

Master Schedule of APISTVS 2018

(New Miyako Hotel, Kyoto, Japan)

Tuesday, July 10

13:00 - 17:50	Board of Directors Meeting	Room Yasaka
15:00 - 17:50	Registration	Room Uji
18:00 - 20:00	Ice-Breaker Party	Room Yomeiden West

Wednesday, July 11

8:00 -	Registration	Room Uji
9:00 - 9:20	Opening Ceremony	Room Yomeiden East
9:20 - 9:40	ISTVS RI, Technical Visit Info	Room Yomeiden East
9:40 - 10:40	Keynote Address	Room Yomeiden East
10:40 - 11:10	Coffee Break	Room Suehiro
11:10 - 12:30	Parallel Session	
	<i>Session 1: Terramechanics, terrain/soil-wheel/tire/track interaction, modeling and characterization (1)</i>	Room Yasaka
	<i>Session 2: Advances in mobility, energy transfer, efficiency, ground vehicle dynamics, safety (1)</i>	Room Katsura
12:30 - 13:40	Lunch	Room Yomeiden West
13:40 - 15:00	Parallel Session	
	<i>Session 3: Terramechanics, terrain/soil-wheel/tire/track interaction, modeling and characterization (2)</i>	Room Yasaka
	<i>Session 4: Advances in mobility, energy transfer, efficiency, ground vehicle dynamics, safety (2)</i>	Room Katsura
15:00 - 15:30	Coffee Break	Room Suehiro
15:30 - 16:50	Parallel Session	
	<i>Session 5: Terramechanics, terrain/soil-wheel/tire/track interaction, modeling and characterization (3)</i>	Room Yasaka
	<i>Session 6: Land locomotion, off-road vehicles, operation snow and ice</i>	Room Katsura
18:00 - 20:30	Banquet	Room Yomeiden West

Thursday, July 12

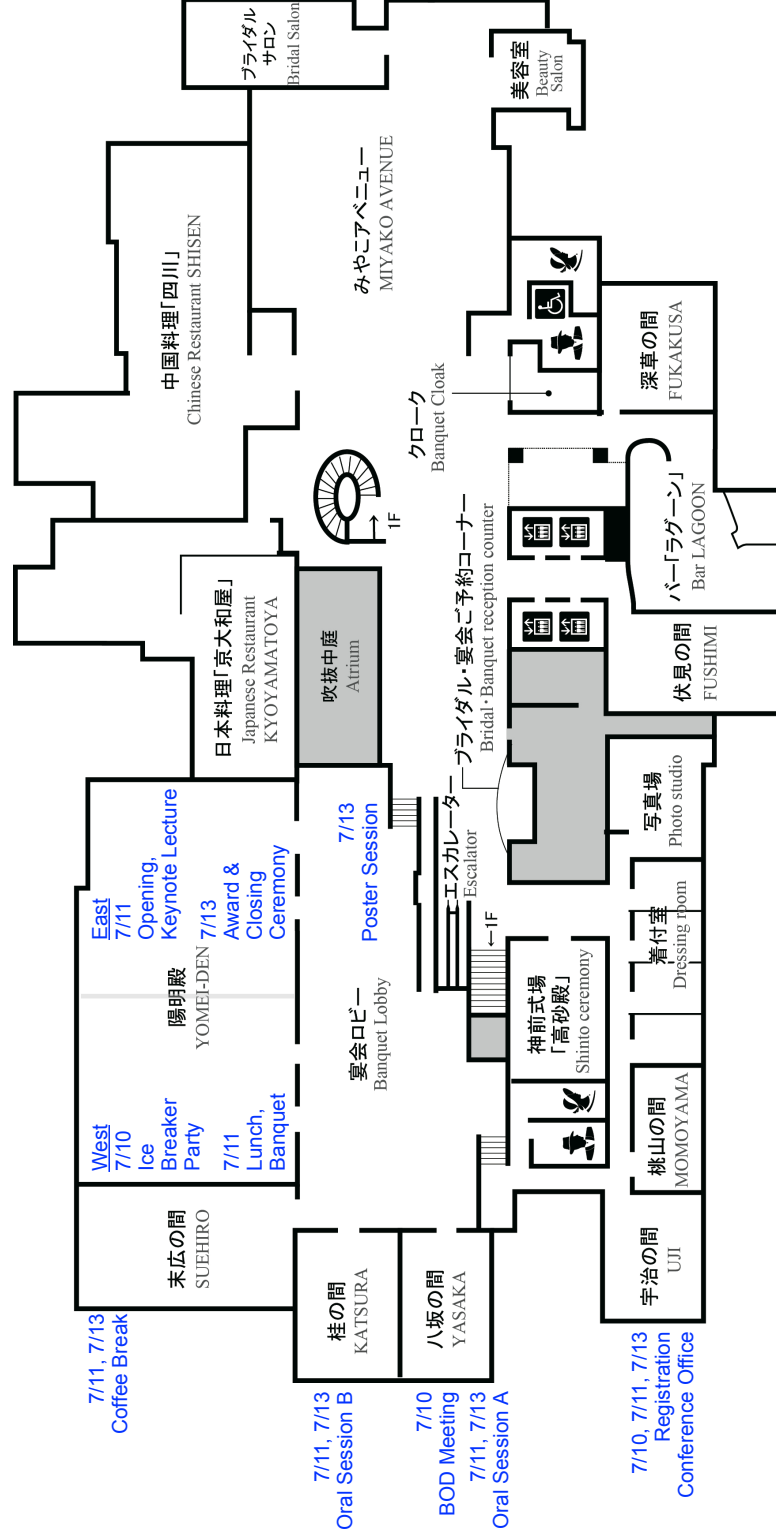
8:00	Meeting at Lobby of New Miyako Hotel
8:15	Departure to Technical Visit
17:00	Return to New Miyako Hotel

Friday, July 13

8:30 -	Registration	Room Uji
9:00 - 10:20	Parallel Session	
	<i>Session 7: Terramechanics, terrain/soil-wheel/tire/track interaction, modeling and characterization (4)</i>	Room Yasaka
	<i>Session 8: Agricultural, forestry, construction and mining equipment and vehicles (1)</i>	
		Room Katsura
10:20 - 10:50	Coffee Break	Room Suehiro
10:50 - 12:10	Parallel Session	
	<i>Session 9: Mobile robotics for ground applications, planetary and exploration, other environments</i>	Room Yasaka
	<i>Session 10: Agricultural, forestry, construction and mining equipment and vehicles (2)</i>	Room Katsura
12:10 - 13:40	Lunch	
13:40 - 14:40	Poster Session (Core time)	B1 Banquet Lobby
14:40 - 16:00	Parallel Session	
	<i>Session 11: Innovative system designs for terrain and road-vehicle applications</i>	Room Yasaka
	<i>Session 12: Application of bionics engineering to terramechanics</i>	
		Room Katsura
16:00 - 16:30	Coffee Break	Room Suehiro
16:30 - 17:15	Closing Ceremony	Room Yomeiden East

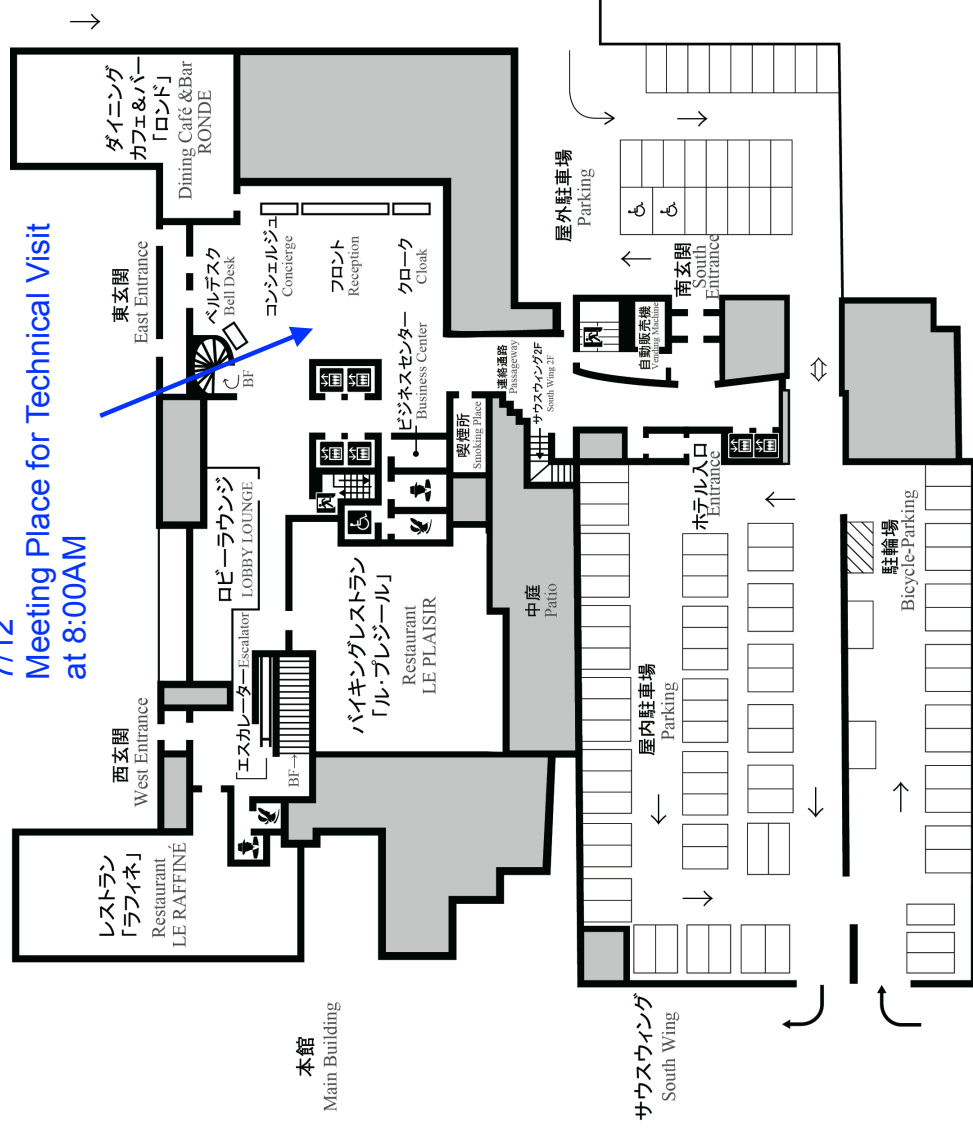
B1 Floor, New Miyako Hotel

Conference Rooms



1st Floor, New Miyako Hotel

7/12
Meeting Place for Technical Visit
at 8:00AM



Contents

Keynote Address	1
THE HISTORY OF BULLDOZER DEVELOPMENT AND TERRAMECHANICS	
Norihisa Matsumoto	
 Session 1: Terramechanics, terrain/soil-wheel/tire/track interaction, modeling and characterization (1)	2
TERRAMACHANICS ANALYSIS OF WHEEL WITH GROUSERS BASED ON EXTENDED RFT	
Hirotaka Suzuki, Kota Katsushima, Shingo Ozaki and Taizo Kobayashi	
DEVELOPMENT OF IN-TRACK SENSOR SYSTEM FOR THREE DIMENSIONAL MEASUREMENT OF PRESSURE DISTRIBUTION ON LOOSE SOIL	
Satoshi Ishibashi and Genya Ishigami	
PIV ANALYSIS OF SOIL DEFORMATION BENEATH A GROUSER WHEEL	
Yousuke Yamano, Kenji Nagaoka and Kazuya Yoshida	
MEASUREMENT OF FORCE ON THE TREAD OF A RIGID WHEEL TRAVELING ON LOOSE SANDY SOIL AND SAND MOTION IN THE VICINITY OF THE WHEEL SURFACE	
Junya Yamakawa and Ryosuke Eto	
 Session 2: Advances in mobility, energy transfer, efficiency, ground vehicle dynamics, safety (1)	5
GPS-BASED VEHICLE LATERAL ACCELERATION MEASUREMENT AND APPLICATIONS TO TERRAIN IMPACT AND STABILITY	
Paul Ayers and Ryan Carlile	
PREDICTED IMPACT FORCE ACTING ON ROPS OF OVERTURNING TRACTOR BY PHYSICS ENGINE	

Chaoran Sun, Hiroshi Nakashima, Hiroshi Shimizu,
Juro Miyasaka and Katsuaki Ohdoi

SEMI-ACTIVE SUSPENSION SWITCHING STRATEGIES ON OFF-ROAD
VEHICLES FOR ROLLOVER PREVENTION

Andries Peenze and Schalk Els

APPLICATION OF THREE-PORT MOTORS IN HYDROSTATIC TRANSMISSION
ARCHITECTURES FOR 4WD VEHICLES

Massimo Martelli, Silvia Gessi, Pietro Marani and Luca G. Zarotti

***Session 3: Terramechanics, terrain/soil-wheel/tire/track interaction,
modeling and characterization (2)*** ————— 8

WHEEL-TERRAIN INTERACTION MODEL OF FLEXIBLE METAL WHEEL FOR
PLANETARY ROVER ON DEFORMABLE TERRAIN

Song Wang, Meng Zou, Hongjian Gai and Wei Zong

IDENTIFICATION OF THE SHEAR PARAMETERS FOR REGOLITH BASED ON A
GA-BP NEURAL NETWORK

Hongjian Gai, Long Xue, Zhaolong Dang, Song Wang, Meng Zou

AN INTEGRATED PREDICTION MODEL FOR WHEEL-SOIL INTERACTION
UNDER MULTIPLE DRIVING CONDITIONS

Du Yonghao, Zhang Yuanchao, Gao Jingwei

SIMULATION TECHNIQUES AND MODELS FOR WHEEL-SOIL INTERACTION

László Kovács, Albert Peiret Gimenez, Daniel Holz,
Marek Teichmann and József Kövecses

***Session 4: Advances in mobility, energy transfer, efficiency, ground
vehicle dynamics, safety (2)*** ————— 10

STATE OBSERVERS: AN OVERVIEW AND APPLICATION TO AGILE TIRE
SLIPPAGE DYNAMICS

Vladimir Vantsevich, David Gorsich, Andriy Lozynskyy,
Lyubomyr Demkiv and Taras Borovets

INVESTIGATING THE PARAMETERIZATION OF MAGIC FORMULA TIRE MODEL
USING DATA FROM DYNAMIC TIRE-SOIL TESTS

Rui He, Corina Sandu and Javier E. Osorio

INFLUENCE OF TIRE INFLATION PRESSURE ON ESTIMATION OF RATING
CONE INDEX USING WHEEL SINKAGE

Joo Seon Oh, Ju Seok Nam, Kyeong Uk Kim and Young-Jun Park

***Session 5: Terramechanics, terrain/soil-wheel/tire/track interaction,
modeling and characterization (3)*** _____ 13

EXPERIMENTAL ANALYSIS OF CAMBER ANGLE EFFECT ON SLOPE
TRAVERSABILITY OF WHEELED MOBILE ROBOT

Ryota Matsumura and Genya Ishigami

VERIFICATION OF A TRACKED VEHICLE SIMULATION MODEL TRAVELING
OVER SOFT SOIL

Dror Rubinstein, Yaron Franco, Gilad Gat and Itzhak Shmulevich

DEVELOPMENT AND APPLICATION OF SLOPE TRAVELING MODEL FOR
CRAWLER VEHICLES

Hirokazu Kohara, Nobutaka Tsujiuchi, Akihito Ito,
Kohei Chikahisa and Hiroaki Ando

WHEELED SKID-STEER UGV MODELING: NEW STEERING INPUTS FOR
MOBILITY IMPROVEMENT

Siyuan Zhang, Mostafa A Salama and Vladimir V Vantsevich

Session 6: Land locomotion, off-road vehicles, operation snow and ice
_____ 16

STATIC AND DYNAMIC PARAMETERIZATION TEST RIGS FOR LARGE TYRES

Carl Becker and Schalk Els

A PREDICTION MODEL OF OFF-ROAD VEHICLE TRACTION DRIVING ON ICE

Yuanchao Zhang, Jingwei Gao, Yonghao Du, Qiao Li and Linxuan Zhou

TIRE-ICE TRACTION MODEL RESEARCH BASED ON FEM SECONDARY
DEVELOPMENT

Gao Jingwei, Zhang Yuanchao, Zeng Degui, and Suo Yanru

INTEGRATION OF ADVANCED TIRE-ICE INTERFACE MODEL INTO A BICYCLE
MODEL

Emilio Jimenez and Corina Sandu

***Session 7: Terramechanics, terrain/soil-wheel/tire/track interaction,
modeling and characterization (4)*** _____ 19

A STUDY OF THE MECHANICAL PROPERTIES OF THREE KINDS OF SOIL
BASED ON THE MOHR-COULOMB CONSTITUTIVE MODEL AND DRUCKER-
PRAGER CONSTITUTIVE MODEL

Jiangtao Yu, Lingjian Duanmu, Lidong Wang, Junwei Li,
Yunhai Ma and Jian Zhuang

DESIGN AND VALIDATION OF THE SIMULATION SYSTEM OF THE
INTERACTION BETWEEN TRACK AND SOFT GROUND WITH LOW MOISTURE
BY DEM

Zhang Xiang, Meng Xianggui, Du Yonghao and Zhang Yuanchao

DEM STUDY ON VERTICAL PLATE PENETRATION INTO DRY GRANULAR
MATERIALS (INFLUENCE OF PARTICLE SIZE)

Shinichiro Miyai, Murino Kobayakawa, Takuya Tsuji,
Masanori Sato, Kazuya Imamura and Toshitsugu Tanaka

DEM ANALYSIS OF INTERACTION BETWEEN DRY GRANULAR MATERIAL AND A
PLATE

Murino Kobayakawa, Shinichiro Miyai, Takuya Tsuji and Toshitsugu Tanaka

***Session 8: Agricultural, forestry, construction and mining equipment
and vehicles (1)*** _____ 22

FIELD MEASUREMENTS OF TRAFFICABILITY OF UNDERWATER GROUND

Mitsuru Yamada, Hiroki Kajita and Kennichi Fujino

EULERIAN CFD MODEL VALIDATION FOR DISCHARGE PROCESS OF A
DUMPER TRUCK

Cristian Ferrari, Nicolò Beccati and Massimo Martelli

STUDY ON ACQUISITION OF GROUND INFORMATION FOR EFFECTIVE
BUCKET EXCAVATION: MEASUREMENT OF GROUND SHAPE AFTER THE
EXCAVATION

Hiroshi Takahashi, Tomoharu Minato, Tomoaki Satomi, Shigeru Aoki,
Hiroshi Kanamori, Sachiko Wakabayashi and Takeshi Hoshino

EXPERIMENTAL ANALYSIS OF BUCKET-SOIL INTERACTION MECHANICS
USING SENSOR-EMBEDDED BUCKET TEST APPARATUS

Kenji Tsuchiya and Genya Ishigami

***Session 9: Mobile robotics for ground applications, planetary and
exploration, other environments*** _____ 25

DEVELOPMENT ON ESTIMATION OF CONE INDEX BY USING SOIL
EXCAVATION BUCKET

Tomoaki Satomi, Hiroshi Takahashi, Shigeru Aoki, Hiroshi Kanamori,
Sachiko Wakabayashi and Takeshi Hoshino

SHAPE EFFECTS OF WHEEL GROUSERS ON TRACTION PERFORMANCE ON
SANDY TERRAIN

Kenji Nagaoka, Kazumasa Sawada and Kazuya Yoshida

EXPERIMENTAL VALIDATION OF A SUPPORT FORCE SIMULATION IN DEEPER
SINKAGE FOR AN INCHING LOCOMOTION ROVER

Daisuke Fujiwara, Naoki Tsujikawa, Tomohiro Watanabe and Kojiro Iizuka

***Session 10: Agricultural, forestry, construction and mining equipment
and vehicles (2)*** _____ 27

IMPROVED OPERATOR COMFORT AND OFF-ROAD CAPABILITY THROUGH
PENDULUM ARM TECHNOLOGY

Olle Gelin, Fredrik Henriksen, Rolf Volungholen, Rolf Bjöheden

CONCEPT EVALUATIONS OF THREE NOVEL FORWARDERS FOR GENTLER
FOREST OPERATIONS

Olle Gelin and Rolf Björheden

THE EXCAVATION EFFICIENCY TEST BY USE OF A MULTISTAGE EDGE
EXCAVATION METHOD

Takahisa Shigematsu, Takuma Kawai, Shinichi Kawamura,
Yoshihiro Ohnishi, Noboru Oda and Kazumi Ryuo

STUDY ON CONSTRUCTION METHOD OF A HYBRID SOIL IMPROVEMENT
TECHNOLOGY

Yoichi Tanaka, Hiroki Kajita and Kenichi Fujino

Session 11: Innovative system designs for terrain and road-vehicle

applications

30

LUNAR BASE CONSTRUCTION TECHNOLOGIES DEVELOPED BY JAXA'S
SPACE EXPLORATION INNOVATION HUB CENTER

Sachiko Wakabayashi, Hiroshi Kanamori and Takeshi Hoshino

STUDY ON THE EFFECT OF WATER ON SOIL GRADATION AND ITS
CONSISTENCY BY USING IMAGE ANALYSIS TECHNIQUE

Shwetha Shivanna, Takaaki Yokoyama and Kazuyoshi Tateyama

IMPROVEMENT OF 3D CONTACT PATCH MEASUREMENT USING CAMERAS
INSIDE ROLLING TYRES

Filip Feldesi, Theunis R. Botha and P. Schalk Els

NEW CTPE SENSORS FOR TIRE MONITORING

Massimiliano Ruggeri and Andrea Vecchiattini

Session 12: Application of bionics engineering to terramechanics — 33

DESIGN OPTIMIZATION AND DRAG REDUCTION OF BIONIC SUBSOILER
THROUGH FEM SIMULATIONS

Jiyu Sun, Yueming Wang, Wei Wu, Yunhai Ma,
Jin Tong and Zhijun Zhang

RESEARCH ON THE REACTIVE CONTROL BASED ON THE VIRTUAL LEG
DYNAMICS FOR THE QUADRUPEL ROBOT

Peng Xu, Bo Su, Lei Jiang, Qichang Yao, Ruina Dang,
Wei Xu, Xingjie Liu, Yunfeng Jiang, Lindong Mu

BIONIC DESIGN AND TEST OF EXTRUDED HEAD BASED ON PANGOLIN
SCALES

Donghui Chen, Gang Long and Zhiyong Chang

Poster Session _____ 35

DEM ANALYSIS OF INTERACTION BETWEEN BLADE AND WOOD RUBBLE

Kota Katsushima and Shingo Ozaki

MEASURING THE LATERAL IMPACT ON ROPS DURING SIDEWAYS
OVERTURN

Mingtao Xiao, Chaoran Sun and Songlin Sun

EFFECT OF GROUSER SPACING ON TRACTIVE PERFORMANCE OF
GROUSER SHOE

Akira Yokoyama, Hiroshi Nakashima, Hiroshi Shimizu,
Juro Miyasaka and Katsuaki Ohdoi

DESIGN METHOD OF GEAR SPEED DISTRIBUTION AND TRANSMISSION
RATIO MATCHING FOR HIGH-POWERED TRACTOR

Donghui Chen, Jianhua Lv, Gang Long, Yuchen Zhang and Zhiyong Chang

3D DEM ANALYSIS OF LUGGED WHEEL PERFORMANCE USING OPEN
SOURCE SOFTWARE

Ryota Nakanishi, Hiroshi Nakashima, Hiroshi Shimizu,
Juro Miyasaka and Katsuaki Ohdoi

EFFECT OF SOIL MOISTURE CONTENT ON TRACTIVE PERFORMANCE OF A
SINGLE GROUSER SHOE IN TRACKED VEHICLE

Zhiqiang Xie, Xiulun Wang, Jun Ge and Chihiro Nishiyama

INVESTIGATION OF POSSIBILITIES OF USING THE MOBILE ROBOT GROUP
FOR COASTAL MONITORING

Pavel Beresnev, Dmitry Porubov, Valery Filatov, Dmitry Tyugin,
Andrey Kurkin and Denis Zeziulin

TERRAMECHANICS-BASED TRAVELING ANALYSIS OF MINING DUMP TRUCK

Tomoya Suzuki, Hirotaka Suzuki, Shingo Ozaki,
Shinya Kondo and Kouji Uematsu

International Program Committee

Dr. Ala-Ilomäki, Jari (Finland)
Dr. Ayers, Paul (USA)
Dr. Els, Schalk (South Africa)
Dr. Ivanov, Valentin (Germany)
Dr. Keen, Alex (United Kingdom)
Dr. Kim, Kyeong Uk (South Korea)
Dr. Kiss, Péter (Hungary)
Dr. Kobayashi, Taizo (Japan) *Secretary*
Dr. Kövecses, József (Canada)
Dr. Li, Jianqiao (P. R. China)
Dr. Nakashima, Hiroshi (Japan)
Dr. Prikner, Patrik (Czech Republic)
Dr. Richter, Lutz (Germany)
Dr. Rubinstein, Dror (Israel)
Dr. Sandu, Corina (USA)
Dr. Shoop, Sally (USA)
Dr. Tateyama, Kazuyoshi (Japan) *Chair*
Dr. Vantsevich, Vladimir V. (USA)
Dr. Wästerlund, Iwan (Sweden)
Dr. Yamakawa, Junya (Japan)
Dr. Yokoyama, Takaaki (Japan) *Secretary*

Local Organizing Committee

Mr. K. Fujino, Public Works Research Institute
Prof. R. Fukagawa, Ritsumeikan University
Mr. T. Hada, Obayashi Corporation
Dr. H. Kanamori, Shimizu Corporation
Prof. T. Kobayashi, Ritsumeikan University, *Secretary, Program Committee*
Dr. J. Miyasaka, Kyoto University, *General Secretary*
Mr. R. Miyamoto, Bridgestone Corporation, *Auditor*
Dr. H. Nakashima, Kyoto University, *Chair*
Dr. T. Okayasu, Kyushu University
Prof. H. Takahashi, Tohoku University
Prof. K. Tateyama, Ritsumeikan University, *Program Committee Chair*
Dr. Y. Tsukimoto, Sakai Heavy Industries Ltd.
Prof. J. Yamakawa, National Defense Academy
Dr. T. Yokoyama, Ritsumeikan University, *Secretary, Program Committee*

Conference Sponsors

Kyoto City, and the Kyoto Convention & Visitors Bureau
Rent All Scholarship Foundation
SAKAI HEAVY INDUSTRIES, LTD

Company's Exhibition

Tec Gihan Co., Ltd.  株式会社 テック技販 Tec Gihan Co., Ltd.