C. FOSTER

Samuel G. Webster

Reathias K. Gobbert

Ja Eun Ku

Alan Demlow

Johnny Guzman

Dmitriy LEYKELMAN

Varis Carey

Christos Xenophonotos

Peter Mark

Joseph H. Kinnest

Stuart Antman

David Levermore

A.R. Aziz

Participants

John Osborn	Peter Wolfe
Uday Banerjee	Bo Li
Jae-Hong PYO	Howard Elma
Shuhua Zhang	M Corbin
Tobias van PETERSDOORFF	
Biyue (Betty) Liu	
Tong Sun	
Chisup Kim	
Chin-Tien Wu	
Daniel Kessler	
Kunibert Liebert	
Li Wu	
Gerard Puchter	
Alfred Schatz	
Alan Berger	
Hong Wei	
LONG CHEN	

Talks

Peter Oswald: $\sqrt{3}$ - subdivision

Constantin Bacuta: Regularity estimates
for Laplace operator
via Besov Spaces and
applications.

Richard Falk: Quadrilateral H(div)
finite elements

Lars WAHLBIN: Max-norm
estimates for resolvents:
Extreme logarithm-
chasing.

Zhimin Zhang: Meshless Gradient Recovery

Ricardo H. Nochetto: Surface Evolution via Surface
Diffusion (w. E. Bänsch and P. Morin)

LUDMIL T. ZIKATANOV: SUBSPACE CORRECTION METHOD
FOR GENERALIZED FINITE ELEMENT
METHOD.

T. VON PETERSDORFF: BOUNDARY ELEMENTS FOR
MAXWELL EQUATIONS ON LIPSCHITZ DOMAINS

Talks

John Osborn: On Principle for the Selection of
Shape Functions for the Generalized Finite
Element Method (Part I)

Uday Banerjee - On Principles for the Selection
of Shape Functions for the
Generalized Finite Element
Method (Part 2)

Jae-Hong PYO: convergence of Uzawa
algorithm for stationary
stokes Equation
with relaxation parameter
 $\alpha = 1$

Chisup Kim: A uniform multi-level
preconditioner for an anisotropic
mixed finite element problem

David Vesski: Modeling, numerical analysis and
simulation of a spatial phase-field model

Kunibert Siebert: Localized Pointwise & Posteriori
Error Estimates for Elliptic Obstacle Problems

Alexander L. Hentert - Numerical
Simulation of Calcium Concentration in
Human Heart Cells.

Nathanas K. Goblet - Parallel Numerical
Solution of the Boltzmann Equation
for Atomic Layer Deposition

Alan Demlow - Piecewise Linear Finite Element Methods
Are Not Localized

Dmitriy Leykekhman - Pointwise Localized Max
norm estimates for Parabolic PDE's.

Varis Carey - A Posteriori Error Estimation Via
Recovered Gradients

Christos Xenophonos - Revisiting the
Shishkin mesh.

Bokil: Lagrange interpolation
and finite element superconvergence

Howard Elman Oscillations and their
Cure for Discrete Convection-
Diffusion Problem

Penn State University
October 25-26, 2002

The Fall Circus at Penn State
had a large turnout of 53 circus members,
with 22 giving talks. The Friday night
Circus dinner was held at the Gardens
Restaurant at the Penn State Hotel and
was followed by a party at the home of
Jinchao Xu and Jenny Li.

***IF WILLIAM BLAKE AND DR. SEUSS
HAD BEEN AT THE PENN STATE CIRCUS...***

Mathematicians came; like lambs, looking tame,
Not-any lions in sight?

Their theorems true; did though shine through,
As tygers burning bright.

What immortal hand or eye,
Dared frame their fearful symmetry?

Sweet delight of endless strain,
In the furnace of the brain,
Glor'ous mo'rns of sweet delight,
When your thoughts shine bright and right,
Endless nights of strain and pain,
When your brain goes down the drain.

Glorious infinity,
Is sun rise to eternity,
Infinities of elegance,
Grace dancing Finite Elephants.

A H e n d e e s

Bill Fack

Douglas N Arnold

Juehao Lu

Jim Bramble

Shangyou Zhang

Bruce Kellogg

Adrian Dunca

Yekaterina Epshteyn

Eric DARRIGRAND

Jie Shen

Yinnian He

Béatrice Rivière

Gergina Pendueva

Alexandra J. Chaillon

Ana Maria Soane

Nathias K. Gobbert

Peter Monk

Alexander Alekseenko

Konstantinos Chrysafinos

Varis Carey

Parathi Haas (Parasimhan)

Ann B. Walker

Aaron Ado

Jaime H. Banera

Dragan Stojkovic

Jiong Wei

Sogul Kaya

Faranak Pahlavan

Jung-Han Kim

Ludmila Zikatonov.

Sheng Zhang

Yongju Lee

Daniel Kessler

Jun Zhao

Constantin Bocut

Guangri Xue

Pengtao Sun

Wenxiang Zhu

Alan Sambo

Jalen Ku

Tong Sun

Johang GORAN

Dmitriy Leykashman

Juan Gil

Paul Loya

Zhimin Zhang

Victor NISTOR

NOEL F. HEITMANN

~~Will W~~

J. Gil

Calje

Wister

M. P. H.

Talks

JIM BRAMBLE : A NEW APPROXIMATION
TECHNIQUE FOR DIV-CURL SYSTEMS

SHANGYU ZHANG : Nested refinement of
quadrilateral and hexahedral elements,
and affine approximation.

Bruce Kellogg

Derivative bounds for a simple
singularly perturbed convection-diffusion
problem

Adrian Dunca:

Approximating local averages of
fluid velocities: The equilibrium
Navier-Stokes Equations

Eric DARLIGNAND :

Fast Multipole Method and Microlocal Discretization
for the Integral Equations of Electromagnetism.

Jie Shen

A new dual-Petrov-Galerkin method for
higher odd-order equations

Béatrice Rivière : Superconvergence and $H(\text{div})$
projection for discontinuous Galerkin methods

Gergina Pencheva : Balancing Domain Decomposition
for Mortar Mixed Finite Element Methods

22/07
Hartthias K. Gobbert: Parallel Numerical Solution of
the Linear Boltzmann Equation on Irregular
Three-Dimensional Domains

Peter Monk: The ultra weak variational
formulation for elastic wave problems

Alexander Alexseenko: Hyperbolic formulations
in linearized gravity

Atife Caglar: A penalty method for
Boundary conditions of
Navier-Stokes Equations

Faranak Pahlevan

Time stepping for multiscale finite
element discretization.

Al Schatz

L_∞ estimates for problems with discontinuous
coefficients on nonconvex polygonal domains allowing
highly refined grids.

Songul Kaya

Numerical analysis of a Subgrid
eddy viscosity method for higher
Reynolds number flow problems.

Jun Zhao, Analysis of finite element approximation of time-dependent Maxwell's problem.

Constantin Bacuta: Subspace Interpolation and applications to elliptic BVP.

Zhimin Zhang Gradient Recovery of $\mathbb{Z}_2$ least-square
discrete
fitting at rectangular symmetry points.

NOEL F. HEITMANN - SUBGRIDSCALE EDDY VISCOSITY FOR
CONVECTION DOMINATED DIFFUSIVE TRANSPORT

Jung-Han Kimn - A Convergence Theory for Discontinuous Overlapping Schwarz Method

Jinchao Xu - Asymptotically exact a posteriori error estimator for unstructured grids

Wayne State University
March 28-29, 2003

For the first time, the Circus met
at Wayne State. We were graciously
hosted by the two Zhang's, Zhimin
and Sheng. We had a banquet style
dinner at an Italian restaurant, with
the motto "Where the Mob congregates".
And, a free Lunch on Saturday.

Since only 12 people gave talks,
each were allotted a generous 20 min.

Due to a miscommunication among the
"poets", two "poems" were contributed:
Both were, to a large extent, inspired by
Ivo's thought-provoking talk.

Our Leader Returns

by R. Falk, Spring 2003

If you missed it,
It's a pity.

We had quite a circus
In the Motor City.

Zhang and Zhang picked the date
And hosted us at Wayne State.
Ivo was there, it was nice to see.
We listened intently to his philosophy.

Validation and verification
Were his themes.
Without them, we have only
Worthless schemes.

WELCOME TO THE CLUB (or, The First Circus at Wayne State)

On the fair campus of Wayne State,
We were given verification,
That finite elements are, simply, great,
In helping us in validation.

The terminology may be confusing,
Maybe we mean validation
of the methods we try to be using
in modeling verification ?

What we can all validate,
What struck us all uppermost,
What we can all verify:
The Zhang Brothers are super hosts !

Attendees

Dick Fark

Chang Zhang

Skfau Sanket

Zhimin Zhang

Junping Wang

Shen R. Wu

Lei Gu

Son-Young Yi

Johnny Guzmán

Jaime H. Benner

ANDREI MAXIM

Nicolae Tarfulea

Song, Qingshuo

Sugin Chen

Hongsen Chen

Tong Sun

Zhiqiang Cai

Ruth Favre

Jihang, Fong

Nicolas Tafelbe

Wen (Wendy) Zhang

David Field

John Parcell

RUNCHANG LIN

Lars Wahlbin

Arman Norouzi

Dmitriy Leykikhman

Alan Demlow

Jennifer Zhao

Richard Katnik

SYLVESTER LATA

Talks

Rick Falk: Finite Element Approximation
Theory Using Families of ~~Refined~~ Elements
Reference

Sheng Zhang: A method that works
for bending and membrane-shear Arches.

Stefan Sauter: Lattice Equations
(with I. Babuška)

Shen R. Wu: A-priori error estimate for
explicit finite element for
elasto-dynamics.

MOONGYU PARK: Development and Analysis
of Higher Order Finite Volume methods
for Elliptic Equations.

Hongsen Chen, Pointwise Error Estimate for Stokes
Finite elements.

Tong Sun, A posteriori stability/error analysis for
subdomain semi-implicit schemes on parabolic
equations.

Zhiqiang Cai, Numerical methods for incompressible Newtonian
fluid flow

Ahmed A. NAGA

"The Polynomial Preserving Recovery"

RUNCHANG LIN.

"NATURAL SUPERCONVERGENT POINTS IN TRIANGULAR ELEMENTS".

1. Babuška. Can we believe in the numbers we compute for engineering decisions: Problem of Validation of the used models under uncertainties.

Lars B. Wahlbin, Finite Element Methods for the Strongly damped wave equation.

Cornell University

November 7-8, 2003

The Fall Circus at Cornell had 33 attendees and a high percentage of those (21/33) gave talks. Friday night, Lars and Anita Wahlén hosted an excellent buffet dinner at their home and on Saturday, circus members were treated to a terrific lunch at the Statler Hotel.

A HYPERBOLIC CAMPING TRIP.

Courant, Friedrichs and Lewy
they pitched their tent at night.
They had been drinking heavy,
they couldn't get it ~-*~~ straight.

They stumbled in the dark,
they couldn't find the light.
They all had lost their spark,
they didn't look too bright.

But then they all sat down
to really start to think.
"We really are all clowns,
we really truly stink."

But they were charismatic,
and in a very blink,
with thinking charact'ristic,
they found the missing link.

"I think we aimed too high,
it got to be unstable.
Let's lower our sights
and start when we are able."

Soon the blinking stars,
their light-rays straight, unbent,
shone down on our three Stars
in their cozy circus tent.

The night was soon all gone,
the sun came up to glance:
Sweet dreams inside their cone,
had Dick and Kurt and Hans.

Attendees

Jim B. Waller

Kevin Allen

Matthias Gobbert

Victor Nistor

Nicolae Tarfulea

Constantin Bocuta

Faranak Paktevari

Beatrice Riviere

Johnny Guzmán

Dmitriy LEYKEKHMAN

Gerard Richter

Graham Carey

Al. Schatz

Susanne C. Bunner

Uday Banerjee

Haron Solo

JaEun Ku

Mark Harnisch

Yuesheng Xu

SHANGYOU ZHANG

Tong Sun

ANIDDEI MAXIM

LONG CHEN

Pengtao Sun

Young - Ju Lee

Durkbin Cho

Rolf Ryham

Guangri Xue

LUDMIL ZIKATANOV

Peter Monk

Karis Carey

Birk ~~Tall~~

Bigue Liu

Talks

- Kevin Allen "Parallel Matrix-Free Solution to a Finite Element Discretized Elliptic Problem"
- Rathian Gabbert "Numerical Simulations of the Boltzmann Equation for Applications in Microelectronics Manufacturing"
- Victor Nistor "Sobolev spaces with weights and an optimal rate of convergence FEM on polygons"
- Nicolae Tarfulea "Well posed constraint preserving boundary conditions for Einstein's Equations"
- Constantin Bacuta "Partition of Unity Method for the Stokes System"
- Faranak Pahlevani Finite element error analysis of the turbulent flow sensitivities
- Beatrice Riviere Coupling discontinuous Galerkin and mixed finite element for Stokes/Darcy.
- Johany Guzmán Pointwise estimates for three discontinuous Galerkin methods with lifting operators for elliptic problems

Talks

Dmitriy LEYKERMAN

Graham Cary

Alfred Schatz

Susanne Brenner

Uday Banerjee

Ja Eun Ku

LONG CHEN

Peter Monk

Jay Gopalakrishnan

Diego Facci

LUDMIL ZIKATANOV

Rolf Ryham

Young-Ju Lee

"Some observations on fully discrete scheme for inhomogeneous parabolic PDEs"
Residual strategies for Adaptive Meshing and Adaptive Modeling

Pointwise estimates for perturbed bilinear forms.

Discontinuous Versions of Some Classical Inequalities

Selection of shape functions in meshless methods.

A least-squares FEM.

Optimal Anisotropic Meshes

A discontinuous Galerkin method for symmetric hyperbolic systems.

Quasioptimality of some spectral mixed methods.

Degrees of Freedom for $H(\text{div})$ Finite Elements

STABLE PARTITIONS OF UNITY.

Two level convergence and choice of optimal coarse space.

Some new scheme for the rate-type non-Newtonian fluid simulations.

University of Pittsburgh

Spring 2004, April 16-17.

Hosted by the University of Pittsburgh for the first time, the 2004 Spring Circus drew a large crowd of 54 attendees. Of these, 34 gave talks, so time became limited to 10 minutes a person (which most speakers handled with aplomb).

Beatrice Kiviere handled the local arrangements in a beautiful way; dinner at the Pitt Club on Friday, and breakfast and lunch on Saturday. Thank you, Beatrice!

CIRCUS AT U. OF PITTSBURGH.

*Finite Elementers all felt the urge,
To converge at U. of Pittsburgh.*

*Their spirits surged, indeed they splurged,
Their thoughts meshed and truly merged.*

*From clownish pitt-falls all purged,
Finite elements emerged, boldly verged.*

Attendees

CHENSONG ZHANG

Khamron Mekchay

Mrs B. Waller

Aida Tala

Franisco Pena

Sören Bartels

Kyoung-Sook Moon, Univ. of Maryland

Yekaterina Eshcegh, Univ. of Pittsburgh

Adrian Dunca, Univ. of Pittsburgh

Ivan Yotov, Univ. of Pittsburgh

Volker John, Otto-von-Guericke-University, Magdeburg (GER)

Sam Webster, University of Maryland, Baltimore County

Ana Maria Soane, University of Maryland, Baltimore County

Matthias Gobbert, University of Maryland, Baltimore County (UMBC)

Shim Zhang, Dept. of Math. Wayne State U.

Christos Xenophontos, Loyola College (MD)

Susanne C. Brenner

Shahnes Kara Keshian, Math Dept. U. of Tennessee, Knoxville

Beatrice Riviere, University of Pittsburgh

Songul Kaya, University of Pittsburgh

Son-Young Yi, Purdue University

Jae-Hong Pyo, Purdue University

Li-Lian Wang, Purdue University

Aaron Solo, Cornell University

Dmitriy LEYKEKHAN, Cornell University

Johnny Guzman CORNELL

Delia Monk
Constantin Abacuta

Delaware
PSU

Alon Dembar Univ. of Freiburg, Germany

William LAYTON Univ. of Pittsburgh.

Robert Kirby Univ. Chicago

Kumar Venuganti Univ. of Cincinnati
Lea Jenkins Clemson University

Jennifer Proft Univ. of Texas
Martin Stynes National Univ. of Ireland, Cork
Bruce Kellogg, Univ. South Carolina,

Michael Vogel, Rutgers

Daniel Vassilev, Univ. of Pittsburgh
Gergina Pencheva, Univ. of Pittsburgh

Carolina C. Manica, Univ. of Pittsburgh
Jabun Ku, Cornell University

Graham Carey, The Univ. of Texas at Austin
Al Schatz, Cornell University

Varis Carey, Cornell University

Tong Sun, Bowling Green State Univ.

Lei Gu, Ford Research Lab.

Shen R. Wu, Ford Motor Co./Research Lab.

Guangxi Xue, Penn State Univ.

Pengtao Sun, Penn State

Durkbin Cho, Penn State Univ.

Ralf Ryham, Penn State University

LONG CHEN

Traian Iliescu, Penn State Univ.

Faranak Pahlevani, Virginia Tech
University of Pittsburgh

Talks

- Kyoung-Sook Moon "Adaptive Monte Carlo algorithm for Stochastic Differential Equations"
- Ivan Yotov "Superconvergence in control-volume mixed finite element methods"
- Volker John "On a new type of variational multiscale method for the incompressible Navier-Stokes equations"
- Sam Webster "Stability and Convergence of a Spectral Galerkin Method for the Linear Boltzmann Equation"
- Matthias Gobbert "Numerical Studies of a Reaction-Diffusion System with a Fast Reaction"
- Zhimin Zhang "Superconvergence of Galerkin Spectral Collocation P -version methods in 1-D."
- Christos Xenophontos "The use of curved elements in the FE approximation of plates by p and hp methods"
- Susanne C. Brenner "Multigrid Algorithms for C^0 Interior Penalty Methods"
- Shauves Karakashian "Domain Decomposition methods for 2D Biharmonic problems"
- Songul Kaya "Discontinuous Approximation of Subgrid eddy viscosity models"
- Son-Young Yi "Nonconforming Mixed Finite Element Method for Linear Elasticity on rectangular elements"
- Jae-Hong Pyo "Normal mode analysis for a class of 2nd-order projection type method for unsteady Navier-Stokes equations"

Alan Demlow Localized a posteriori estimates for pointwise gradient errors in quasilinear elliptic problems

Robert Kirby FIAT: Computing finite element basis functions automatically

Kumar Venuganti Goal-Oriented Error Estimation for Hierarchical Models of Thin Elastic Structures

Jennifer Proft "Coupled Hyperbolic-Parabolic Problems"

Bruce Kellogg, Some derivative bounds for the solution of a singularly perturbed problem near a corner

Gergina Pencheva: Interior velocity error estimates for mixed finite element methods on nonmatching multiblock grids

Carolina C. Manica: Convergence of Time Averaged Statistics of finite element Approximations of the Navier-Stokes equations

Jakub Ku : A First Order least-squares FEM.

Varis Carey : Some Extensions and Applications for Recovered Gradients

Shen R. Wu Bathe-Dvorkin element for transient dynamics

Rolf Ryham On the Convergence of Matching based Multigrid

Long Chen Sphere Covering and Optimal triangulation

Li-Lian Wang Spectral approximation of Helmholtz Equation

Konstantinos Chrysafinos Moving mesh discontinuous
Galerkin Methods.

Victor Nistor Interior estimates for
the GFEM

Edward W. Swim - A Nonconforming Finite Element Method
for Fluid-Structure Interaction Problems

Durkbin Cho On Some Results in the Convergence
Analysis of Multigrid Method.

Søren Bartels Numerical Analysis of Time-Dependent
Ginzburg-Landau Equations -
Can Vertices be Approximated
Robustly?

Khamron Mekchaney "Convergence of AFEM for a general
second order linear Elliptic PDE"

Chensong Zhang "A posteriori Error Estimate for Parabolic
Variational Inequalities"

Traian Iliescu Approximate Deconvolution Boundary
Conditions for Large Eddy Simulation

Faranak Pahlavani Sensitivity analysis of flows
using finite element method.

SYRACUSE UNIVERSITY

Fall 2004, Oct 15-16

Syracuse, by way of Uday Banerjee and Jossheng Xu, hosted the Circus for the first time. The beauty and ambience of the Math. Department building was striking! There were 35 people attending, with 14 giving talks.

We had a fantastic Dinner at "China Road" on Friday night, and a nice lunch on Saturday (when food was allowed in the Library). The "Poem" is set in Syracuse, ca 265 BC.

HOW THE HOTTUB WAS INVENTED.

A lovely number born in Greece, ever ready to tease,
PI, a maiden of Hellas, toyed with a Syracuse fellow:
"I like being irrational, transcendental and random,
You are so very rational, but can you catch a phantom?"

Ardent Archimedes, in turn set his clever Hunter's Snare:
"For a Phantom and Enigma, a Mirage and Chimera,
You do cut solid figures, Spheres, Paraboloids, what not,
They make me hot to trot to untie that Hymen's Knot,
Ninety-six elements I hope we merrily shall share,
 $3 \frac{10}{71} < \text{PI} < 3 \frac{1}{7}$,
I'm longing to embrace you in our Seventh Heaven."

Lovely PI was pleased to be so gently squeezed:
"I'll add my elementary and very merry share,
Both Earth and crisp October Air,
But mostly I'll your mind inspire,
In Water and with Fire."

Footnotes to Circus Poem, Fall 2004.

At lunch-time Saturday, I was asked several questions in connection with my "poem". OK, it did contain references to facts that people not steeped in classical European history, or the history of Mathematics, might not understand. Here goes:

1. "HELLAS": For all practical purposes today, Greece is simply the English translation of the name of the country of Hellas.
2. "SYRACUSE": The "poem" is set around the year 267 BC, when Archie would have been twenty years old (PI is ageless...). Syracuse was a Greek colony on the East coast of Sicily, settled in 734 BC. Caught between Rome and Carthage in their power struggle over control of the Mediterranean Sea, Syracuse first chose the "right" side, but then went over to the "wrong" side and was sacked by the Romans in the Second Punic War, in 212 BC. Archie was killed in that sack (that apocryphal story with "Stand away from my diagram!").
3. "IRRATIONAL": PI was shown to be irrational by Johann Heinrich Lambert in 1761, in a paper presented to the Berlin Academy.
4. "TRANSCENDENTAL": PI was shown to be transcendental in 1882 by C. L. F. Lindemann in *Mathematische Annalen*.
5. "RANDOM": As far as I know, not yet proven. But, that famous result by Bailey, Borewin and Plouffe, that you can calculate any digit of PI without knowing the previous ones, (see *Math. Comp.* 66 (1997), 903-913) strongly suggests that PI is random. (Of course, all statistical tests, up to 500 billion digits at present as far as I know, also so suggest.)
6. "PARABOLOIDS". There is an article in the latest *Mathematical Intelligencer* (Volume 26, #3, Summer 2004, pp. 32-42, by Chris Rorres) about how Archie calculated how paraboloids would float in water. (Was PI in the pool for inspiration?)
7. "...TO UNTIE THAT HYMEN'S KNOT". Archie proposes marriage to PI. Hymen was the Greek God of Marriage. The ancient marriage ceremony began by untying the knot around the bride (signifying her virginity), then using the bands so loosened to tie up the couple in "the bands of Hymen". (In the US today, we just say "tie the knot". Many European languages preserve the before, "untie" and after, "tie", distinction.) In this respect, see Shakespeare, *The Tempest*, Act 4, Scene 1, the second time Prospero speaks.
8. "NINETY-SIX ELEMENTS, and the inequality": So, 48 triangles inside the circle, all centered at the origin, then enlarged to circumscribe the circle. Cf. Boyer and Merzbach, *A History of Mathematics*, pages 125-126 for how Archie used a very clever iterative algorithm to do the calculations.
9. "SEVENTH HEAVEN": OK, poetic license: As far as I know, the concept of 7H was not in the Hellenistic world at Archie's time. (How it entered English is up for grabs: The Muslim concept of Paradise divided into several celestial levels, awarded according to the degree of righteousness achieved during one's mortal lifetime? There are also Jewish mystical traditions wrt 7H.)
10. "...ELEMENTARY AND VERY MERRY SHARE.": At Archie's time, these four classical Elements were already quite old. WATER proposed by Thales around 600 BC, AIR by Anaximenes (588-524 BC), EARTH by Xenophanes (570-480 BC) and FIRE by Heraclitus (540-480 BC). Empedocles (483-424 BC) suggested that they all existed from the "Beginning" in fixed quantities and make all of the world. Together, it makes a rational attempt to understand the world surrounding us, and, before experimental science was there, these Philosophers gave us shoulders to stand on.

ATTENDEES

Jim B. Wallin	Cornell University
Tao Jiahe	UTexas at Austin
Susanne C. Brenner	University of South Carolina
John Osbou	University of Maryland
Uday Banerjee	Syracuse University
Yuesheng Xu	Syracuse University
Jinchao Xu	Penn state university
LUDMIL ZIKATANOV	PENN STATE UNIVERSITY
Jiguang Sun	Univ. of Delaware
Shangyan Zhang	Uni. of Delaware
Dmitriy Leychenko	Cornell University
Al Schatz	Cornell University.
Varis Carey	Cornell University
Guohua F. Carey	The University of Texas at Austin.
Larry Lardy	Syracuse University
Dong Mao	Syracuse University
Yunchuan Gao	Syracuse Univ.
Bin Zheng	Penn State Univ.
Durkbin Cho	Penn State Univ
Fengyan Li	University of South Carolina

LONG CHEN

The Penn State Univ.

Guangxi Xue

Penn State Univ.

Jae-Hong PYO

Purdue University

Victor NISTOR

Penn State Univ.

Nicolae Tarfulea

Purdue Univ. Calumet

Jaime H. Barrera

Cornell University

Aaron Solo

Cornell University

Johnny Guzmán

CORNELL UNIVERSITY

ANDREI MAXIM

CORNELL U.

Constantin Bacuta

UNIVERSITY OF DELAWARE

Cosmin Anitescu

Syracuse University

David T. Walker

ATK Thiolol Inc.

Bill Falk

Rutgers University

Carlos Armando Duarte

Univ. of Illinois at Urbana-

Pete Mue

Univ. of Del.

Champaign

TALKS.

Bobuska Stochastic PDEs and
their numerical solution.

Shangyou Zhang. Extended BPX
Framework Covering Nonnested
V-cycles.

Fengyan Li Locally Divergence-free Discontinuous
Galerkin Methods for Maxwell
Equations

LONG CHEN Stability and accuracy of adapted
finite element methods for
convection-dominated problems.

Jae-Hong P'yo The Gauge-Uzawa Finite element
Method for the incompressible
Density Navier-Stokes equations.

Al Schatz

Some New local Negative norm estimates
with applications to a-posteriori estimates
(the second part is joint with Vasilis Carey)

TALKS.

- Nicolae Tarfulea "Boundary Conditions for a Constrained Hyperbolic System".
- Jay Gopalakrishnan "Solving axisymmetric Laplace and Maxwell equations"
- Johnny Guzmán "Quadrature and Schatz's ~~Finite~~ Pointwise Estimates"
- Constantin Bocuta Convergence rates for Uzawa Type Algorithms
- LUDMIL ZIKATANOV A note on exponential fitting scheme for convection diffusion equation.
- E. Armando Duarte C^k Generalized Finite Element Approximations in $\mathbb{R}^n$
- Jinchao Xu Consistency, stability, convergence and superconvergence