ECCOMAS Thematic Conference

MULTIBODY2023

11th ECCOMAS Thematic Conference on MULTIBODY DYNAMICS

BOOK OF ABSTRACTS

PROGRAM INCLUDED

EDITED BY

Jorge Ambrósio • Paulo Flores • Carlos Quental • Hugo Magalhães

24-28 July 2023

Instituto Superior Técnico | Lisboa | Portugal

TÉCNICO LISBOA

idmec IST engenharia mecânica

Title:

BOOK OF ABSTRACTS
11th ECCOMAS Thematic Conference on **MULTIBODY DYNAMICS**

Edited by:

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Welcome Message

20 years after its 1st edition in Lisbon, the **ECCOMAS Thematic Conference on Multibody Dynamics** returns to Lisbon for its 11th edition. We are proud to welcome all colleagues and friends who are attending this **Thematic Conference on Multibody Dynamics**. We hope that you continue finding in the Conference and all its scientific and social activities, a very healthy and relaxed environment in which you can exchange your scientific ideas, find new research directions and development opportunities, foster new relations, and strengthen existing collaborations. Allow us to have a particular word of acknowledgment for those of you that are returning to Lisbon 20 Years after.

The **ECCOMAS Thematic Conference on Multibody Dynamics** serves as a meeting point for the international multibody community and provides an opportunity to exchange cutting-edge knowledge and ideas on the theory and applications of multibody systems. Starting in Lisbon in 2003, this series of Thematic Conferences has been held biennially, with subsequent editions taking place in Madrid (2005), Milan (2007), Warsaw (2009), Brussels (2011), Zagreb (2013), Barcelona (2015), Prague (2017), Duisburg (2019), and Budapest (2021). What a long trip this has been, and continues to be.

The current edition, **Multibody2023**, gathers more than 270 participants from all Continents, representing most of the active research groups in the World. The topics of the Conference include, but are not limited to: Aerospace, Medical, and Industrial Applications; Biomechanics; Contact, Impact, and Constraints; Efficient Simulation and Real-Time Applications; Flexible Multibody Dynamics; Formulations and Numerical Methods; Mechatronics, Robotics, and Control; Multibody Kinematics; Optimization and Sensitivity Analysis; Multiphysics and Multiscale Problems & Education, Validation, and Software Development; and Dynamics of Vehicles. Thematic sessions are organized around these topics to better promote discussion and foster cooperation between participants. Considering the excellence of the research communicated in these technical sessions, a Thematic Issue of the international journal Multibody System Dynamics is being organized to include selected works, which will undergo a comprehensive review, revision, and rigorous evaluation process for acceptance.

We want to express our appreciation to all members of the Scientific Committee who were instrumental in promoting the Conference and ensuring that all relevant topics in Multibody Dynamics are addressed. To all staff members, colleagues, and students that were fundamental in putting together the **Multibody2023**, we thank you for the dedicated work without which this Conference would not be possible. A special word of appreciation is dedicated to Mrs. Paula Jorge for her remarkable efforts in organizing and coordinating all logistical aspects of this Conference. We want to thank all authors and presenters for sharing with all participants their ideas and results, and to all participants for making **Multibody2023** possible. We invite all of you to be an active part of our Conference during this coming week. We hope that you feel rewarded for your participation in **Multibody2023** and that it will be a reference in your scientific activities.

Welcome to Lisbon and to Multibody2023.

Lisbon, July 2023.

Jorge Ambrósio,
Paulo Flores,
Carlos Quental,
Hugo Magalhães

Contents

Conference Organization

Executive Committee

- **Jorge Ambrósio** (Portugal)
- **Paulo Flores** (Portugal)
- **Carlos Quental** (Portugal)
- **Hugo Magalhães** (Portugal)

Scientific Committee

- **Y. Aoustin** (France)
- **M. Arnold** (Germany)
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- **P. Fisette** (Belgium)
- **J. Font-Llagunes** (Spain)
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- **J. Meijaard** (Netherlands)
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- **D. Negrut** (USA)
- **P. Nikravesh** (USA)
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- **J. Pombo** (UK)
- **M. Poursina** (Norway)
- **T. Qiang** (China)
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- **Z. Terze** (Croatia)
- **M. Valásek** (Czech)
- **C. Woernle** (Germany)

Conference Information

Endorsed by

IDMEC - Instituto de Engenharia Mecânica
Técnico Lisboa - Instituto Superior Técnico

Conference Venue

The 11th **ECCOMAS Thematic Conference on Multibody Dynamics** takes place in Instituto Superior Técnico (**IST**) Congress Center, situated at the Civil Engineering Building (Pavilhão de Civil).

Secretariat Open Hours

- **Monday**, July 24, 09:00 -17:00
- **Tuesday**, July 25, 08:30 -17:00
- **Wednesday**, July 26, 08:30 -17:00
- **Thursday**, July 27, 08:30 -13:00
- **Friday**, July 28, 09:00 -13:00

Congress Center (Civil Engineering Building) Ground -1

Certificate of Participation

Certificates will be sent by e-mail after the conference upon request to:
multibody2023@tecnico.ulisboa.pt

Name Badges

Please use your name badge at all times, including technical sessions, lunches and social events.

Coffee-Breaks

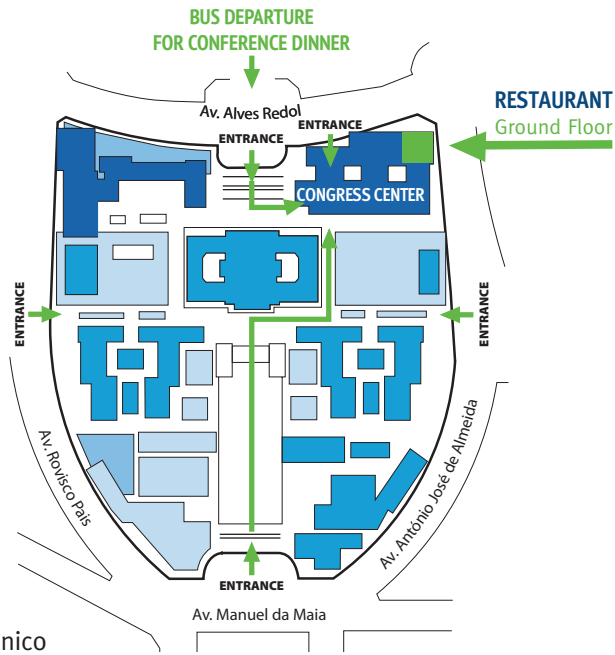
The coffee-breaks will take place in the hall -2 (2nd Basement) of the conference center (see map of the conference center) and will be open to all participants. Kindly wear your name badge.

Lunches

The Lunch Tickets included in the package received during the registration will be accepted in the restaurant, whose location is highlighted in the map below. The restaurant opens at 12:00 pm and offers a few choices for lunch in self-service, including a daily vegetarian option. Note that the lunch tickets have diferent colors for the different days and are valid only for the day printed in the front.

Plant

Instituto Superior Técnico

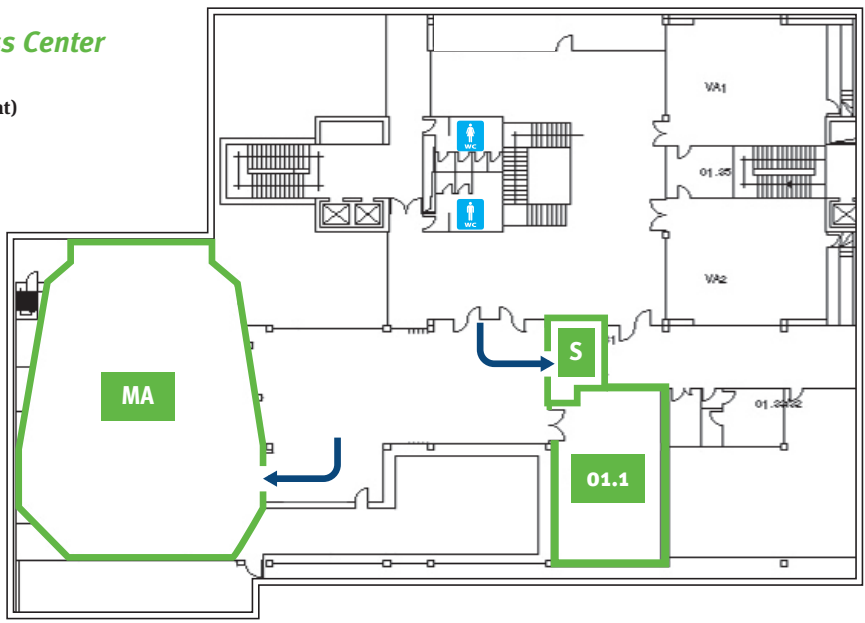


Conference Information

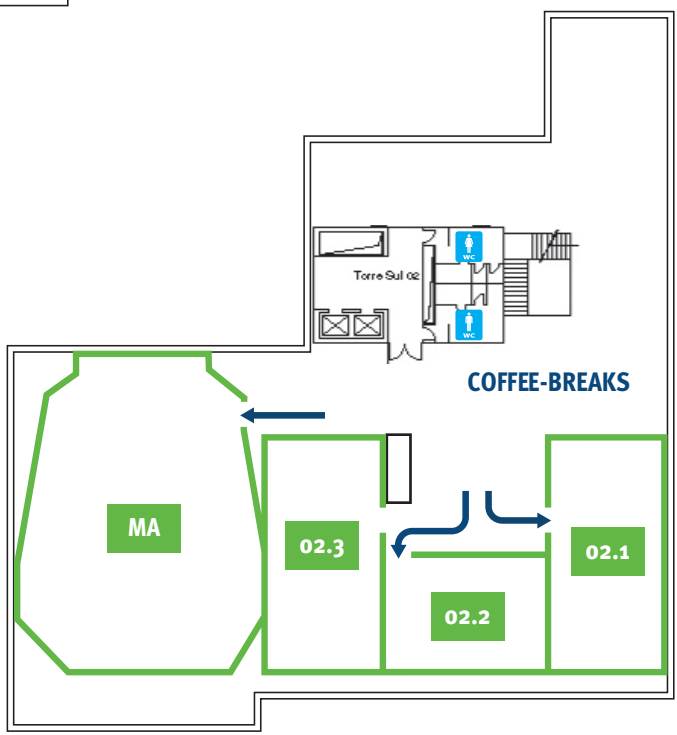
Congress Center Floor Plans

Congress Center

Floor -1
(1st Basement)



MA - Main Auditorium
S - Secretariat
01.1 - Session Room
02.1 - Session Room
02.2 - Session Room
02.3 - Meetings Room

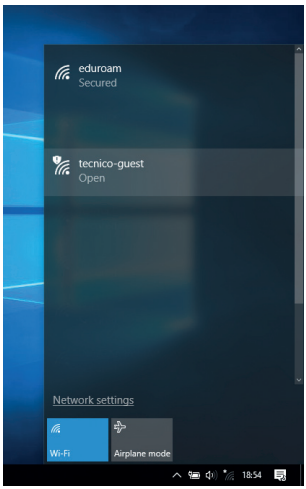


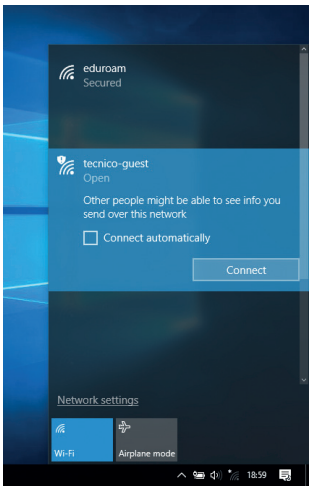
Congress Center

Floor -2
(2nd Basement)

Conference Information

Wireless Internet Access





Step 1: ***Browse available wireless networks and select*** **"tecnico-guest"**

Step 2: ***Open your web browser and access the website*** **" wifi.tecnico.ulisboa.pt"**
(most of the computers will do it automatically)

Step 3: ***Click on the (blue) button*** **"Ligar"**

Step 4: ***Enter the following credentials:***

Account name: **MB2023**
Password: **mFcLwz**

Instructions for Presenters

- Each Oral presentation will take 20 minutes including discussion.
- The files required for the presentation (PowerPoint or PDF) should be uploaded, and tested to ensure compatibility, during the coffee or lunch breaks before the beginning of the session.
- The lecture rooms contain a Windows PC, with Office and Acrobat PDF Reader, connected to a data projector. The use of personal computers is not recommended.
- Technical support will be provided on-site by the MULTIBODY2023 staff to ensure a smooth delivery of all presentations.

Social Program

Welcome Reception › Monday, 24th July • 18:30h

*The Welcome Reception will take place at **Castelo de S. Jorge**.*
*Find your own way to the Reception location. There are several ways to reach **Castelo S. Jorge,** such as: by subway to Rossio station and taking the 737 bus from Praça da Figueira to Castelo; by subway to Rossio station and if you feel like it, you can walk. It´s a 30 min steep hillside stroll but, if you follow the tram lines going up from Rua da Conceição, in the downtown area, you will pass by a couple of interesting monuments (such as the Sé the Lisboa, dating from the 12th century) and sightseeing opportunities; by taxi or Uber (ask the driver for Castelo de São Jorge's Entrance).*
Confortable shoes are recommended as most of the castle's pavement is made out of cobblestone.
Please don't forget to bring your name badge.

Tour to Óbidos › Thursday, 27th July • 14:30h

*The bus will depart from **IST** (Rua Alves Redol) at 14:30h. Please be there 10 minutes prior to departure and **do not forget to bring your tour/dinner voucher**.*

Conference Dinner

Conference Dinner › Thursday, 27th July • 19:30h

The conference Dinner will take place at Quinta do Sanguinhal. Quinta do Sanguinhal is a unique space with a winery and a distillery dating back to the 19th Century. Visiting and tasting these wines is a unique experience and a journey into 100 years of the Portuguese wine.

General Tourist Information

Getting to Lisbon by air

Direct flights from most of European cities, North or South America and Africa land at the Portela Airport, terminal 1. A taxi ride from the airport to IST is about 4-5 km that takes 10-15 min, depending on traffic, and should cost around 8€. To downtown, the taxi ride is about 7 km and should cost around 10€. 1.60€ is charged for the transportation of luggage or animals. A sure option is the "Taxi Voucher", a prepaid taxi service starting at 16.40€, on sale at the "Information Desk" in the arrival terminal. Lisbon Airport has its own Metro Station, Aeroporto - red line (see map of Lisbon with subway lines). Other options are the AeroBus and the Aeroshutle (3.5€).

Getting to Lisbon by car

Drivers can use highway A1 when coming from the North, highway A2, through the 25 de Abril bridge, when coming from the South, and highway A12, through Vasco da Gama bridge, when coming from the Northeast.

Getting to Lisbon by train

The St. Apolónia station is the terminal for trains arriving from the North of Portugal. Another option is to use the train station Oriente. From the South of Portugal an option is to use the train station Oriente. Connections to the metro lines exist at both stations (St. Apolónia - blue line, Oriente - red line).

Moving around

Taxi:

Lisbon is served by an extensive network of public transportation that can take you anywhere in the city and to its surroundings. Taxis (black and green or beige) are cheap when comparing to most of the European countries. They can be called by phone, picked-up on taxi plazas or stopped on the street. The fare on the taxi meter should start at 3.25€ (daytime pick-up) or 3.90€ (nighttime). Outside the city limits, city fares are charged per kilometer. 1.60€ is charged for the transportation of luggage or animals. Before taking a taxi, inquire about the fare.

Metro:

The Lisbon Metro is a very comfortable and an easy way to reach most of the city, from 6:30 to 1:00. The Metro lines reach most of the city being the Metro stations close to IST:

- Alameda (red and green line)
- Saldanha (red and yellow line)

Bus

The bus routes cover all Lisbon and extend to its outskirts. The tickets can be pre-paid, at the counters of Carris, the surface transportation operator forLisbon, or bought aboard the bus, electric cars or funiculars.
For IST hop off at one of the following bus stops:

- Av. Manuel da Maia
- Av. Rovisco Pais
- Arco do Cego

Metro and Bus Fares:

Reusable card – 0,50 €
METRO/CARRIS – 1,65 €
CARRIS Bus – 2,00 € (on board fare)
Tram – 3,00 € (on board fare)

Trains

Suburban trains to Estoril and Cascais depart from the Cais do Sodré train station; to the south of the river cities depart from Roma-Areeiro (Entrecampos); and to Sintra depart from Rossio or Oriente train stations. The ride to Cascais or to Sintra should take about 35-45 min, each way. The train ride to south of the river is a highlight as the train will cross the 25 de Abril bridge with magnificent views of Lisbon.
For IST, the nearby train stations are:

- Roma-Areeiro
- Entrecampos

Other general information

- **National emergency number:** 112
- **Time zone:** GMT +1 summer time
- **Electricity:** 220V, 50 Hz with standard *European power sockets*
- **Temperature:** high 28ºC - low 18ºC
- **Currency:** Euro (€)
- **Banks:** working hours are 8:30 – 15:00 *(Monday-Friday)*
- **Pharmacies:** 9:00 – 19:00
- **Shops:** 9:00 – 19:00
- **Shopping Malls:** 10:00 – 23:00

Main Museums in Lisbon:

- **Centro de Arte Moderna** *(Modern Art Museum)*
- **Museu do Oriente** *(Oriente Museum)*
- **Museu Calouste Gulbenkian** *(Calouste Gulbenkian Museum)*
- **Museu dos Coches** *(Coach Museum)*
- **Museu Nacional de Arte Antiga** *(National Museum for Ancient Art)*
- **Colecção Berardo** *(The Berardo Collection)*
- **Museu do Azulejo** *(Tile Museum)*
- **Aqueduto das Águas Livres** *(Águas Livres' Aqueduct)*
- **Basílica da Estrela** *(Estrela Basilica)*
- **Castelo de São Jorge** *(Saint George's Castle)*
- **Sé Patriarcal** *(Patriarchal Church)*
- **Mosteiro dos Jerónimos** *(Jerónimos Monastery)*
- **Padrão dos Descobrimentos** *(Monument to the Overseas Discoveries)*
- **Torre de Belém** *(Belém Tower)*

Map of Lisboa

Network Map / Underground Lines

MULTIBODY2023

11th ECCOMAS Thematic Conference on MULTIBODY DYNAMICS

SCIENTIFIC PROGRAM

24-28 July 2023

Instituto Superior Técnico | Lisboa | Portugal

Program at a Glance

SESSIONS	Monday, July 24			
09:00	**REGISTRATION**			
12:00	Lunch			
13:30	**OPENING CEREMONY** > ROOM MA			
14:00	**Topic 03 > Session 01** ROOM MA **CONTACT, IMPACT AND CONSTRAINTS**	**Topic 10 > Session 01** ROOM 01.1 **OPTIMIZATION AND SENSITIVITY ANALYSIS**	**Topic 06 > Session 01** ROOM 02.1 **FLEXIBLE MULTIBODY DYNAMICS**	**Topic 08 > Session 01** ROOM 02.2 **MECHATRONICS, ROBOTICS AND CONTROL**
15:20	Coffee-break			
15:40	**Topic 03 > Session 02** ROOM MA **CONTACT, IMPACT AND CONSTRAINTS**	**Topic 10 > Session 02** ROOM 01.1 **OPTIMIZATION AND SENSITIVITY ANALYSIS**	**Topic 06 > Session 02** ROOM 02.1 **FLEXIBLE MULTIBODY DYNAMICS**	**Topic 08 > Session 02** ROOM 02.2 **MECHATRONICS, ROBOTICS AND CONTROL**
18:30	**WELCOME RECEPTION** > CASTELO S. JORGE			

SESSIONS	Tuesday, July 25			
08:45	**PLENARY LECTURE I** (ROOM MA) > ***José L. Escalona***			
09:40	**Topic 12 > Session 01** ROOM MA **DYNAMICS OF VEHICLES**	**Topic 05 > Session 01** ROOM 01.1 **EFFICIENT SIMULATION AND REAL-TIME APPLICATIONS**	**Topic 01 > Session 01** ROOM 02.1 **AEROSPACE, MEDICAL AND INDUSTRIAL APPLICATIONS**	**Topic 02 > Session 01** ROOM 02.2 **BIOMECHANICS**
11:00	Coffee-break			
11:20	**Topic 12 > Session 02** ROOM MA **DYNAMICS OF VEHICLES**	**Topic 05 > Session 02** ROOM 01.1 **EFFICIENT SIMULATION AND REAL-TIME APPLICATIONS**	**Topic 01 > Session 02** ROOM 02.1 **AEROSPACE, MEDICAL AND INDUSTRIAL APPLICATIONS**	**Topic 02 > Session 02** ROOM 02.2 **BIOMECHANICS**
13:00	Lunch			
14:20	**Topic 03 > Session 03** ROOM MA **CONTACT, IMPACT AND CONSTRAINTS**	**Topic 05 > Session 03** ROOM 01.1 **EFFICIENT SIMULATION AND REAL-TIME APPLICATIONS**	**Topic 07 > Session 01** ROOM 02.1 **FORMULATIONS AND NUMERICAL METHODS**	**Topic 08 > Session 03** ROOM 02.2 **MECHATRONICS, ROBOTICS AND CONTROL**
16:00	Coffee-break			
16:20	**Topic 03 > Session 04** ROOM MA **CONTACT, IMPACT AND CONSTRAINTS**		**Topic 07 > Session 02** ROOM 02.1 **FORMULATIONS AND NUMERICAL METHODS**	**Topic 08 > Session 04** ROOM 02.2 **MECHATRONICS, ROBOTICS AND CONTROL**

SESSIONS	Wednesday, July 26			
08:45	**PLENARY LECTURE II** (ROOM MA) › ***Sigrid Leyendecker***			
09:40	**TOPIC 12 > SESSION 03** ROOM MA **DYNAMICS OF VEHICLES**	**Topic 10 > Session 03** ROOM 01.1 **OPTIMIZATION AND SENSITIVITY ANALYSIS**	**Topic 06 > Session 03** ROOM 02.1 **FLEXIBLE MULTIBODY DYNAMICS**	**Topic 02 > Session 03** ROOM 02.2 **BIOMECHANICS**
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11:20	**Topic 12 > Session 04** ROOM MA **DYNAMICS OF VEHICLES**	**Topic 10 > Session 04** ROOM 01.1 **OPTIMIZATION AND SENSITIVITY ANALYSIS**	**Topic 06 > Session 04** ROOM 02.1 **FLEXIBLE MULTIBODY DYNAMICS**	**Topic 02 > Session 04** ROOM 02.2 **BIOMECHANICS**
13:00	Lunch			
14:20	**Topic 03 > Session 05** ROOM MA **CONTACT, IMPACT AND CONSTRAINTS**	ROOM 01.1 **Topic 11 > Session 01** **MULTIPHYSICS AND MULTISCALE PROBLEMS** & **Topic 4 > Session 01** **EDUCATION, VALIDATION AND SOFTWARE DEVELOPMENT**	**Topic 06 > Session 05** ROOM 02.1 **FLEXIBLE MULTIBODY DYNAMICS**	**Topic 08 > Session 05** ROOM 02.2 **MECHATRONICS, ROBOTICS AND CONTROL**
16:00	Coffee-break			
16:20	**Topic 03 > Session 06** ROOM MA **CONTACT, IMPACT AND CONSTRAINTS**		**Topic 08 > Session 06** ROOM 02.1 **MECHATRONICS, ROBOTICS AND CONTROL**	

SESSIONS	Thursday, July 27			
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11:20	**Topic 12 > Session 05** ROOM MA **DYNAMICS OF VEHICLES**	**Topic 07 > Session 04** ROOM 01.1 **FORMULATIONS AND NUMERICAL METHODS**	**Topic 06 > Session 07** ROOM 02.1 **FLEXIBLE MULTIBODY DYNAMICS**	**Topic 09 > Session 01** ROOM 02.2 **MULTIBODY KINEMATICS**
12:20	Lunch			
14:30	**Conference Tour - Óbidos**			
19:30	**CONFERENCE BANQUET – QUINTA DO SANGUINHAL**			

SESSIONS	Friday, July 28			
09:00	**PLENARY LECTURE IV** (ROOM MA) › ***Johannes Gerstmayer***			
10:00	**Topic 12 > Session 06** ROOM MA **DYNAMICS OF VEHICLES**	**Topic 02 > Session 05** ROOM 01.1 **BIOMECHANICS**	**Topic 06 > Session 08** ROOM 02.1 **FLEXIBLE MULTIBODY DYNAMICS**	**Topic 08 > Session 08** ROOM 02.2 **MECHATRONICS, ROBOTICS AND CONTROL**
11:20	Coffee-break			
11:40	**Topic 12 > Session 07** ROOM MA **DYNAMICS OF VEHICLES**	**Topic 02 > Session 06** ROOM 01.1 **BIOMECHANICS**	**Topic 06 > Session 09** ROOM 02.1 **FLEXIBLE MULTIBODY DYNAMICS**	**Topic 08 > Session 09** ROOM 02.2 **MECHATRONICS, ROBOTICS AND CONTROL**
13:00	**CLOSING CEREMONY** > ROOM MA			
13:15	Lunch			

REGISTRATION	Monday, July 24 • 09:00 - 13:30
09:00	REGISTRATION
12:00 – 13:30	Lunch
13:30	OPENING CEREMONY > ROOM MA

Parallel SESSION 1A		Monday, July 24 • 14:00 - 15:20	
ROOM **MA**		CHAIR ***Aki Mikkola***	TOPIC 03 > SESSION 01 **CONTACT, IMPACT AND CONSTRAINTS**
TIME	ID	PRESENTING AUTHOR	TITLE
14:00	**109**	***Alessandro Tasora***	**MULTIBODY SIMULATION OF CONTACTS BETWEEN ARBITRARY MESHES OF CAD QUALITY: RECENT RESULTS, OPEN PROBLEMS AND POSSIBLE DEVELOPMENTS** *Alessandro Tasora; Dario Mangoni; Dario Fusai*
14:20	**133**	***Tobias Rückwald***	**A QUASISTATIC CONTACT MODEL FOR IMPACT ANALYSIS IN FLEXIBLE MULTIBODY SYSTEMS BASED ON IGA** *Tobias Rückwald; Alexander Held; Robert Seifried*
14:40	**180**	***Huan Zhang***	**EFFICIENT AND ACCURATE MULTIBODY SIMULATION FOR CABLE PULLEY SYSTEMS BASED ON ALE FORMULATION AND SDF CONTACT DETECTION** *Huan Zhang; Zhicheng Sun; Gexue Ren; Xiaodong Song*
15:00	**236**	***Babak Bozorgmehri***	**SURFACE-TO-SURFACE CONTINUUM BEAMS CONTACT DYNAMICS USING THE COMPLEMENTARITY PROBLEM APPROACH** *Babak Bozorgmehri; Leonid P. Obrezkov; Marko K. Matikainen; Aki Mikkola; Frank Naets*

Parallel SESSION 1B		Monday, July 24 • 14:00 - 15:20	
ROOM **01.1**		CHAIR ***Robert Seifried***	TOPIC 10 > SESSION 01 **OPTIMIZATION AND SENSITIVITY ANALYSIS**
TIME	ID	PRESENTING AUTHOR	TITLE
14:00	**245**	***Corina Sandu***	**ADAPTIVE STEP SIZE DETERMINATION FOR CONVEX OPTIMIZATION** *Jyotirmoy Mukherjee; Ekansh Chaturvedi; Corina Sandu*
14:20	**242**	***Kensuke Hara***	**PARAMETER IDENTIFICATION METHOD FOR MULTIBODY SYSTEMS INCORPORATING THE ADJOINT METHOD AND THE PROPER ORTHOGONAL DECOMPOSITION** *Ryoya Nishi; Kensuke Hara; Hirhoshi Yamaura*
14:40	**223**	***Alexander Held***	**ADJOINT SENSITIVITY ANALYSIS OF MULTIBODY SYSTEM EQUATIONS IN STATE-SPACE REPRESENTATION OBTAINED BY QR DECOMPOSITION** *Alexander Held; Jospin Ananfack Kenfack; Robert Seifried*
15:00	**188**	***Veit Gufler***	**SENSITIVITY ANALYSIS OF FLEXIBLE MULTIBODY DYNAMICS APPLIED TO THE GRADIENT-BASED DESIGN OPTIMIZATION OF A TYROLEAN WEIR CLEANING MECHANISM** *Veit Gufler; Erich Wehrle; Renato Vidoni*

Parallel SESSION 1C		Monday, July 24 • 14:00 - 15:20	
ROOM **02.1**	CHAIR ***Johannes Gerstmayr***	TOPIC 06 > SESSION 01 **FLEXIBLE MULTIBODY DYNAMICS**	
TIME	ID	PRESENTING AUTHOR	TITLE
14:00	**87**	***Joachim Linn***	**IMPACT OF SHEAR AND EXTENSIONAL STIFFNESS ON EQUILIBRIUM CONFIGURATIONS OF ELASTIC COSSERAT RODS** *Joachim Linn; Fabio Schneider-Jung; Michael Roller; Tomas Hermansson*
14:20	**132**	***Konstantina Ntarladima***	**A MULTIBODY APPROACH FOR THE SIMULATION OF ROPEWAY SYSTEMS** *Konstantina Ntarladima; Johannes Gerstmayr*
14:40	**147**	***Kang Guo***	**STUDY ON BÉZIER CURVE DISCRETE TWO-DIMENSIONAL SHEAR BEAM METHOD BASED ON ABSOLUTE NODAL COORDINATE FORMULATION** *Kang Guo; Dingguo Zhang; Liang Li; Xian Guo; Xiaokang Du*
15:00	**123**	***Yiming Fang***	**DYNAMIC MODELLING AND ANALYSIS OF A ROTATING FLEXIBLE BEAM WITH SEGMENTED CONSTRAINED LAYER DAMPING TREATMENT** *Yue Wang; Yiming Fang; Liang Li; Dingguo Zhang; Yongbin Guo; Xian Guo*

Parallel SESSION 1D		Monday, July 24 • 14:00 - 15:20	
ROOM **02.2**	CHAIR ***Peter Betsch***	TOPIC 08 > SESSION 01 **MECHATRONICS, ROBOTICS AND CONTROL**	
TIME	ID	PRESENTING AUTHOR	TITLE
14:00	**254**	***Michael Valasek***	**MODIFIED SMC FOR CONTROL OF REDUNDANTLY ACTUATED PKM WITH UNCERTAIN MODEL** *Michael Valasek*
14:20	**39**	***Fernando Gonçalves***	**DYNAMIC MODELING AND SIMULATION OF THE OMNIDIRECTIONAL LOCOMOTION OF A MOBILE MANIPULATOR ROBOT WITH FOUR SWEDISH WHEELS AND AN INDEPENDENT SUSPENSION SYSTEM** *Fernando Gonçalves; Tiago Ribeiro; A. Fernando Ribeiro; Gil Lopes; Paulo Flores*
14:40	**193**	***Baptiste Toussaint***	**IMPROVEMENT OF TRAJECTORY TRACKING ACCURACY IN SERIAL ROBOTIC ARMS BASED ON FEED-FORWARD NEURAL NETWORKS PER SERVOMOTOR FOR POSITION CONTROL** *Baptiste Toussaint; Maxime Raison*
15:00	**195**	***Simeon Schneider***	**ON OPTIMAL CONTROL PROBLEMS IN REDUNDANT COORDINATES** *Simeon Schneider; Peter Betsch*

15:20 – 15:40	Coffee-break

Parallel SESSION 2A — Monday, July 24 • 15:40 - 17:00

ROOM **MA** | CHAIR ***Olivier Brüls*** | TOPIC 03 > SESSION 02 **CONTACT, IMPACT AND CONSTRAINTS**

TIME	ID	PRESENTING AUTHOR	TITLE
15:40	**33**	***Armin Bosten***	**NUMERICAL THREATMENT OF NONSMOOTH FRICTIONAL BEAM-TO-BEAM CONTACT** *Armin Bosten; Alejandro Cosimo; Joachim Linn; Olivier Brüls*
16:00	**50**	***Dario Fusai***	**RHEONOMIC CONE COMPLEMENTARITY CONSTRAINTS FOR THE EFFICIENT SIMULATION OF SLIDING AND VIBRATING FEEDERS WITH NON-SMOOTH FRICTIONAL CONTACTS** *Dario Fusai; Alessandro Tasora*
16:20	**126**	***Luca D'Angelo***	**UNCERTAINTY ANALYSIS OF A CONTACT-BASED MULTIBODY MODEL OF MESHING SPUR GEARS** *Luca D'Angelo; Marco Cirelli; Oliviero Giannini; Alessio Cellupica; Pier Paolo Valentini*
16:40	**4**	***Ekansh Chaturvedi***	**NON-SMOOTH DYNAMICS FORMULATION FOR PLANAR TRANSLATIONAL JOINTS WITH CLEARANCES** *Ekansh Chaturvedi; Corina Sandu; Adrian Sandu*

Parallel SESSION 2B — Monday, July 24 • 15:40 - 17:00

ROOM **01.1** | CHAIR ***Daniel Dopico*** | TOPIC 10 > SESSION 02 **OPTIMIZATION AND SENSITIVITY ANALYSIS**

TIME	ID	PRESENTING AUTHOR	TITLE
15:40	**175**	***Karin Nachbagauer***	**COMBINED OPTIMAL CONTROL AND DESIGN OF FLEXIBLE MULTIBODY SYSTEMS** *Daniel Lichtenecker; Karin Nachbagauer*
16:00	**81**	***Seok Hee Han***	**ANALYSIS OF MULTIBODY DYNAMICS UNDER UNCERTAINTY USING TIME-DEPENDENT POLYNOMIAL CHAOS** *Seok Hee Han; Hee-Sun Choi; Hee Jong lee; Se Hwan jeong; Jin Hwan Choi; Jin-Gyun Kim*
16:20	**112**	***Wenxiang Zhou***	**DISTRIBUTED CONTROL OPTIMIZATION OF SPACE MEMBRANE REFLECTORS BASED ON MACHINE LEARNING** *Wenxiang Zhou; Kai Luo; Qiang Tian*
16:40	**252**	***Álvaro López Varela***	**SENSITIVITY ANALYSIS OF A NATURAL COORDINATES FFR FORMULATION** *Álvaro López Varela; Alberto Luaces Fernández; Juan Carlos García Orden; Daniel Dopico Dopico*

Parallel SESSION 2C — Monday, July 24 • 15:40 - 17:00

ROOM **02.1** | CHAIR ***Martin Arnold*** | TOPIC 06 > SESSION 02 | **FLEXIBLE MULTIBODY DYNAMICS**

TIME	ID	PRESENTING AUTHOR	TITLE
15:40	**55**	***Davide Manfredo***	**MODELLING THE INELASTIC CONSTITUTIVE BEHAVIOUR OF MULTI-LAYER SPIRAL STRANDS: COMPARISON OF HYSTERESIS OPERATOR APPROACH TO RHEOLOGICAL MODEL** *Davide Manfredo; Mohammad Ali Saadat; Vanessa Dörlich; Damien Durville; Joachim Linn; Martin Arnold*
16:00	**71**	***Kai Luo***	**PROGRESS ON SOFT MULTIBODY DYNAMICS AND ITS APPLICATION IN AEROSPACE ENGINEERING** *Kai Luo*
16:20	**116**	***Alessandro Cammarata***	**FURTHER INSIGHT ON THE REFERENCE CONDITIONS IN THE FLOATING FRAME OF REFERENCE FORMULATION** *Alessandro Cammarata; Pietro Davide Maddio; Rosario Sinatra; Michele Lacagnina*
16:40	**103**	***Ji Wu***	**DYNAMICS ANALYSIS OF RIGID-FLEXIBLE-LIQUID COUPLED SATELLITE SYSTEM BASED ON THE ABSOLUTE NODAL COORDINATE FORMULATION** *Ji Wu; Dingguo Zhang; Liang Li; Xian Guo; Yuanzhao Chen*

Parallel SESSION 2D — Monday, July 24 • 15:40 - 17:00

ROOM **02.2** | CHAIR ***Andreas Müller*** | TOPIC 08 > SESSION 02 | **MECHATRONICS, ROBOTICS AND CONTROL**

TIME	ID	PRESENTING AUTHOR	TITLE
15:40	**177**	***Suraj Jaiswal***	**INDIRECT KALMAN FILTER-BASED STATE ESTIMATOR FOR A HYDRAULIC CRANE** *Suraj Jaiswal; Lauri Pyrhönen; Heikki Handroos; Aki Mikkola*
16:00	**210**	***Dezhi Jiang***	**COMPARING EXTENDED KALMAN FILTER AND UNSCENTED KALMAN FILTER IN THE STATE ESTIMATION OF HYDRAULICALLY ACTUATED MACHINES** *Dezhi Jiang; Qasim Khadim; Yashar Shabbouei Hagh; Suraj Jaiswal; Emil Kurvinen; Aki Mikkola*
16:20	**12**	***Gabriel Krög***	**CLOSED-FORM METHOD FOR THE INERTIA-WEIGHTED INPUT MATRIX UTILIZING O(N) FORWARD DYNAMICS** *Gabriel Krög; Hubert Gattringer; Andreas Müller*
16:40	**117**	***Lingling Shi***	**ADAPTIVE CONTROL FOR A POST-CAPTURE SYSTEM OF NON-COOPERATIVE TARGETS BY A DUAL-ARM SPACE ROBOT** *Xinle Yan; Lingling Shi; Minghe Shan*

Plenary LECTURE			Tuesday, July 25 • 08:45 - 09:30
ROOM **MA**		CHAIR ***João Pombo***	**PLENARY LECTURE I**
TIME	ID	PRESENTING AUTHOR	TITLE
08:45	**PL**	***José L. Escalona***	**RAILWAY MULTIBODY DYNAMICS: MODELING ADVANCES AND INDUSTRIAL APPLICATIONS** *José L. Escalona*

Parallel SESSION 3A			Tuesday, July 25 • 09:40 - 11:00
ROOM **MA**		CHAIR ***Filipe Marques***	TOPIC 12 > SESSION 01 **DYNAMICS OF VEHICLES**
TIME	ID	PRESENTING AUTHOR	TITLE
09:40	**90**	***Ehsan Askari***	**TIRE CORNERING STIFFNESS ESTIMATION USING HYBRID MODELING** *Ehsan Askari; Davide Gorgoretti; Guillaume Crevecoeur*
10:00	**78**	***Felipe Moretti Leila***	**A NEW CONTACT AND ROAD MODEL FOR MULTI-BODY DYNAMIC SIMULATION OF WHEELED VEHICLES ON SOFT-SOIL TERRAIN** *Evangelos Koutras; Felipe Moretti Leila; Adrijan Ribaric; Sotirios Natsiavas*
10:20	**207**	***Pedro Millan***	**ADAPTED UA TYRE MODEL FOR COMPUTATIONALLY EFFICIENT AND STABLE DYNAMIC SIMULATIONS OF ROAD VEHICLES** *Pedro Millan; Jorge Ambrósio*
10:40	**121**	***Angelo Domenico Vella***	**MULTIBODY SIMULATION OF EMERGENCY BRAKING ON ELECTRIC KICK SCOOTER** *Angelo Domenico Vella; Elisa Digo; Alessandro Vigliani*

Parallel SESSION 3B			Tuesday, July 25 • 09:40 - 11:00
ROOM **01.1**		CHAIR ***Grzegorz Orzechowski***	TOPIC 05 > SESSION 01 **EFFICIENT SIMULATION AND REAL-TIME APPLICATIONS**
TIME	ID	PRESENTING AUTHOR	TITLE
09:40	**243**	***Jozsef Kovecses***	**REAL-TIME SIMULATION OF CABLE-BASED ROBOTIC END EFFECTORS** *Siamak Arbatani; Jozsef Kovecses; Marek Teichmann*
10:00	**32**	***Niklas Fahse***	**TOWARDS LEARNING HUMAN-SEAT INTERACTIONS FOR OPTIMALLY CONTROLLED MULTIBODY MODELS TO GENERATE REALISTIC OCCUPANT MOTION** *Niklas Fahse; Monika Harant; Michael Roller; Fabian Kempter; Marius Obentheuer; Joachim Linn; Jörg Fehr*
10:20	**246**	***Qasim Khadim***	**NUMERICAL OPTIMIZATION OF PARAMETERS USING THE COVARIANCE MATRIX ADAPTATION EVOLUTION STRATEGY IN THE COUPLED MULTIBODY SYSTEMS** *Qasim Khadim; Grzegorz Orzechowski; Emil Kurvinen; Aki Mikkola*
10:40	**205**	***Márton Kuslits***	**VEHICLE DYNAMICS STATE ESTIMATION METHOD FEATURING SPATIAL MULTIBODY MODEL AND EXTENDED KALMAN FILTER** *Márton Kuslits*

Parallel SESSION 3C		Tuesday, July 25 • 09:40 - 11:00	
ROOM **02.1**	CHAIR ***Peter Eberhard***	TOPIC 01 > SESSION 01 **AEROSPACE, MEDICAL AND INDUSTRIAL APPLICATIONS**	
TIME	ID	PRESENTING AUTHOR	TITLE
09:40	**206**	***Pierangelo Masarati***	**MULTIBODY ANALYSIS OF HELICOPTER PILOT BIOMECHANICS FOR REAL-TIME END POINT IMPEDANCE ESTIMATION** *Andrea Zanoni; Davide Marchesoli; Carmen Talamo; Gianni Cassoni; Pierangelo Masarati*
10:00	**5**	***Lennart Frie***	**SURROGATE MASS OPTIMIZATION FOR HELICOPTER VIBRATION TESTS** *Lennart Frie; Oliver Dieterich; Peter Eberhard*
10:20	**18**	***Jeffrey Stegink***	**A CONCEPT FOR WIND CONDITION ESTIMATION USING TENSORFLOW AND RANDOM FOREST MODELS** *Jeffrey Stegink; Jörn Froböse; János Zierath*
10:40	**76**	***Yuhang Liu***	**VIBRATION SUPPRESSION OF FLEXIBLE SPACE STRUCTURES VIA TRAJECTORY OPTIMIZATION OF MANIPULATORS IN ASSEMBLY TASKS** *Yuhang Liu*

Parallel SESSION 3D		Tuesday, July 25 • 09:40 - 11:00	
ROOM **02.2**	CHAIR ***Sigrid Leyendecker***	TOPIC 02 > SESSION 01 **BIOMECHANICS**	
TIME	ID	PRESENTING AUTHOR	TITLE
09:40	**235**	***John McPhee***	**MULTIBODY SYSTEM DYNAMICS: A FUNDAMENTAL TOOL FOR BIOMECHATRONIC SYSTEM DESIGN** *John McPhee; Ali Nasr*
10:00	**58**	***Simon Hinnekens***	**SOLVING THE MUSCLE REDUNDANCY PROBLEM WITH EMG INPUT: APPLICATION TO BACK MUSCLES FOR THE SORENSEN TEST POSTURE** *Simon Hinnekens; Christine Detrembleur; Philippe Mahaudens; Paul Fisette*
10:20	**35**	***Simon Heinrich***	**INCLUSION OF OPTICAL MARKER POSITION DATA IN OPTIMAL CONTROL SIMULATIONS OF A RIGID BODY MODEL OF THE HUMAN HAND** *Simon Heinrich; Birte Coppers; Anna-Maria Liphardt; Sigrid Leyendecker*

11:00 – 11:20	Coffee-break

Parallel SESSION 4A — Tuesday, July 25 • 11:20 - 13:00

ROOM **MA** | CHAIR ***José L. Escalona*** | TOPIC 12 > SESSION 02 **DYNAMICS OF VEHICLES**

TIME	ID	PRESENTING AUTHOR	TITLE
11:20	**168**	***Javier Fernandez Aceituno***	**A SIMPLIFIED RAILROAD TRACK MODEL WITH PERIODICALLY VARIABLE PARAMETERS FOR MBD SIMULATION OF RAILWAY VEHICLES** *Javier Fernandez Aceituno; Aki Mikkola*
11:40	**237**	***João Pagaimo***	**RAILWAY SWITCH DESIGN OPTIMISATION USING A KINEMATICS-DRIVEN APPROACH** *João Pagaimo; Hugo Magalhães; Pedro Jorge; Yann Bezin; Jorge Ambrósio*
12:00	**92**	***Pedro Urda***	**DEVELOPMENT OF A REAL-TIME ON-BOARD SYSTEM FOR THE MEASUREMENT OF TRACK IRREGULARITIES** *Pedro Urda; Miguel Rodríguez; Sergio Muñoz; José L. Escalona*
12:20	**53**	***Xinxin Yu***	**DETECTION OF RAIL CORRUGATION USING AXLE BOX ACCELERATION MEASUREMENT AND SIGNAL PROCESSING** *Xinxin Yu; Sergio Muñoz; Pedro Urda; José L. Escalona*
12:40	**96**	***Raül Acosta Suñé***	**ANALYSIS OF THE TRACK IRREGULARITIES IN RAILWAY SWITCH & CROSSING VIA THE MULTIBODY APPROACH** *Raül Acosta Suñé*

Parallel SESSION 4B — Tuesday, July 25 • 11:20 - 13:00

ROOM **01.1** | CHAIR ***József Kövecses*** | TOPIC 05 > SESSION 02 **EFFICIENT SIMULATION AND REAL-TIME APPLICATIONS**

TIME	ID	PRESENTING AUTHOR	TITLE
11:20	**244**	***Alan Bowling***	**LONG TERM SIMULATION OF ADIPOGENIC DIFFERENTIATION** *Manoochehr Rabiei; Vatsal Joshi; Kelli Fowlds; Michael Cho; Alan Bowling*
11:40	**37**	***Yuki Murayama***	**ANALYSIS OF SYSTEMS WITH VISCOELASTIC MATERIALS BASED ON GENERALIZED ALPHA SCHEME** *Yuki Murayama; Kazuki Ueda; Taichi Shiiba*
12:00	**54**	***Zhenhao Zhou***	**A CHRONO-BASED FRAMEWORK FOR LARGE-SCALE TRAFFIC SIMULATION WITH HUMAN IN THE LOOP** *Zhenhao Zhou; Huzaifa Mustafa Unjhawala; Alexandra Kissel; Radu Serban; Dan Negrut; Amudha V. Kamaraj; John D. Lee*
12:20	**91**	***Louis Guigon***	**DYNAMICS OF A 3R SERIAL ROBOT BASED ON A GPU APPROACH** *Louis Guigon; Benjamin Boudon; Andrés Kecskeméthy*

Parallel SESSION 4C			Tuesday, July 25 • 11:20 - 13:00
ROOM **02.1**		CHAIR ***Pierangelo Masarati***	TOPIC 01 > SESSION 02 **AEROSPACE, MEDICAL AND INDUSTRIAL APPLICATIONS**
TIME	ID	PRESENTING AUTHOR	TITLE
11:20	**118**	***Tommaso Aresi***	**ENHANCED MODEL-BASED APPROACH OF SPACECRAFT DOCKING SYSTEM SIMULATION** *Tommaso Aresi; Pierangelo Masarati*
11:40	**98**	***Shuai Wang***	**DYNAMICS CONTROL OF A SPATIAL SPACECRAFT-MANIPULATOR SYSTEM BASED ON GEOMETRIC APPROACHES** *Shuai Wang; Qiang Tian; Haiyan Hu*
12:00	**101**	***Tianjiao Dang***	**EFFICIENT COMPUTATIONAL METHOD FOR MULTIBODY DYNAMICS OF SUPERSONIC INTERMITTENT CONTACT SYSTEM** *Tianjiao Dang; Marco Morandini; Pierangelo Masarati; Zhen Liu; Jiaming Zhou*
12:20	**113**	***Seung-Ho Ham***	**INTRODUCTION OF SEVERAL APPLICATIONS OF MULTIBODY DYNAMICS IN SHIP PRODUCTION PLANNING** *Seung-Ho Ham; Myung-Il Roh; Hye-won Lee*
12:40	**114**	***Hyewon Lee***	**COUPLED ANALYSIS OF SIDE-BY-SIDE OFFLOADING OPERATION BETWEEN TWO SHIPS CONSIDERING STABILITY** *Hyewon Lee; Myung-Il Roh; Seung-Ho Ham; Do-Hyun Chun*

Parallel SESSION 4D			Tuesday, July 25 • 11:20 - 13:00
ROOM **02.2**		CHAIR ***Hamid Lankarani***	TOPIC 02 > SESSION 02 **BIOMECHANICS**
TIME	ID	PRESENTING AUTHOR	TITLE
11:20	**165**	***Monika Harant***	**SIMULATION OF A STANDING PASSENGER DURING DRIVEAWAY USING OPTIMAL CONTROL** *Monika Harant; Marius Obentheuer; Michael Roller; Joachim Linn*
11:40	**52**	***Marius Obentheuer***	**EMMA4DRIVE: A DIGITAL HUMAN MODEL FOR OCCUPANT SIMULATION IN DYNAMIC DRIVING MANEUVERS** *Marius Obentheuer; Niklas Fahse; Monika Harant; Michael Kleer; René Reinhard; Michael Roller; Joachim Linn; Fabian Kempter; Jörg Fehr*
12:00	**247**	***Ana P. Martins***	**DEVELOPMENT AND SIMULATION OF CALIBRATION TESTS OF MULTIBODY HEAD-NECK MODELS FOR THE HYBRID-II AND HYBRID-III ATDS** *Ana P. Martins; Marta S. Carvalho; Hamid Lankarani; Gerardo Olivares*
12:20	**229**	***Gonçalo Marta***	**THE INFLUENCE OF THE TYPE OF RUNNING SHOES IN THE LOWER LIMB MUSCULAR ACTIVITY** *Gonçalo Marta; Carlos Quental; Francisco Guerra Pinto; João Folgado*
12:40	**38**	***Josep M. Font-Llagunes***	**PREDICTIVE SIMULATIONS MATCH THE OBSERVED EFFECTS OF CHANGING AXILLARY CRUTCH LENGTH ON UPPER LIMB KINEMATICS DURING SWING-THROUGH GAIT** *Míriam Febrer-Nafría; Gregor Kuntze; Josep M. Font-Llagunes; Janet L. Ronsky; Ranita H.K. Manocha*

13:00 – 14:20	Lunch

Parallel SESSION 5A		**Tuesday, July 25 • 14:20 - 16:00**	
ROOM **MA**	CHAIR ***Enrico Meli***	TOPIC 03 > SESSION 03 **CONTACT, IMPACT AND CONSTRAINTS**	
TIME	ID	PRESENTING AUTHOR	TITLE
14:20	**201**	***Hugo Magalhães***	**WHEEL WEAR PREDICTION BY MEANS OF MULTIBODY SIMULATIONS WITH NON-HERTZIAN CONTACT MODELS** *H. Magalhães; F. Alves; J. Pagaimo; J. N. Costa; F. Marques; J. Pombo; J. Ambrósio*
14:40	**212**	***Filipe Marques***	**A NOVEL APPROACH TO ESTIMATE WHEEL-RAIL CONTACT FORCES CONSIDERING WHEEL FLATS AND OUT-OF-ROUNDNESS** *Filipe Marques; Hugo Magalhães*
15:00	**130**	***Matteo Magelli***	**MULTIBODY SIMULATION OF THE WEAR OF RAILWAY WHEEL PROFILES WITH LOCAL AND GLOBAL APPLICATION OF THE ARCHARD'S LA** *Nicola Bosso; Matteo Magelli; Nicolò Zampieri*
15:20	**170**	***Leandro Nencioni***	**AN INNOVATIVE WHEEL AND RAIL WEAR MODEL TO STUDY PROFILES EVOLUTION IN PRESENCE OF CONFORMAL CONTACT CONDITIONS** *Nencioni Leandro; Enrico Meli; Zhiyong Shi; Andrea Rindi*
15:40	**25**	***Auteliano Antunes dos Santos***	**PREDICTION OF ROLLING CONTACT FATIGUE LOCI: A COMPARISON BETWEEN DYNAMIC AND A SIMPLIFIED QUASI-STATIC APPROACHES** *Philipe Augusto de Paula Pacheco; Paola Gonzalez Ramos; Thiago Leister Sá; Alfredo Gay Neto; Guilherme Fabiano Mendonça dos Santos; Auteliano Antunes dos Santos*

Parallel SESSION 5B		**Tuesday, July 25 • 14:20 - 16:00**	
ROOM **01.1**	CHAIR ***Taichi Shiiba***	TOPIC 05 > SESSION 03 **EFFICIENT SIMULATION AND REAL-TIME APPLICATIONS**	
TIME	ID	PRESENTING AUTHOR	TITLE
14:20	**93**	***Francisco González***	**EXPERIMENTAL STUDY OF THE EFFECT OF CO-SIMULATION SCHEMES ON CYBER-PHYSICAL TESTING** *Antonio J. Rodríguez; Eloy Vázquez; Carlos Lourido; Pablo Díaz; Emilio Sanjurjo; Urbano Lugrís; Francisco González*
14:40	**34**	***Stefan Klimmek***	**IMPLICIT CO-SIMULATION AND SOLVER-COUPLING: EFFICIENT CALCULATION OF INTERFACE-JACOBIAN AND COUPLING SENSITIVITIES/GRADIENTS** *Stefan Klimmek; Bernhard Schweizer*
15:00	**14**	***Laurane Thielemans***	**OFFLINE LEARNING CONTROL TO IMPROVE THE ACCURACY OF REAL-TIME EXPLICIT CO-SIMULATION** *Laurane Thielemans; Francisco González; Laurens Jacobs; Roland Pastorino; Jan Swevers*
15:20	**15**	***Jan-Lukas Archut***	**REAL-TIME MULTIBODY SIMULATION OF VEHICLE WHEEL SUSPENSIONS OF DIFFERENT TOPOLOGIES WITH ELASTOKINEMATIC PROPERTIES** *Jan-Lukas Archut; Burkhard Corves*
15:40	**184**	***Xu Dai***	**MODEL-BASED CO-SIMULATION OF FLEXIBLE ROBOTIC SYSTEMS** *Xu Dai; Ali Raoofian; József Kövecses; Marek Teichmann*

Parallel SESSION 5C		Tuesday, July 25 • 14:20 - 16:00	
ROOM 02.1	CHAIR *Marek Wojtyra*	TOPIC 07 > SESSION 01 FORMULATIONS AND NUMERICAL METHODS	
TIME	ID	PRESENTING AUTHOR	TITLE
14:20	49	*Abhinandan Jain*	**PARTITIONING OF RECURSIVE MULTIBODY DYNAMICS** *Abhinandan Jain*
14:40	192	*Martin Arnold*	**HALF-EXPLICIT RUNGE-KUTTA METHODS FOR CONSTRAINED SYSTEMS ON LIE GROUPS** *Martin Arnold*
15:00	232	*Timo Ströhle*	**NUMERICAL INTEGRATION OF QUASI-LINEAR HYPERBOLIC PDES GOVERNING THE INVERSE DYNAMICS OF FLEXIBLE MECHANICAL SYSTEMS** *Timo Ströhle; Peter Betsch*
15:20	146	*Jiajun Wu*	**A STATE SPACE METHOD FOR SOLVING DIFFERENTIAL ALGEBRAIC EQUATIONS WITH NONHOLONOMIC CONSTRAINTS** *Jiajun Wu; Dingguo Zhang; Xian Guo; Liang Li*
15:40	152	*Marcin Pękal*	**DIVIDE-AND-CONQUER-BASED METHOD FOR THE REACTION UNIQUENESS ANALYSIS IN OVERCONSTRAINED MULTIBODY SYSTEMS** *Marcin Pękal; Marek Wojtyra; Paweł Malczyk; Janusz Frączek*

Parallel SESSION 5D		Tuesday, July 25 • 14:20 - 16:00	
ROOM 02.2	CHAIR *John McPhee*	TOPIC 08 > SESSION 03 MECHATRONICS, ROBOTICS AND CONTROL	
TIME	ID	PRESENTING AUTHOR	TITLE
14:20	238	*Keaton Inkol*	**FACILITATING DYNAMIC BALANCE RECOVERY IN LOWER-LIMB EXOSKELETONS WITH STATE ESTIMATION** *Keaton Inkol; John McPhee*
14:40	172	*Pavel Polach*	**DEVELOPMENT OF UNDERACTUATED BIPED ROBOT MODELS WITH UPPER BODY** *Pavel Polach; Štěpán Papáček; Milan Anderle*
15:00	181	*Jeongho Lee*	**GRASP SYNTHESIS ESTIMATION OF DISHWARE USING MEAN SHAPE FITTING FOR A TABLE BUSSING ROBOT** *Jeongho Lee; Dong Hwan Kim*
15:20	198	*Alinjar Dan*	**SELF-EXCITED WALKING OF A BIPED ON VARIOUS GEOMETRICAL SURFACES** *Alinjar Dan; S.K. Saha; K. RamaKrishna*
15:40	231	*Jan Krivošej*	**COOPERATION OF PASSIVE SPRINGS AND ACTUATORS FOR ENERGY-EFFICIENT EXOSKELETONS OF UPPER LIMB** *Jan Krivošej; Matej Daniel; Zbyněk Šika*

16:00 – 16:20	Coffee-break

Parallel SESSION 6A			Tuesday, July 25 • 16:20 - 18:00
ROOM **MA**		CHAIR ***Álvaro López-Varela***	TOPIC 03 > SESSION 04 **CONTACT, IMPACT AND CONSTRAINTS**
TIME	ID	PRESENTING AUTHOR	TITLE
16:20	**64**	***Alberto Cardona***	**SIMULATION OF SPHERICAL RIGID BODIES SUBJECT TO FRICTION WITH MULTIPLE IMPACTS** *Eliana Sanchez; Alberto Cardona; Alejandro Cosimo; Olivier Brüls; Federico Cavalieri*
16:40	**65**	***Tomas Slimak***	**SPARSE IDENTIFICATION OF UNKNOWN EQUATION OF MOTION TERMS ASSOCIATED WITH COMPLEX JOINT PHENOMENA IN MULTIBODY SYSTEM DYNAMICS** *Tomas Slimak; Andreas Zwölfer; Francesco Trainotti; Daniel Rixen*
17:00	**73**	***Mario López-Lombardero***	**CONTACT PRESSURE PROFILE INFLUENCE ON WEAR PREDICTION FOR MBS REVOLUTE JOINTS MODELS** *Mario López-Lombardero; Javier Cuadrado; Mario Cabello; Félix Martínez; Daniel Dopico; Álvaro López-Varela*
17:20	**234**	***Michal Hajžman***	**QUALITATIVE DYNAMIC ANALYSIS OF MUTUAL INTERACTION OF IMPERFECTIONS AND FRICTION IN JOINTS** *Michal Hajžman; Radek Bulín; Martin Hrabačka; Luboš Smolík; Zbyněk Šika; Jan Zavřel*

Parallel SESSION 6B			Tuesday, July 25 • 16:20 - 18:00
ROOM **02.1**		CHAIR ***Christoph Woernle***	TOPIC 07 > SESSION 02 **FORMULATIONS AND NUMERICAL METHODS**
TIME	ID	PRESENTING AUTHOR	TITLE
16:20	**7**	***Olivier Bauchau***	**MODELING VISCOELASTIC BEHAVIOR IN FLEXIBLE MULTIBODY SYSTEMS** *Olivier Bauchau*
16:40	**249**	***Igor Fernández de Bustos***	**A NEW APPROACH TO FORMULATE STRUCTURAL METHODS FOR MULTIBODY DYNAMICS** *Igor Fernández de Bustos; Haritz Uriarte; Ibai Coria; Gorka Urkullu*
17:00	**79**	***Dario Mangoni***	**A SPARSE CONSTRAINED KRYLOV-SCHUR EIGENVALUE SOLVER FOR THE AEROELASTIC STABILITY ASSESSMENT OF MULTI-FLEXIBLE-BODY SYSTEMS** *Chao Peng; Alessandro Tasora; Dario Mangoni*
17:20	**108**	***Ji Yi***	**A THREE-SUB-STEP COMPOSITE METHOD FOR THE DYNAMIC ANALYSIS OF RIGID-FLEXIBLE MULTIBODY SYSTEMS** *Ji Yi; Xing Yufeng*
17:40	**128**	***Yusheng Su***	**EXPERIMENTAL VALIDATION OF AN OBSERVER FOR THE DEFORMATION STATE OF WIND TURBINE STRUCTURES BASED ON INERTIAL MEASUREMENTS** *Yusheng Su; Johannes Luthe; Andreas Schulze; János Zierath; Christoph Woernle*

Parallel SESSION 6C		Tuesday, July 25 • 16:20 - 18:00	
ROOM **02.2**	CHAIR ***Henrik Ebel***	TOPIC 08 > SESSION 04 **MECHATRONICS, ROBOTICS AND CONTROL**	
TIME	ID	PRESENTING AUTHOR	TITLE
16:20	**22**	***Erik Gerlach***	**LOCOMOTION OF A NON-CONVENTIONAL TENSEGRITY STRUCTURE - SIMULATED AS MULTI-BODY SYSTEM** *Erik Gerlach; Klaus Zimmermann*
16:40	**248**	***Krešimir Osman***	**STABILITY ANALYSIS APPROACH IN DEVELOPMENT OF IN-PIPE INSPECTION ROBOT** *Krešimir Osman; Trpimir Alajbeg*
17:00	**173**	***Yujie Tang***	**PUSHING MANIPULATION WITH A NONHOLONOMIC MOBILE BASE** *Yujie Tang; Martijn Wisse*
17:20	**153**	***Youngjin Hong***	**VISION-BASED STABLE 2D PLANAR PUSHING OF DISHWARE WITH 6-DOF MANIPULATOR** *Youngjin Hong; Hong-ryul Jung; Sungwon Seo; Jeongmin Jeon; Jonghyun Kim; Hyungpil Moon*

Plenary LECTURE		**Wednesday, July 26 • 08:45 - 09:30**	
ROOM **MA**	CHAIR ***Alberto Cardona***	**PLENARY LECTURE II**	
TIME	ID	PRESENTING AUTHOR	TITLE
08:45	**PL**	***Sigrid Leyendecker***	**GEOMETRIC MODELLING, INTEGRATION AND OPTIMAL CONTROL OF FLEXIBLE MULTIBODY DYNAMICS** *Sigrid Leyendecker*

Parallel SESSION 7A		**Wednesday, July 26 • 09:40 - 11:00**	
ROOM **MA**	CHAIR ***Hugo Magalhães***	TOPIC 12 > SESSION 03 **DYNAMICS OF VEHICLES**	
TIME	ID	PRESENTING AUTHOR	TITLE
09:40	**258**	***Pedro Antunes***	**DEVELOPMENT AND VALIDATION OF A MULTIBODY PANTOGRAPH MODEL FOR REALISTIC CURRENT COLLECTION STUDIES** *Pedro Antunes; José Santos; Hugo Magalhães; J. M. Rebelo; João Pombo; Jorge Ambrósio; Matthew Askill*
10:00	**260**	***João Pombo***	**PANTOGRAPH-CATENARY INTERACTION DYNAMICS WITH AERODYNAMIC EFFECTS ON CONTACT WIRE GRADIENTS** *J. M. Rebelo; Frankie Jackson; João Pombo; Pedro Antunes; José Santos; Rakesh Mishra; Hugo Magalhães*
10:20	**225**	***Shashwat Jain***	**NUMERICAL INTEGRATION OF MULTIBODY PANTOGRAPH MODEL AND FINITE ELEMENT CATENARY MODEL USING NEWMARK METHOD** *Shashwat Jain; Rama Krishna K; Satinder Paul Singh*
10:40	**233**	***Bhanu Vardhan***	**INFLUENCE OF LATERAL FLEXIBILITY IN RAIL PANTOGRAPH-CATENARY ON CONTACT PERFORMANC** *Bhanu Vardhan Chennoju; Rama Krishna K; Ashish K Darpe*

Parallel SESSION 7B		**Wednesday, July 26 • 09:40 - 11:00**	
ROOM **01.1**	CHAIR ***Ehsan Askari***	TOPIC 10 > SESSION 03 **OPTIMIZATION AND SENSITIVITY ANALYSIS**	
TIME	ID	PRESENTING AUTHOR	TITLE
09:40	**19**	***Simon Schiller***	**PARAMETER IDENTIFICATION OF A VIBRATORY CONVEYOR WITH STATISTICAL PART BEHAVIOR** *Simon Schiller; Wolfgang Steiner*
10:00	**59**	***Félix Martínez***	**OPTIMIZATION OF A WASHING MACHINE SUSPENSION SYSTEM** *Félix Martínez; Mario Cabello; Mario López-Lombardero; Aitor Cenitagoya; Julen Manterola; Mikel Asensio; Marta Melendez*
10:20	**16**	***Ramin Masoudi***	**PARAMETER IDENTIFICATION OF A DOUBLE WISHBONE SUSPENSION SYSTEM USING THE HOMOTOPY OPTIMIZATION** *Ramin Masoudi*
10:40	**21**	***Dewald Hattingh***	**DYNAMIC ANALYSIS AND OPTIMUM DESIGN OF A RECONFIGURABLE PLANAR GOUGH-STEWART MACHINING PLATFORM** *Dewald Leonard Hattingh; Lukas Johannes du Plessis*

Parallel SESSION 7C		Wednesday, July 26 • 09:40 - 11:00	
ROOM **02.1**	CHAIR ***Matteo Verotti***	TOPIC 06 > SESSION 03 **FLEXIBLE MULTIBODY DYNAMICS**	
TIME	ID	PRESENTING AUTHOR	TITLE
09:40	**216**	***Orazio Sorgonà***	**TESTINGS OF DISCRETE MODELINGS OF PLANAR COMPLIANT MECHANISMS THROUGH FLEXIBLE MULTIBODY SIMULATIONS** *Sorgonà, Orazio; Cirelli, Marco; Verotti, Matteo; Giannini, Oliviero*
10:00	**230**	***Marijn Nijenhuis***	**SPATIAL BEAM ELEMENT WITH THIRD-ORDER GEOMETRIC STIFFNESS FORMULATION FOR IMPROVED MESH CONVERGENCE** *Marijn Nijenhuis; J.P. Meijaard; M. Naves; R.G.K.M. Aarts*
10:20	**255**	***Francisco Vieira***	**FLEXIBLE MULTIBODY SYSTEM DYNAMICS WITH FRACTURE PROPAGATION USING PERIDYNAMICS** *Francisco Vieira; João Pagaimo; Hugo Magalhães; Jorge Ambrósio; Aurélio Araújo*
10:40	**262**	***Jose Munoz***	**INFERENCE OF CONTRACTILITY EVOLUTION ON PLANAR WORM LOCOMOTION** *Jose Munoz; Albert Jiménez-Blanco; Ashutosh Bijalwan*

Parallel SESSION 7D		Wednesday, July 26 • 09:40 - 11:00	
ROOM **02.2**	CHAIR ***Carlos Quental***	TOPIC 02 > SESSION 03 **BIOMECHANICS**	
TIME	ID	PRESENTING AUTHOR	TITLE
09:40	**41**	***Raphael Dumas***	**LINEAR WEAR INDEX COMPARISON BETWEEN STANDARD TOTAL HIP ARTHROPLASTY AND DUAL MOBILITY CUP** *Raphael Dumas; Louis Riglet; Laure-Lise Gras; Florent Moissenet; Xavier Gasparutto; Stephane Armand*
10:00	**135**	***Madalena Antunes***	**SHOULDER STABILITY AFTER ARTHROSCOPIC SUPERIOR CAPSULAR RECONSTRUCTION: COMPUTATIONAL ANALYSIS ON THE INFLUENCE OF THE ROTATOR CUFF TEAR PATTERN** *Madalena Antunes; Carlos Quental; João Folgado; Clara Azevedo; Ana Ângelo*
10:20	**57**	***Jianqiao Guo***	**IMPLANTATION PARAMETER DESIGNATION FOR TOTAL HIP PROSTHESIS BASED ON MULTIBODY MUSCULOSKELETAL MODELING** *Jianqiao Guo; Yanbing Wang; Xinyue Wang; Hao Tang; Xinxin Li; Qiang Tian*
10:40	**28**	***Mariana Rodrigues da Silva***	**MODELING THE ANKLE ARTICULAR COMPLEX: A COMPUTATIONAL AND EXPERIMENTAL ANALYSIS** *Mariana Rodrigues da Silva; Filipe Marques; Sérgio Gonçalves; Miguel Tavares da Silva; Paulo Flores*

11:00 – 11:20	Coffee-break

Parallel SESSION 8A			Wednesday, July 26 • 11:20 - 13:00
ROOM **MA**		CHAIR ***Javier Fernandez Aceituno***	TOPIC 12 > SESSION 04 **DYNAMICS OF VEHICLES**
TIME	ID	PRESENTING AUTHOR	TITLE
11:20	**67**	***Matteo Santelia***	**ANALYSIS OF POST-DERAILMENT DYNAMIC BEHAVIOUR OF A RAILWAY VEHICLE AND INTERACTION WITH DEFORMABLE CONTAINMENT STRUCTURE** *Matteo Santelia; Francesco Mazzeo; Egidio Di Gialleonardo; Stefano Melzi; Stefano Bruni*
11:40	**66**	***Francesco Mazzeo***	**MULTIBODY MODEL OF A BRAKE RIGGING MECHANISM OF A FREIGHT WAGON** *Francesco Mazzeo; Matteo Santelia; Michele Vignati; Egidio di Gialleonardo; Stefano Melzi*
12:00	**253**	***Prapanpong Damsongsaeng***	**ROBUST CONTROL SYSTEM FOR ACTIVE WHEELSET STEERING OF RAILWAY VEHICLES BASED ON SLIDING MODE CONTROL** *Prapanpong Damsongsaeng; Rickard Persson; Sebastian Stichel; Carlos Casanueva*
12:20	**185**	***Zhiyong Shi***	**ADHESION MODELLING IN RAILWAY VEHICLE MULTIBODY DYNAMICS CONSIDERING THE EFFECT OF ENVIRONMENTAL TEMPERATURE** *Zhiyong Shi; Leandro Nencioni; Andrea Rindi; Enrico Meli*
12:40	**106**	***Dan Negrut***	**CALIBRATION OF AN EXPEDITIOUS TERRAMECHANICS MODEL USING A HIGHER-FIDELITY MODEL, BAYESIAN INFERENCE AND A VIRTUAL BEVAMETER TEST** *Wei Hu; Pei Li; Huzaifa Mustafa Unjhawala; Radu Serban; Dan Negrut*

Parallel SESSION 8B			Wednesday, July 26 • 11:20 - 13:00
ROOM **01.1**		CHAIR ***Michal Hajžman***	TOPIC 10 > SESSION 04 **OPTIMIZATION AND SENSITIVITY ANALYSIS**
TIME	ID	PRESENTING AUTHOR	TITLE
11:20	**6**	***Eve Charbonneau***	**WARM-STARTING PROCEDURE INVOLVING PENALTIES INSTEAD OF CONSTRAINTS TO FIND MORE OPTIMAL TRAJECTORIES** *Eve Charbonneau; Francisco Pascoa; Mickaël Begon*
11:40	**251**	***Alberto Luaces Fernández***	**OPTIMAL TRAJECTORY TRACKING TECHNIQUES FOR SINGLE-TRACK VEHICLES** *Alberto Luaces Fernández; Álvaro López Varela; Francisco Mouzo Murujosa; Daniel Dopico Dopico*
12:00	**263**	***Ashutosh Bijalwan***	**A COMPUTATIONAL FRAMEWORK FOR OPTIMAL LOCOMOTION IN LIMBLESS ORGANISM** *Ashutosh Bijalwan; José J. Muñoz*
12:20	**226**	***Martin Hrabačka***	**METHODS OF ACTUATION PLANNING OF ACTIVE TENSEGRITY STRUCTURES** *Martin Hrabačka; Radek Bulín; Michal Hajžman; Zbyněk Šika; Jan Krivošej*

Parallel SESSION 8C		Wednesday, July 26 • 11:20 - 13:00	
ROOM **02.1**		CHAIR ***Joachim Linn***	**TOPIC 06** > SESSION 04 **FLEXIBLE MULTIBODY DYNAMICS**
TIME	ID	PRESENTING AUTHOR	TITLE
11:20	**30**	***Denise Tumiotto***	**NONLINEAR STABILITY OF LIE GROUP INTEGRATORS** *Denise Tumiotto; Ergys Çokaj; Elena Celledoni; Brynjulf Owren; Martin Arnold*
11:40	**11**	***Martina Stavole***	**HOMOGENISED STIFFNESS COEFFICIENTS OF UNLOADED ENDOSCOPE SHAFTS** *Martina Stavole; Rodrigo T. Sato Martín de Almagro; Vanessa Dörlich; Sigrid Leyendecker*
12:00	**204**	***Bertold Bongardt***	**APPROACHING LINEAR ELASTIC DEFORMATIONS OF FLEXIBLE BODIES VIA SCREW THEORY** *Bertold Bongardt; Jan de Jong*
12:20	**154**	***Fabio Schneider-Jung***	**FLEXIBLE MOUNTING ELEMENTS FOR COSSERAT RODS** *Michael Roller; Fabio Schneider-Jung; Joachim Linn*

Parallel SESSION 8D		Wednesday, July 26 • 11:20 - 13:00	
ROOM **02.2**		CHAIR ***Josep M. Font-Llagunes***	**TOPIC 02** > SESSION 04 **BIOMECHANICS**
TIME	ID	PRESENTING AUTHOR	TITLE
11:20	**174**	***Adam Ciszkiewicz***	**COMPARISON OF TWO METHODS FOR LIGAMENT PRESTRAIN IN A MULTIBODY MODEL OF AN ANKLE JOINT USING A GENERATIVE APPROACH** *Adam Ciszkiewicz*
11:40	**228**	***Sunjung Kim***	**COMPARATIVE STUDY OF LIGAMENT MODELING TECHNIQUES IN A WRIST JOINT MODEL: THE EFFECT OF LIGAMENT REMOVAL ON CONTACT PRESSURE DURING COMPRESSION FOCUSING ON CARPAL BONES** *Sunjung Kim; Farid Amirouche*
12:00	**218**	***Simone Conti***	**HOW TO SIMULATE SOFT TISSUES IN EXTINCT ANIMALS. USING SAUROPOD DINOSAURS AS A CASE STUDY** *Simone Conti; Pierangelo Masarati; Emanuel Tschopp; Andrea Zanoni; Octavio Mateus; Giuseppe Sala*
12:20	**157**	***L. P. Obrezkov***	**MODELING OF THE ACHILLES SUBTENDONS IN A FRAMEWORK OF THE ABSOLUTE NODAL COORDINATE FORMULATION** *L. P. Obrezkov; T. Finni; M. K. Matikainen*
12:40	**44**	***Filippo Maceratesi***	**A COMPARISON BETWEEN A FUNCTIONAL AND AN ANTHROPOMETRIC APPROACH TO ESTIMATE SUBJECT-SPECIFIC MUSCULOTENDON PARAMETERS** *Filippo Maceratesi; Míriam Febrer-Nafría; Josep M. Font-Llagunes*

13:00 – 14:20	Lunch

Parallel SESSION 9A			Wednesday, July 26 • 14:20 - 16:00
ROOM **MA**		CHAIR ***Gabor Csernak***	TOPIC 03 > SESSION 05 **CONTACT, IMPACT AND CONSTRAINTS**
TIME	ID	PRESENTING AUTHOR	TITLE
14:20	**62**	***Mohammad Poursina***	**DAMPING COEFFICIENT FOR IMPACTS WITH RESIDUAL DEFORMATION AT THE TIME OF SEPARATION** *Mohammad Poursina; Parviz E. Nikravesh*
14:40	**56**	***Dylan Ramaswamy***	**A CONTINUOUS CONTACT FORCE MODEL FOR HIGHLY DAMPED IMPACTS OF ARBITRARY MATERIAL AND GEOMETRY** *Dylan Ramaswamy; Sean Humbert*
15:00	**60**	***Aitor Cenitagoya***	**SIMPLIFIED METHOD TO PREDICT TRANSLATIONAL JOINT WEAR IN RIGID MULTIBODY SYSTEMS** *Aitor Cenitagoya; Mario Cabello; Felix Martinez; Julen Manterola; Mikel Asensio; Mario López-Lombardero; Jon Arregui*
15:20	**224**	***Gabor Csernak***	**PHASE PORTRAITS AND BIFURCATIONS INDUCED BY DYNAMIC FRICTION MODELS** *Balazs J. Bekesi; Mate Antali; Gabor Csernak*
15:40	**257**	***Raluca Andra Constantin***	**DYNAMICS OF MECHANICAL IMPACT ON A QUADRILATERAL ARTICULATED MECHANISM** *Raluca Andra Constantin; Sorin Dumitru; Nicolae Dumitru; Ionut Geonea; Cristian Copilusi*

Parallel SESSION 9B			Wednesday, July 26 • 14:20 - 16:00
ROOM **01.1**		CHAIR ***Alan Bowling***	TOPIC 11 > SESSION 01 **MULTIPHYSICS AND MULTISCALE PROBLEMS** & TOPIC 4 > SESSION 01 **EDUCATION, VALIDATION AND SOFTWARE DEVELOPMENT**
TIME	ID	PRESENTING AUTHOR	TITLE
14:20	**68**	***Federico Maria Reato***	**A MULTI-PHYSICS-BASED METHODOLOGY FOR ELECTRO-MAGNETO-MECHANICAL CO-SIMULATION IN DYNAMIC APPLICATIONS: A CASE STUDY** *Federico Maria Reato; Claudio Ricci; Simone Cinquemani; Jan Misfatto; Matteo Calzaferri*
14:40	**241**	***Mathijs Goris***	**A MULTIBODY AND DISCRETE ELEMENT MODELLING CO-SIMULATION APPROACH FOR ROBOMOULD PROCESS ANALYSIS** *Mathijs Goris; Elke Deckers; Frank Naets*
15:00	**120**	***Ambrus Zelei***	**MULTIBODY ELASTIC SIMULATION OF A GO-KART IN PROJECT-BASED EDUCATION: CORRELATION BETWEEN FRAME STIFFNESS AND DYNAMIC PERFORMANCE** *Krisztián Horváth; Ambrus Zelei*
15:20	**178**	***Jurnan Schilder***	**TEACHING MULTIBODY DYNAMICS: FROM RIGID TO FLEXIBLE SYSTEMS** *Jurnan Schilder; Karlijn van Voorthuizen; Marcel Ellenbroek*

Parallel SESSION 9C		Wednesday, July 26 • 14:20 - 16:00	
ROOM **02.1**		CHAIR ***Pier Paolo Valentini***	TOPIC 06 > SESSION 05 **FLEXIBLE MULTIBODY DYNAMICS**
TIME	ID	PRESENTING AUTHOR	TITLE
14:20	**115**	***Seongsu Kim***	**FLEXIBLE MULTI-BODY DYNAMICS ANALYSIS USING DATA INTEGRATED MODEL DRIVEN SIMULATION** *Seongsu Kim; Joon Shik Yoon; Juhwan Choi; Jin Hwan Choi*
14:40	**125**	***Benjamin Bauer***	**PHYSICAL VALIDATION OF SIMULATION TOOLS FOR SLENDER ELASTIC STRUCTURES** *Benjamin Bauer; Armin Bosten; Muhannad Hawwash; Olivier Brüls; Joachim Linn*
15:00	**187**	***Bram Seinhorst***	**EDGE EFFECTS IN MIXED BOUNDARY CO-ROTATIONAL BEAM ELEMENTS** *Bram Seinhorst; Marijn Nijenhuis; Wouter Hakvoort*
15:20	**190**	***Jingwei Meng***	**DYNAMIC ANALYSIS FOR FLEXIBLE MULTIBODY SYSTEMS WITH HYBRID UNCERTAINTIES** *Jingwei Meng; Yanfei Jin*
15:40	**131**	***Alessio Cellupica***	**MULTIBODY APPROACH TO MODEL TOOTHBRUSH BRISTLES ELASTO-KINEMATICS** *Alessio Cellupica; Luca D'Angelo; Pier Paolo Valentini; Marco Cirelli; Marta Mazur*

Parallel SESSION 9D		Wednesday, July 26 • 14:20 - 16:00	
ROOM **02.2**		CHAIR ***Andrés Kecskeméthy***	TOPIC 08 > SESSION 05 **MECHATRONICS, ROBOTICS AND CONTROL**
TIME	ID	PRESENTING AUTHOR	TITLE
14:20	**47**	***Ronald Aarts***	**A COMPLIANT AND REDUNDANTLY ACTUATED 3-DOF 4RRR PKM: FIRST STEP TO FULL PLANAR MOTION** *Paul Stoffels; Ronald Aarts*
14:40	**196**	***Joana Coelho***	**DYNAMIC CONTROL OF A HEXAPOD ROBOT USING COMPLIANT CONTACT FORCE MODELS** *Joana Coelho; João Canedo; Filipe Marques; Bruno Dias; Gil Lopes; Fernando Ribeiro; Paulo Flores*
15:00	**48**	***Vigen Arakelyan***	**DESIGN OF FIXED-SEQUENCE PLANAR 5R PARALLEL MANIPULATORS WITH ADJUSTABLE LINKS** *Vigen Arakelyan*
15:20	**160**	***Matteo Verotti***	**LOCAL ISOTROPIC COMPLIANCE IN PLANAR PARALLEL 3RRR MANIPULATORS** *Matteo Verotti; Pierangelo Masarati; Marco Morandini; Nicola P. Belfiore*
15:40	**182**	***Ja Choon Koo***	**DESIGN AND KINEMATICS ANALYSIS OF A 3-DOF ROBOT ACTUATOR** *Moo Heon Lee; Young Wuk Kim; Ja Choon Koo*

16:00 – 16:20	Coffee-break

Parallel SESSION 10A			Wednesday, July 26 • 16:20 - 18:00
ROOM **MA**		CHAIR ***Dan Negrut***	TOPIC 03 > SESSION 06 **CONTACT, IMPACT AND CONSTRAINTS**
TIME	ID	PRESENTING AUTHOR	TITLE
16:20	**80**	***Luning Fang***	**HANDLING FRICTIONAL CONTACTS ON SMOOTH SURFACES USING AN EVOLVING CONTACT APPROACH** *Luning Fang; Dan Negrut*
16:40	**156**	***Radek Bulín***	**COMPUTATIONAL STUDY OF FRICTION MODELS' PARAMETERS IN A HEAVILY LOADED BALL AND SOCKET COUPLING** *Radek Bulín; Štěpán Dyk; Jan Rendl; Luboš Smolík*
17:00	**138**	***Matteo Autiero***	**A SURVEY OF EMPIRICAL FRICTION MODELS FOR LUBRICATED SLOTTED JOINTS IN MULTIBODY DYNAMICS SIMULATIONS** *Matteo Autiero; Marco Cirelli; Giovanni Paoli; Ettore Pennestrì; Pier Paolo Valentini; Nicola Pio Belfiore*

Parallel SESSION 10B		Wednesday, July 26 • 16:20 - 18:00	
ROOM **02.1**		CHAIR ***Ronald Aarts***	**TOPIC 08** > SESSION 06 **MECHATRONICS, ROBOTICS AND CONTROL**
TIME	ID	PRESENTING AUTHOR	TITLE
16:20	**63**	***Ingeborg Wenger***	**DETECTING ANOMALOUS BEHAVIOUR IN ROBOT SWARMS** *Peter Eberhard; Henrik Ebel; Ingeborg Wenger*
16:40	**144**	***Jinhwi Lee***	**OBJECT REARRANGEMENT IN CLUTTER FOR MOBILE MANIPULATOR USING HYBRID SOFT ACTOR-CRITIC METHOD** *SeungHyun Kang; Jinhwi Lee; Changhwan Kim*
17:00	**8**	***Henrik Ebel***	**COOPERATIVE OBJECT TRANSPORTATION WITH NON-HOLONOMIC MOBILE ROBOTS: MULTIBODY DYNAMICS MEETS DISTRIBUTED OPTIMIZATION** *Henrik Ebel; Mario Rosenfelder; Daniel Niklas Fahse; Peter Eberhard*
17:20	**211**	***Oleg Rogov***	**REINFORCEMENT LEARNING METHODS FOR MULTIBODY SYSTEMS EVALUATED WITH CONTROLLED MULTI-LINK INVERTED PENDULUM ON THE CART** *Oleg Rogov; Peter Manzl; Johannes Gerstmayr; Grzegorz Orzechowski*
17:40	**85**	***Peter Manzl***	**IMPROVED MODELING OF MECANUM WHEELS FOR MOBILE PLATFORMS** *Peter Manzl; Martin Sereinig; Johannes Gerstmayr*

Plenary LECTURE		**Thursday, July 27 • 08:45 - 09:30**	
ROOM **MA**	CHAIR ***Radu Serban***	**PLENARY LECTURE III**	
TIME	ID	PRESENTING AUTHOR	TITLE
08:45	**PL**	***Pier Paolo Valentini***	**ADVANCED PSEUDO-RIGID BODY MODELS FOR THE DESIGN OF COMPLIANT MECHANISMS** *Pier Paolo Valentini*

Parallel SESSION 11A		**Thursday, July 27 • 09:40 - 11:00**	
ROOM **MA**	CHAIR ***Mohammad Poursina***	TOPIC 03 > SESSION 07 **CONTACT, IMPACT AND CONSTRAINTS**	
TIME	ID	PRESENTING AUTHOR	TITLE
09:40	**143**	***Marek Wojtyra***	**BODY-WISE ANALYSIS OF REACTION FORCES IN OVERCONSTRAINED MULTIBODY SYSTEMS** *Marek Wojtyra; Marcin Pękal*
10:00	**150**	***Yuki Kitazawa***	**ANALYSIS METHOD FOR FINGER-MACHINE NON-SMOOTH CONTACT CONSIDERING FLEXIBILITY OF SKIN** *Yuki Kitazawa; Yoshiki Sugawara; Masakazu Takeda*
10:20	**51**	***Lorenzo Mazzanti***	**MULTIBODY JOINT PARAMETER ESTIMATION USING AN AUGMENTED EXTENDED KALMAN FILTER** *Lorenzo Mazzanti; Mathijs Vivet; Daniel De Gregoriis; Bart Blockmans*
10:40	**141**	***Indrajeet Patil***	**A BEAM-TO-RIGID BODY FRICTIONAL CONTACT FORMULATION: APPLICATION TO YARN-MANDREL INTERACTIONS** *Indrajeet Patil; Alejandro Cosimo; Armin Bosten; Olivier Brüls*

Parallel SESSION 11B		**Thursday, July 27 • 09:40 - 11:00**	
ROOM **01.1**	CHAIR ***Alexander Held***	TOPIC 07 > SESSION 03 **FORMULATIONS AND NUMERICAL METHODS**	
TIME	ID	PRESENTING AUTHOR	TITLE
09:40	**239**	***Olivier Bruls***	**ON THE ACCURATE EVALUATION AND DIFFERENTIATION OF THE EXPONENTIAL MAP IN FLEXIBLE MULTIBODY DYNAMICS** *Juliano Todesco; Olivier Bruls*
10:00	**31**	***Philipp L. Kinon***	**ENERGY-CONSISTENT INTEGRATION OF MECHANICAL SYSTEMS BASED ON LIVENS PRINCIPLE** *Philipp L. Kinon; Peter Betsch*
10:20	**197**	***Tobias Thoma***	**PORT-HAMILTONIAN FORMULATION AND STRUCTURE-PRESERVING DISCRETIZATION OF HYPERELASTIC STRINGS** *Philipp L. Kinon; Tobias Thoma; Peter Betsch; Paul Kotyczka*
10:40	**77**	***Evangelos Koutras***	**A GENERAL CO-SIMULATION FRAMEWORK BASED ON A NOVEL WEAK FORMULATION AT THE INTERFACE LEVEL** *Evangelos Koutras; Elias Paraskevopoulos; Sotirios Natsiavas*

Parallel SESSION 11C		Thursday, July 27 • 09:40 - 11:00	
ROOM **02.1**		CHAIR ***Qiang Tian***	**TOPIC 06** > SESSION 06 **FLEXIBLE MULTIBODY DYNAMICS**
TIME	ID	PRESENTING AUTHOR	TITLE
09:40	**191**	***Maximilian Herrmann***	**EFFICIENT DISCRETE-TIME DYNAMICS OF GEOMETRICALLY EXACT BEAMS BASED ON RELATIVE KINEMATICS** *Maximilian Herrmann; Paul Kotyczka*
10:00	**107**	***Ju Chen***	**A NEW FIELD VARIATIONAL INTEGRATOR FOR SIMULATING DYNAMICS OF FLEXIBLE MULTIBODY SYSTEMS ON SE (3)** *Ju Chen; Ziheng Huang; Qiang Tian*
10:20	**20**	***Andrzej Urbaś***	**DYNAMICS ANALYSIS OF A MOBILE CRANE WITH TAKING INTO ACCOUNT THE HANGED LOAD ECCENTRICITY** *Andrzej Urbaś; Krzysztof Augustynek; Jacek Stadnicki*

Parallel SESSION 11D		Thursday, July 27 • 09:40 - 11:00	
ROOM **02.2**		CHAIR ***Paweł Malczyk***	**TOPIC 08** > SESSION 07 **MECHATRONICS, ROBOTICS AND CONTROL**
TIME	ID	PRESENTING AUTHOR	TITLE
09:40	**26**	***Arnim Kargl***	**NMPC-BASED CONTROL OF OVERDETERMINED SYSTEMS BY THE EXAMPLE OF MAGNET CONTROL OF THE TRANSRAPID** *Arnim Kargl; Patrick Schmid; Peter Eberhard*
10:00	**122**	***Yongbin Guo***	**DYNAMIC ANALYSIS OF ROTATING STRUCTURES WITH ACTIVE CONSTRAINED LAYER DAMPING TREATMENT BY USING THE PID NEURAL NETWORK** *Yongbin Guo; Liang Li; Dingguo Zhang; Xian Guo*
10:20	**127**	***Minghe Shan***	**A SYSTEMATIC FORMULATION FOR DYNAMICS OF FLEXIBLE MULTIBODY SYSTEMS WITH TOPOLOGY CHANGES** *Yifan Qi; Minghe Shan; Lingling Shi*
10:40	**214**	***Łukasz Rówienicz***	**MULTI-RIGID-BODY DYNAMICS AND STABILIZATION OF TWO-AXIS LINE-OF-SIGHT SYSTEM WITH PLATFORM-INDUCED DISTURBANCES** *Łukasz Rówienicz; Paweł Malczyk*

11:00 – 11:20	Coffee-break

Parallel SESSION 12A — Thursday, July 27 • 11:20 - 13:00

ROOM **MA** | CHAIR ***Alberto Martini*** | TOPIC 12 > SESSION 05 **DYNAMICS OF VEHICLES**

TIME	ID	PRESENTING AUTHOR	TITLE
11:20	**69**	***Alessio Cascino***	**COMBINING TOPOLOGICAL OPTIMIZATION AND MULTIBODY DYNAMICS: APPLICATION TO AN INNOVATIVE RAILWAY BOGIE** *Alessio Cascino; Enrico Meli; Andrea Rindi*
11:40	**194**	***Martijn Vermaut***	**INDIRECT WHEEL-RAIL FORCE SENSING OF A FLEXIBLE MULTIBODY TRAIN BOGIE MODEL: A KALMAN FILTER-BASED STATE-INPUT ESTIMATION** *Martijn Vermaut; Rocco Adduci; Michiel Vandecappelle; Mohamed Bentefrit; Frank Naets*
12:00	**24**	***Raphael Cleven***	**CREATION OF SYNTHETIC MOTOR TORQUES AND BRAKE FORCES FOR DETERMINATION OF DESIGN LOADS FOR RAILWAY VEHICLE BOGIES** *Raphael Cleven; Christian Moser; Burkhard Corves*
12:20	**61**	***Ivica Kožar***	**ANALYSIS OF 3D PENDULUM SLIDING ALONG A ROPE** *Ivica Kožar*
12:40	**142**	***Aaron Young***	**AN OVERVIEW OF A FRAMEWORK FOR DESIGNING ROBOT AUTONOMY STACKS IN SIMULATION** *Thomas Hansen; Shouvik Chatterjee; Sriram Ashokkumar; Ishaan Mahajan; Harry Zhang; Stefan Caldararu; Abhirag Dashora; Aaron Young; He Shen; Luning Fang; Dan Negrut*

Parallel SESSION 12B — Thursday, July 27 • 11:20 - 13:00

ROOM **01.1** | CHAIR ***Farid Amirouche*** | TOPIC 07 > SESSION 04 **FORMULATIONS AND NUMERICAL METHODS**

TIME	ID	PRESENTING AUTHOR	TITLE
11:20	**72**	***James R Phillips***	**BOND-GRAPH REPRESENTATION OF IDEAL CONSTRAINTS VIA THE PRINCIPLE OF VIRTUAL POWER** *James R Phillips; Farid Amirouche*
11:40	**167**	***Sérgio B. Gonçalves***	**ON THE ANALYSIS OF FULLY CARTESIAN COORDINATES - A COMPARISON BETWEEN A REDUCED AND FULL-DEFINED MODELLING APPROACH IN SPATIAL MECHANISMS** *Sérgio B. Gonçalves; Ivo Roupa; Miguel Tavares da Silva*
12:00	**104**	***Matthias Schuderer***	**FRICTION MODELING FROM A PRACTICAL POINT OF VIEW** *Matthias Schuderer; Georg Rill; Thomas Schaeffer; Carsten Schulz*
12:20	**200**	***Antonio J. Rodríguez***	**KALMAN FILTER BASED ON MULTIBODY MODELS WITH UNKNOWN STATISTICAL PROPERTIES** *Antonio J. Rodríguez; Emilio Sanjurjo; Miguel Ángel Naya*
12:40	**219**	***Maciej Pikuliński***	**ONLINE DATA-DRIVEN MODELING OF 2DOF PLANAR ROBOT USING TIME-DELAYED DYNAMIC MODE DECOMPOSITION** *Maciej Pikuliński; Paweł Malczyk*

Parallel SESSION 12C — Thursday, July 27 • 11:20 - 13:00

ROOM **02.1** | CHAIR ***Fabio Schneider-Jung*** | TOPIC 06 > SESSION 07 **FLEXIBLE MULTIBODY DYNAMICS**

TIME	ID	PRESENTING AUTHOR	TITLE
11:20	**84**	***Klaus Zauner***	**DESIGN OPTIMIZATION OF MULTI-ELASTIC-LINK ROBOTS BASED ON REPRESENTATIVE LOAD CASES** *Klaus Zauner; Hubert Gattringer; Andreas Müller*
11:40	**86**	***Daan Bortels***	**USE OF MULTI-BODY CO-SIMULATIONS FOR THE OPTIMISATION OF MECHATRONIC SYSTEMS - A DRONE CASE** *Daan Bortels; Jari Peeters; Mathias Bos; Frank Naets*
12:00	**129**	***Thijs Willems***	**VISION-BASED METHODOLOGIES FOR THE MOTION TRACKING AND PARAMETER IDENTIFICATION OF FLEXIBLE MULTIBODY MECHANISMS** *Thijs Willems; Frank Naets*
12:20	**202**	***Tian Zhao***	**IDENTIFICATION OF NONLINEAR ELASTIC BENDING BEHAVIOR FOR CABLE SIMULATION** *Tian Zhao; Fabio Schneider-Jung; Joachim Linn; Ralf Müller*
12:40	**203**	***Sandeep Kumar***	**A SYMBOLIC APPROACH FOR DERIVING DYNAMICS EQUATIONS FOR MULTI-LINK FLEXIBLE MANIPULATOR SYSTEM** *Sandeep Kumar; Subir Kumar Saha; Satinder Paul Singh*

Parallel SESSION 12D — Thursday, July 27 • 11:20 - 13:00

ROOM **02.2** | CHAIR ***Daniel Condurache*** | TOPIC 09; SESSION 01 **MULTIBODY KINEMATICS**

TIME	ID	PRESENTING AUTHOR	TITLE
11:20	**45**	***Florent Moissenet***	**A COMPREHENSIVE DATASET OF EX VIVO SHOULDER GIRDLE KINEMATICS DURING STANDARDISED HUMERUS MOTIONS** *Florent Moissenet*
11:40	**89**	***Daniel Condurache***	**MULTIDUAL QUATERNIONS AND HIGHER-ORDER ANALYSIS OF LOWER-PAIR KINEMATIC CHAINS** *Daniel Condurache; Mihail Cojocari; Ionut Popa*
12:00	**151**	***Yixuan Tang***	**MONTE CARLO TREE SEARCH CONTROL SCHEME FOR THE INVERTED PENDULUM** *Yixuan Tang; Grzegorz Orzechowski; Aki Mikkola*

12:20	Lunch

14:30	Tour and Dinner

Plenary LECTURE			**Friday, July 28 • 09:00 - 09:50**
ROOM **MA**		CHAIR ***Jorge Ambrósio***	**PLENARY LECTURE IV**
TIME	ID	PRESENTING AUTHOR	TITLE
09:00	PL	***Johannes Gerstmayer***	**COMPUTATIONAL METHODS AND IMPLEMENTATION FOR FLEXIBLE MULTIBODY SYSTEMS** *Johannes Gerstmayer*

Parallel SESSION 13A			**Friday, July 28 • 10:00 - 11:20**
ROOM **MA**		CHAIR ***Pedro Urda***	TOPIC 12 > SESSION 06 **DYNAMICS OF VEHICLES**
TIME	ID	PRESENTING AUTHOR	TITLE
10:00	**88**	***Huzaifa Mustafa Unjhawala***	**A FAST AND RELIABLE REDUCED ORDER MODEL FOR LARGE SCALE VEHICLE SIMULATION** *Huzaifa Mustafa Unjhawala; Thomas Hansen; Luning Fang; Zhenhao Zhou; Shouvik Chatterjee; Jinlong Wu; Radu Serban; Dan Negrut*
10:20	**134**	***Radu Serban***	**A FLEXIBLE CO-SIMULATION FRAMEWORK FOR VEHICLE-TERRAIN INTERACTION** *Radu Serban; Dan Negrut; Wei Hu*
10:40	**250**	***Alberto Martini***	**MULTIBODY MODEL FOR ENHANCING THE DYNAMIC BEHAVIOR OF AN AGRICULTURAL TRACTOR** *Matteo Magliani; Alberto Martini*
11:00	**110**	***Marc Guillem Zamora Agustí***	**SELF-EXCITABILITY OF ROLLER COASTER TRAINS ALONG SPATIAL TRAJECTORIES** *Marc Guillem Zamora Agustí; Andrés Kecskeméthy*

Parallel SESSION 13B			**Friday, July 28 • 10:00 - 11:00**
ROOM **01.1**		CHAIR ***Adam Ciszkiewicz***	TOPIC 02 > SESSION 05 **BIOMECHANICS**
TIME	ID	PRESENTING AUTHOR	TITLE
10:00	**215**	***Behzad Danaei***	**SUBJECT-SPECIFIC PREDICTIVE DYNAMIC SIMULATION OF SIT-TO-STAND MOTION AFTER TOTAL KNEE ARTHROPLASTY** *Behzad Danaei; John McPhee*
10:20	**270**	***Lianxin Yang***	**A BIONIC JOINT WITH HSLD STIFFNESS TO ISOLATE VIBRATION** *Lianxin Yang; Zhihua Zhao*
10:40	**36**	***Takahiro Homma***	**DEVELOPMENT OF IDENTIFICATION METHOD FOR MINIMAL SET OF INERTIAL PARAMETERS OF MULTI-BODY SYSTEM** *Takahiro Homma; Hiroshi Yamaura*

Parallel SESSION 13C		Friday, July 28 • 10:00 - 11:20	
ROOM **02.1**	CHAIR ***Martijn Vermaut***	TOPIC 06 > SESSION 08 **FLEXIBLE MULTIBODY DYNAMICS**	
TIME	ID	PRESENTING AUTHOR	TITLE
10:00	**10**	***Jari Peeters***	**EMPLOYING A VARIABLE MODAL BASIS USING THE FLEXIBLE NATURAL COORDINATES FORMULATION** *Jari Peeters; Martijn Vermaut; Frank Naets; Tom Leblicq*
10:20	**155**	***Urs Becker***	**A COMPONET BASED BOUNDED SUB-STRUCTURING APPROACH FOR LARGE GEOMETRICAL DEFORMATIONS IN SLENDER STRUCTURES** *Urs Becker; Jin-Fan Liu*
10:40	**158**	***Felix Weiss***	**BEAM MODELING IN A FLOATING FRAME OF REFERENCE FOR TORSION DYNAMICS OF HELICOPTER ROTOR BLADES** *Felix Weiss; Joshua Merlis*
11:00	**17**	***Karlijn van Voorthuizen***	**A COMPARISON OF REFERENCE CONDITIONS IN FLOATING FRAME FORMULATIONS THAT USE ABSOLUTE INTERFACE COORDINATES** *Karlijn van Voorthuizen; Jurnan Schilder; Mohammed Iqbal Abdul Rasheed; Bojana Rosic*

Parallel SESSION 13D		Friday, July 28 • 10:00 - 11:20	
ROOM **02.2**	CHAIR ***Dario Richiedei***	TOPIC 08 > SESSION 08 **MECHATRONICS, ROBOTICS AND CONTROL**	
TIME	ID	PRESENTING AUTHOR	TITLE
10:00	**27**	***Robert Seifried***	**SOME STUDIES ON COMBINED FEEDFORWARD AND FUNNEL CONTROL OF UNDERACTUATED MULTIBODY SYSTEMS** *Robert Seifried; Svenja Drücker; Thomas Berger; Lukas Lanza; Timo Reis*
10:20	**166**	***Paweł Maciąg***	**ADJOINT-BASED FEEDFORWARD CONTROL OF TWO-DEGREE-OF-FREEDOM PLANAR ROBOT** *Paweł Maciąg; Paweł Malczyk; Janusz Frączek*
10:40	**176**	***Dario Richiedei***	**MODEL PREDICTIVE CONTROL WITH EMBEDDED REFERENCE DYNAMICS FOR PRECISE TRAJECTORY TRACKING IN AN UNDERACTUATED TWO-LINK MULTIBODY SYSTEM** *Jason Bettega; Dario Richiedei; Alberto Trevisani*
11:00	**29**	***Malte Grube***	**MODELING AND ADVANCED CONTROL FOR DESIGNING A SOFT MATERIAL ROBOT** *Malte Grube; Timur Bekman; Robert Seifried*

11:20 - 11:40	Coffee-break

Parallel SESSION 14A		**Friday, July 28 • 11:40 - 13:00**	
ROOM **MA**	CHAIR ***Corina Sandu***	TOPIC 12 > SESSION 07 **DYNAMICS OF VEHICLES**	
TIME	ID	PRESENTING AUTHOR	TITLE
11:40	**213**	***Václav Houdek***	**DERIVATIVES OF QUATERNION SPLINE INTERPOLATION FUNCTION FOR MULTIBODY DYNAMICS** *Václav Houdek; Olivier Verlinden; Michal Hajžman*
12:00	**171**	***Tobias Westmeier***	**DATA-DRIVEN PREDICTION OF FORCED VIBRATIONS: HYBRID MODELLING IN FREQUENCY AND TIME DOMAIN** *Tobias Westmeier; Daniel Kreuter; Simon Bäuerle; Hartmut Hetzler*
12:20	**40**	***Manuel Alcazar Vargas***	**MODELING OF AN OVERACTUATED VEHICLE IN SIMSCAPE MULTIBODY FOR THE CHARACTERIZATION OF SUSPENSION AND STEERING ACTUATION SYSTEMS** *Manuel Alcazar Vargas; Javier Perez Fernandez; Juan J. Castillo Aguilar; Juan A. Cabrera Carrillo*
12:40	**264**	***Benjamin Boudon***	**SIMULATION AND VALIDATION OF A SYMBOLIC MODEL OF A OF FOUR-WHEELS STEERING OFF-ROAD VEHICLE** *Louis Dambacher; Benjamin Boudon; Roberto Lot; Nicolas Bouton; Nicolas Lalande; Roland Lenain*

Parallel SESSION 14B		**Friday, July 28 • 11:40 - 13:00**	
ROOM **01.1**	CHAIR ***Raphaël Dumas***	TOPIC 02 > SESSION 06 **BIOMECHANICS**	
TIME	ID	PRESENTING AUTHOR	TITLE
11:40	**164**	***Yanbing Wang***	**CONVEX WRAPPING ALGORITHM FOR MULTI-JOINT MUSCLES AND ITS APPLICATIONS IN HIP MUSCULOSKELETAL MODELING** *Yanbing Wang; Jianqiao Guo; Qiang Tian*
12:00	**102**	***Pierre Puchaud***	**EXPLORING THE BENEFITS OF VARIATIONAL INTEGRATORS WITH NATURAL COORDINATES: A PENDULUM EXAMPLE** *Pierre Puchaud; Raphaël Dumas; Mickaël Begon*
12:20	**140**	***Nicolas Lambricht***	**TOWARDS A BETTER ASSESSMENT OF PATIENTS WITH ANTERIOR CRUCIATE LIGAMENT INJURY USING SMARTPHONE VIDEOS AND MULTIBODY DYNAMICS** *Nicolas Lambricht; Christine Detrembleur; Laurent Pitance; Paul Fisette*
12:40	**148**	***AliAsghar MohammadiNasrabadi***	**A MULTIBODY PREDICTIVE DYNAMIC MODEL TO OPTIMIZE ACETABULAR CUP ORIENTATION IN TOTAL HIP ARTHROPLASTY SURGERY CONSIDERING DIFFERENT SPINE STIFFNESS** *AliAsghar MohammadiNasrabadi; John McPhee*

Parallel SESSION 14C		Friday, July 28 • 11:40 - 13:00	
ROOM **02.1**	CHAIR ***Olivier Bauchau***	TOPIC 06 > SESSION 09 **FLEXIBLE MULTIBODY DYNAMICS**	
TIME	ID	PRESENTING AUTHOR	TITLE
11:40	**43**	***Paul Wasmer***	**THE GEOMETRICALLY EXACT BEAM MODEL WITH A NORMALIZED QUATERNION DISCRETIZATION** *Paul Wasmer; Peter Betsch*
12:00	**75**	***Shilei Han***	**CONFIGURATIONAL FORCES AND ALE FORMULATION FOR GEOMETRICALLY EXACT, SLIDING BEAMS AND SHELLS IN NON-MATERIAL DOMAINS** *Shilei Han; Olivier A. Bauchau*
12:20	**97**	***Muhannad Hawwash***	**BENDING AND TORSION OF TWISTED CABLE STRANDS ACCOUNTING FOR THE EFFECT OF FRICTION** *Muhannad Hawwash; Vanessa Dörlich; Joachim Linn*
12:40	**149**	***Paolo Gioviti***	**INTEGRATION OF FLEXIBLE MULTIBODY SYSTEMS DYNAMICS AND VIRTUAL COMMISSIONING SIMULATIONS OF A MACHINE TOOL** *Paolo Gioviti; Alberto Martini; Nicolò Vincenzi; Marco Troncossi*

Parallel SESSION 14D		Friday, July 28 • 11:40 - 13:00	
ROOM **02.2**	CHAIR ***Michael Valasek***	TOPIC 08 > SESSION 09 **MECHATRONICS, ROBOTICS AND CONTROL**	
TIME	ID	PRESENTING AUTHOR	TITLE
11:40	**169**	***Michael Pieber***	**KINEMATIC DESIGN OF TETRAHEDRAL CELLS FOR PROGRAMMABLE MATTER** *Michael Pieber; Johannes Gerstmayr*
12:00	**100**	***Lauri Pyrhönen***	**SYSTEM IDENTIFICATION AND END-EFFECTOR FORCE ESTIMATION OF AN OPEN-CHAIN ROBOTIC MANIPULATOR USING A MULTIBODY FORMULATION** *Lauri Pyrhönen; Aki Mikkola; Frank Naets*
12:20	**105**	***Jonghyun Kim***	**TOWARD A SIMPLE IMPLEMENTATION OF ROBUST IMPEDANCE CONTROL FOR ROBOT MANIPULATO** *Jonghyun Kim; Yongjin Jo; Sohyun Moon*
12:40	**74**	***Stefan Caldararu***	**A CASE STUDY IN THE SIM TO REAL GAP WHEN DESIGNING PID AND MPC CONTROLLERS IN SIMULATION** *Harry Zhang; Stefan Caldararu; Thomas Hansen; Shouvik Chatterjee; Nevindu Batagoda; Ishaan Mahajan; Sriram Ashokkumar; Aaron Young; Luning Fang; He Shen; Xiangru Xu; Dan Negrut; Abhiraj Dashora*

13:00	**CLOSING CEREMONY >** ROOM MA
13:15 - 14:30	Lunch