COMPUTATIONAL CONTACT MECHANICS

Proceedings of the VI. International Conference on Computational Contact Mechanics, held in Hannover, Germany

3-5 July 2019

Edited by

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Leibniz Universität Hannover, Germany

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CONTENTS

PREFACE

Within the last twenty years, computational contact mechanics has been a topic of intense research. The main effort was devoted to the development of robust solution schemes and new discretization techniques that can be applied to different classes of contact problems.

In this context, the aim of the VI. International Conference on Computational Contact Mechanics (ICCCM19) is to provide an international forum for researchers, practitioners and for all who are concerned with modern computational techniques and applications in the field of contact mechanics. The organizers hope that this event will provide a platform for participants to discuss recent advances and identify future research directions in this field.

The Conference program is divided into eight sessions related to specific topics. Five keynote lectures, presented by internationally recognized researchers in this field, will provide an overview on current research directions.

Hannover, July 2019

The Chairmen of ICCCM19

P. Wriggers

G. Zavarise

ACKNOWLEDGEMENTS

The conference organizers acknowledge the support towards the organization of the ICCCM19 to the following organizations:

	European Community on Computational Methods in Applied Sciences (ECCOMAS)
	Leibniz Universität Hannover
	MUSIC Graduate School Leibniz Universität Hannover
	Politecnico di Torino
	International Association of Applied Mathematics and Mechanics
	German Association for Computational Mechanics

ORGANIZER AND COMMITTEES

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- J. Rojek, Polish Academy of Science, Warsaw, Poland
- R. Krause, Univ. d. Svizzeria italiana, Lugano, Switzerland
- E. Sacco, Università di Cassino, Italy
- D. Sheng, University of Newcastle, Australia
- G. E. Stavroulakis, Technical University of Crete, Greece
- R. L. Taylor, University of California at Berkeley, USA
- Wohlmuth, Technical University Munich, Germany

CONFERENCE SCHEDULE

Wednesday, July 3rd

10.00	**Registration**
13.00	**Opening**
13.30	**Keynote Lecture**
13.30-14.00	**Contact Mechanics at the Rough Scale** *Vladislav A. Yastrebov, Guillaume Anciaux, Andrei G. Shvarts, J.F. Molinari*
14.00	**Technical Session**
14.00-14.20	**Modeling friction with a 2-D and 3-D spring-block model** *Gianluca Costagliola, Federico Bosia, Nicola M. Pugno*
14.20-14.40	**Unilateral behaviour of microcracks and thermal conduction properties: a homogenization approach** *Sharan Raj Rangasamy Mahendren, Hélène Welemane, Olivier Dalverny, Amèvi Tongne*
14.40-15.00	**Porous-ductile fracture in thermo-elasto-plastic solids with contact applications** *M. Krüger, M. Dittmann, F. Aldakheel, A. Härtel, P. Wriggers and C. Hesch*
15.00-15.20	**A finite element scheme for viscoplastic models in hot-rolling processes** *Ioannis Toulopoulos, Martin Jech, Georg Vorlaufer*
15.20	**Coffee break**

15.50	**Keynote Lecture**
15.50-16.20	**A Comprehensiv HPC Toolbox for Mortar Contact Formulations** *Alexander Popp, Matthias Mayr*
16.20	**Technical Session**
16.20-16.40	**Augmented Lagrangians with adaptive augmentation for multibody contact problems with mortar discretization of contact conditions** *Zdenek Dostál, Oldřich Vlach*
16.40-17.00	**Large-scale simulation of the contact between randomly rough surfaces by direct Monte-Carlo simulation, surface asperity modelling and finite-element analysis** *Miguel Ángel Ramírez, Víctor Hugo Jacobo, Armando Ortiz, Rafael Schouwenaars*
17.00-17.20	**An explicit time-integration of a node-to-segment Nitsche-based approximation of contact problems into a commercial code for transient dynamics** *Maha Hachani, Régis Latrille Seigneur, Lionel Morançay, Yves Renard*
17.20-17.40	**Implicit-explicit (IMEX) schemes for the impact of elastic solids using a Nitsche-based approach** *Elie Bretin, Yves Renard*
17.40-18.00	**Iterative Solver For Solving Large-scale Frictional Contact Problems** *Thierno Diop, Jean Deteix and Michel Fortin*
18.00	**Welcome Reception at “Leibnizhaus”**

Thursday, July 4th

09.00	**Keynote Lecture**
09.00-09.30	***Virtual Element Method for Inelastic and Fracture Mechanics Problems*** *Edoardo Artioli, Sonia Marfia, Elio Sacco*
09.30	**Technical Session**
09.30-09.50	**Virtual elements for large deformation contact** *Peter Wriggers, Wilhelm Rust and B. Hudobivnik*
09.50-10.10	**A two-scale FEM-BEM formulation for contact mechanics between rough surfaces** *Maria Rosaria Marulli, Jacopo Bonari, Nora Hagmayer, Matthias Mayr, Alexander Popp, Marco Paggi*
10.10-10.30	**Contact analysis of anisotropic elastic solids using boundary element method** *Van Thuong Nguyen, Chyanbin Hwu*
10.30-10.50	**Simulation of adhesive contact of rough spheres using the FFT-based boundary element method** *Qiang Li, Roman Pohrt, Valentin L. Popov*
10.50	**Coffee break**
11.20	**Technical Session**
11.20-11.40	**Improving efficiency of the shifted penalty method** Giorgio Zavarise
11.40-12.00	**Adaptive multi-fidelity metamodeling for computational contact problems** *Jan Fuhg, Amelie Fau, Thirumal Alagu Palanichamy, Udo Nackenhorst*
12.00-12.20	**A varying-order B-splines discretization method for peeling computations** *Vishal Agrawal, Saipraneeth Gouravaraju, Roger A. Sauer, Sachin S. Gautam*
12.20-12.40	**Fractional viscoelastic cohesive zone model with long-range interaction** *Gioacchino Alotta, Rossana Dimitri, Francesco P. Pinnola , Giorgio Zavarise*
12.40-13.00	**An isogeometric frictional contact formulation based on surface potentials** *Thang X. Duong and Roger A. Sauer*
13.00	**Lunch**

14.00	**Keynote Lecture**
14.00-14.30	***From Sorcery to Science: A Glimpse into Contact Mechanics with Provable Guarantees in the Computer Graphics Community*** *Eitan Grinspun*
14.30	**Technical Session**
14.30-14.50	**A Set of New Mesh Tying and Contact Formulations for Beam-to-Solid Interaction** *Ivo Steinbrecher, Alexander Popp*
14.50-15.10	**A small-sliding node-to-node formulation for beam-to-beam frictional contact with large displacements** *Pierre-Alain Guidault, Federico Bussolati, Martin Guiton, Olivier Allix, Peter Wriggers*
15.10-15.30	**Solution of the local contact problem (LCP) in master-master formulation** *Alfredo Gay Neto, Peter Wriggers*
15.30-15.50	**A 2D contact model for wheel/rail interaction based on the master-master description** *Debora Naomi Higa, Alfredo Gay Neto*
15.50	**Coffee break**
16.20	**Technical Session**
16.20-16.40	**Revision of the Closest Point Projection procedure and derivation of various contact algorithms for curves** *Alexander Konyukhov*
16.40-17.00	**On Nitsche's Method for Elastic Contact Problems** *Tom Gustafsson , Rolf Stenberg , Juha Videman*
17.00-17.20	**Nitsche's methods for plate's unilateral contact problems** *Mathieu Fabre, Cedric Pozzolini, Yves Renard*
17.20-17.40	**A coupled ALE-Lagrangian approach for the rolling contact of treaded tire** *Udo Nackenhorst, Thirumal Alagu Palanichamys*
17.40-18.00	**On the Setup and Simulation of Large Scale LEGO® Models build with LS-DYNA and LoCo** *Thorsten Gerlinger, David Koch, Andre Haufe, Nils Karajan, Thomas Weckesser, Pierre Glay, Alexandru Saharnean, Marko Thiele*
20.00	**Banquet at restaurant "Insel" at lake Maschsee**

Friday, July 5th

09.00	**Keynote Lecture**
09.00-09.30	**Contact Issues in Complex Industrial Crash, Metal Forming and Multi-physics Simulations with LS-Dyna – Rivalries between Accuracy, Robustness and Efficiency** *Tobias Graf, Tobias Erhart, Thomas Borvall, Stefan Hartmann, Sebastian Stahlschmidt, Bernd Hochholdinger, Christian Liebold, Karl Schweizerhof*
09.30	**Technical Session**
09.30-09.50	**Internal loading distribution in statically loaded ball bearings, subjected to a combined radial, thrust, and moment load, including the effects of temperature and fit** *Mário Ricci*
09.50-10.10	**Optimization of contact stresses in the dovetail connection** *Yury Temis, Denis Yakushev*
10.10-10.30	**Computational modeling of Elasto-Hydrodynamically lubricated soft contacts based on a monolithic formulation using regularized frictional contact conditions** *Mostafa Faraji, Alexander Seitz, Wolfgang A. Wall*
10.30-10.50	**3D contact problem for coated bodies with adhesion** *Fedor Stepanov, Elena Torskaya*
10.50-11.10	**A thin layer model based on polynomial expansion for coated bodies in contact** *Tauno Tiirats, Nicolas Chevaugeon, Nicolas Moës, Claude Stolz, Nabil Marouf*
11.10	**Coffee break**

11.40	**Technical Session**
11.40-12.00	**Transient Gear Contact Simulations using Feedthrough with the Floating Frame of Reference Approach to Elastic Multibody Systems** *Lorin Kazaz, Pascal Ziegler, Peter Eberhard*
12.00-12.20	**A coupled DE-FE approach for simulation of ship collision** *Mohsin Ali Chaudry, Christian Woitzik, Christian Weißenfels, Alexander Düster, Peter Wriggers*
12.20-12.40	**Nonlocal contact treatment in the discrete element method with deformable particles** *Jerzy Rojek, Nikhil Madan, Szymon Nosewicz*
12.40-13.00	**Interactive Forces between Fine Particles and Their Effects on Particle Evolution** *Yuanping He, Weizhen Lu, Zhaolin Gu*
13.00-13.30	**Dynamic simulation of a self-contacted beam with bounding box collision detection** *Xinxin Yu, Babak Bozorgmehri, Marko K Matikainen, Ajay B. Harish and Aki Mikkola*
13.30	**Closing Ceremony & Farewell Cocktail**

CONFERENCE INFORMATION

REGISTRATION

Conference registration will start on **Wednesday, July 3rd**, from 10.00 a.m. – 1.00 p.m. in the foyer of the Conference Venue.

PRESENTATIONS: TIME & EQUIPMENT

Each regular presentation is allocated to 20 minutes, and each keynote lecture presentation is allocated to 30 minutes including questions.

If you wish to use your own PC, connection to the projector **must be tested** before the beginning of your session.

FACILITIES

Wireless connection is available in the Leibnizhaus:

Netzwerkname) (SSIC): ***UHEvent***
WPA2-Schlüssel: **G9jSq2Nk**

COFFEES & LUNCHES

A coffee break area will be available at the conference venue.
A lunch buffet (religiously neutral) is offered.

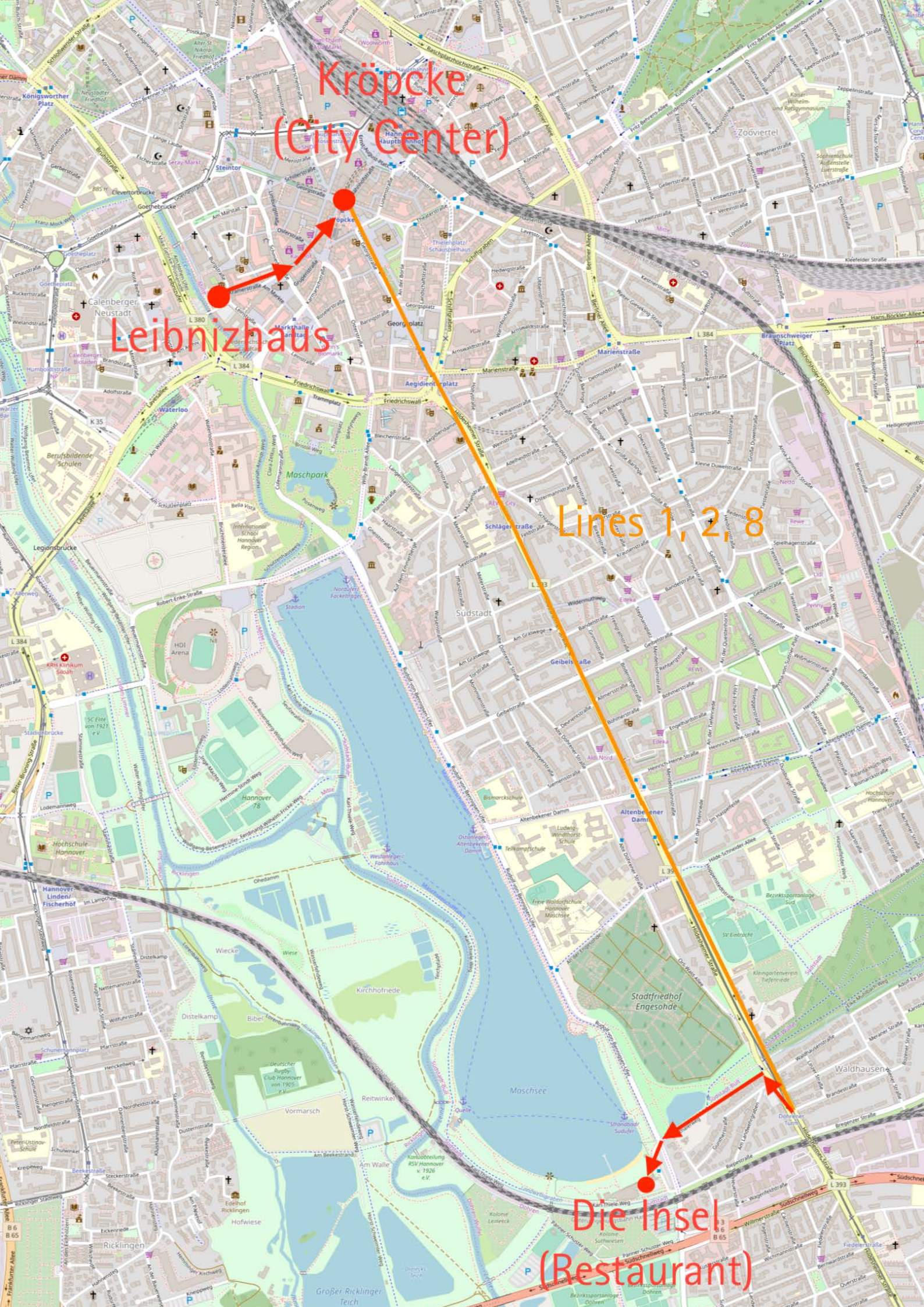
Banquet - Thursday, 4th July

8.00 p.m.: Banquet at Restaurant "Die Insel" at the southern bank of lake Maschsee.

Address: Die Insel am Maschsee
Rudolf-von-Bennigsen-Ufer 81
30519 Hannover

- Reachable by Taxi in about 15 Minutes
- Reachable by tram from the Leibnizhaus/Kröpcke City Centre:
  Walk eastward toward the city centre (about 8. Minutes)
  Take Line 2 in the direction Rethen or Line 1 to Laatzen or Sarstedt, respectively, or Line 8 to Messe/Nord for 5 stops until you have reached **Döhrender Turm**.
  Walk westwards, the restaurant will be at the foot of lake Maschsee.

QR-Link to Google Maps directions:


Kröpcke
(City Center)
Leibnizhaus
Lines 1, 2, 8
Die Insel
(Restaurant)

KEYNOTE LECTURERS

Vladislav Yastrebov
Contact Mechanics at the Roughness Scale
Centre des Materiaux, MINES ParisTech, Paris, France

Alexander Popp
A Comprehensive HPC Toolbox for Mortar Contact Formulations
Mathematics and Computer-Based Simulation, University of the Bundeswehr Munich, Germany

Elio Sacco
Virtual Element Method for Inelastic and Fracture Mechanics Problems
Department of Structures for Engineering and Architecture, University of Naples Federico II, Italy

Eitan Grinspun
From Sorcery to Science: A Glimpse into Contact Mechanics with Provable Guarantees in the Computer Graphics Community
Computer Science and Applied Physics and Applied Mathematics, Columbia University in the City of New York, USA

Karl Schweizerhof
Contact Issues in Complex Industrial Crash, Metal Forming and Multi-physics Simulations with LS-DYNA - Rivalries between Accuracy, Robustness and Efficiency
Institute of Mechanics, KIT Karlsruhe, Germany