

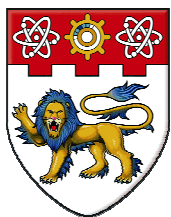
# 10th International Conference on Climbing and Walking Robots and the Supporting Technologies for Mobile Machines

**CLAWAR 2007**  
**Conference Guide**

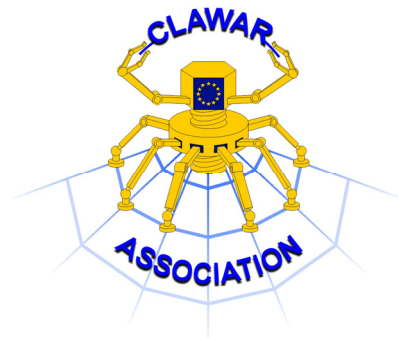


**16 to 18 July 2007**  
**Furama Riverfront, Singapore**

Organized by:



**NANYANG**  
**TECHNOLOGICAL**  
**UNIVERSITY**





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# CONTENT PAGE

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<b>Welcome Message</b>	.....	<b>1</b>
<b>Organizing Committee of CLAWAR 2007</b>	.....	<b>2</b>
<b>General Conference Information</b>	.....	<b>3 – 4</b>
<b>Venue Floor Plans</b>	.....	<b>5</b>
<b>Program Overview</b>	.....	<b>7</b>
<b>Plenary Talks</b>	.....	<b>9</b>
<b>Plenary Talk 1</b>	.....	<b>10</b>
<b>Plenary Talk 2</b>	.....	<b>11</b>
<b>Plenary Talk 3</b>	.....	<b>12</b>
<b>Plenary Talk 4</b>	.....	<b>13</b>
<b>Plenary Talk 5</b>	.....	<b>14</b>
<b>Program on 16 July 2007</b>	.....	<b>15 – 19</b>
<b>Program on 17 July 2007</b>	.....	<b>21 – 25</b>
<b>Program on 18 July 2007</b>	.....	<b>27 – 29</b>
<b>About Singapore</b>	.....	<b>30 – 32</b>
<b>Author Index</b>	.....	<b>33 – 36</b>



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## Welcome Message

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Robotics is an exciting field in engineering and natural sciences. Robotics has already made important widespread contributions and impact in industrial robots for tasks such as assembly, welding, painting, and material handling. In parallel, we have also witnessed the emergence of special robots which perform valuable jobs, in non-industrial environments such as in search and rescue, de-mining, surveillance, exploration, and security missions. Furthermore, research and development works are currently in progress in the robotics technology for use in the domestic and professional service sector. The emergence of mobile machines, such as climbing and walking robots, for these missions in un-structured environments, has significantly broadened challenges that must be considered by robotics research. This includes not only the technological and engineering aspects including standardization, but also socio-economic and ethical aspects.

CLAWAR 2007 is the tenth in a series of international conferences organized annually since 1998 with the aim to report on latest research and development findings and to provide a forum for scientific discussion and debate within the mobile service robotics community. The series has grown in its popularity significantly over the years, and has attracted researchers and developers from across the globe. The CLAWAR 2007 proceedings reports the latest scientific and developmental achievements, future challenges and exciting applications of mobile machines in general, and climbing and walking robots in particular, presented at the CLAWAR 2007 conference, held in Singapore during 16-18 July 2007, in eighty-six technical presentations by authors from 22 countries covering the five continents. The text of the proceedings is organized into five parts: Plenary Introduction, Advances in Climbing Robots, Advances in Walking Robots, Advances in Humanoid Soccer Playing Robots, and Supporting Technologies.

The editors would like to thank members of the International Programme Committee, International Technical Advisory/Organizing Committee and National Organizing Committee for their hard work in creating a well-run and productive meeting, for their efforts in reviewing the submissions, and to the authors in responding to comments and suggestions of the reviewers. It is hoped that this edition of the CLAWAR conference proceedings forms a valuable addition to the scientific and developmental knowledge in mobile robotics.

M. Xie  
S. Dubowsky  
J. G. Fontaine  
M. O. Tokhi  
G. S. Virk

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## Organizing Committee of CLAWAR2007

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Jean-Guy Fontaine (IIT, Italy)

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A. P. New, DSO, Singapore  
H. Y. Yu, DSO, Singapore

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## GENERAL CONFERENCE INFORMATION

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### Name Tag

The name tag is your identification to gain entry to all events of CLAWAR 2007 and MUST be worn at all times.

### Language

The official language of the conference is English.

### Registration and On-site Secretariat Opening Hours

Date	Opening Hours	Venue
16 July 2007	0800 – 1700 hrs	VIP Room, Level 3
17 July 2007	0830 – 1700 hrs	VIP Room, Level 3
18 July 2007	0830 – 1700 hrs	VIP Room, Level 3

### CLAWAR 2007 Secretariat

c/o Nanyang Technological University  
Conference Management Centre/CCE  
11 Slim Barracks Rise (off North Buona Vista Road)  
NTU@one-north campus, Executive Centre, #05-01  
Singapore 138664

Tel: +65 6790 4826

Fax: +65 6774 2911

Email: [clawar2007@ntu.edu.sg](mailto:clawar2007@ntu.edu.sg)

### Exhibition

Date	: 16 to 18 July 2007
Venue	: Foyer of Venus Ballroom
Opening Hours	: 0900 – 1700 hours

### Audio-visual Equipment

There will be a data projector, a pointer, a microphone, and a computer available in each presentation room. Please approach the conference helpers in the respective rooms to load your presentation slides.

### Lunches

Buffet lunches will be provided to all registered CLAWAR2007 participants on 16, 17, and 18 July 2007. Lunches will be served at Venus 2. Additional lunch tickets may be purchased at the price of S\$30.

### Social Functions

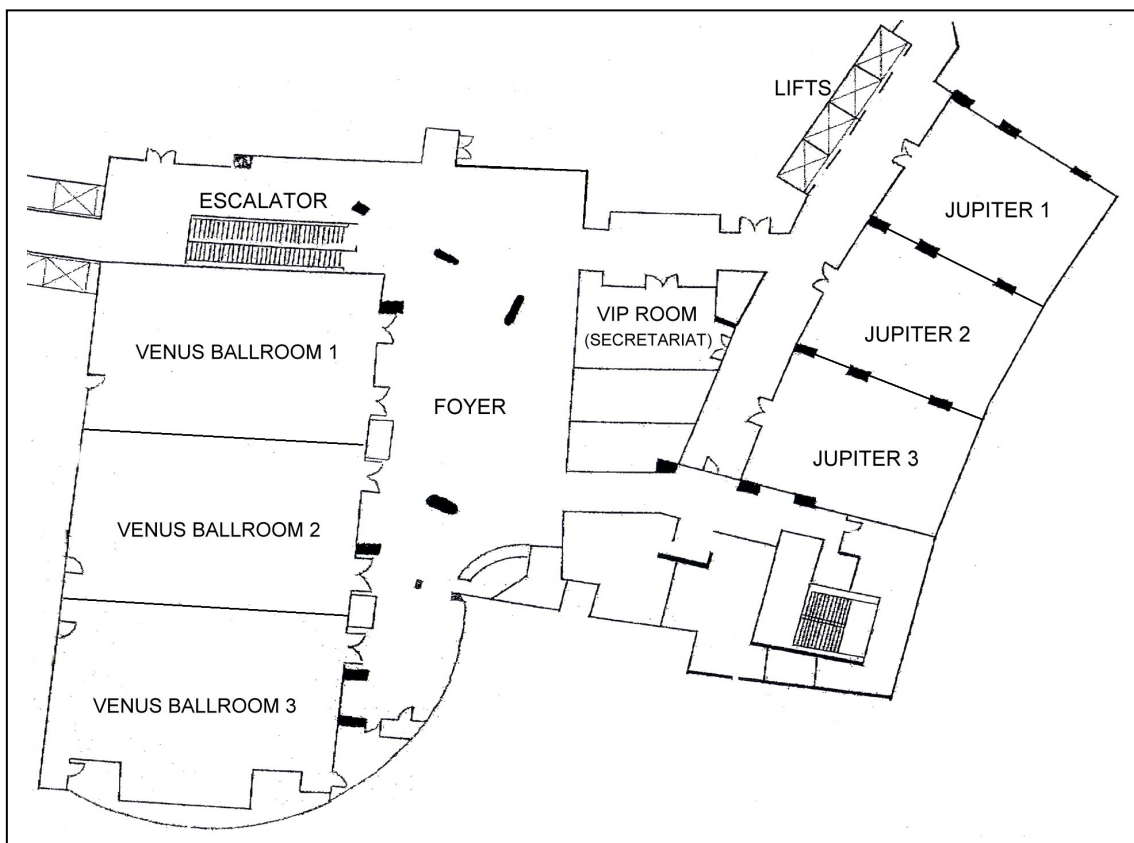
The conference awards banquet will be held in the Mercury Ballroom (Level 5, next to hotel's swimming pool) on 17 July between 18h30 and 20h30. Banquet tickets are issued to registered participants (full rate). Additional tickets could be purchased at the price of S\$100.

**Conference Venue**

Furama Riverfront Hotel  
405 Havelock Road  
Singapore 169633  
Main Tel: (65) 6333 8898  
Main Fax: (65) 6733 1588  
Email: [riverfront@furama.com](mailto:riverfront@furama.com)



## VENUE FLOOR PLANS



Secretariat Room	VIP Room	Level 3
Opening Ceremony	Venus Ballroom 1	Level 3
Plenary Sessions	Venus Ballroom 1	Level 3
Parallel Sessions	Venus Ballroom 1	Level 3
	Venus Ballroom 3	Level 3
Exhibition	Foyer of Venus Ballroom	Level 3
Tea breaks	Foyer of Venus Ballroom	Level 3
Luncheons	Venus Ballroom 2	Level 3
Conference Dinner	Mercury Ballroom	Level 5
Farewell Reception	Foyer of Venus Ballroom	Level 3

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## PROGRAM OVERVIEW

Time	16 July 2007 Monday		17 July 2007 Tuesday		18 July 2007 Wednesday	
8:30 – 8:45	<b>Opening Session</b> (Venus 1)		<b>Briefing Session</b> (Venus 1)		<b>Briefing Session</b> (Venus 1)	
8:45 – 9:30	<b>Plenary Talk 1</b> (Venus 1)		<b>Plenary Talk 2</b> (Venus 1)		<b>Plenary Talk 3</b> (Venus 1)	
9:30 – 10:00	Tea Break Foyer of Venus Ballroom		Tea Break Foyer of Venus Ballroom		Tea Break Foyer of Venus Ballroom	
10:00 – 12:40	<b>M11</b> Climbing Robots 1 (Venus 1)	<b>M12</b> Walking Robots 1 (Venus 3)	<b>T11</b> Walking Robots 2 (Venus 1)	<b>T12</b> Supporting Technologies 2 (Venus 3)	<b>W11</b> Walking Robots 3 (Venus 1)	
12:40 – 13:45	Lunch (Venus 2)		Lunch (Venus 2)		Lunch (Venus 2)	
13:45 – 14:30	<b>Plenary Talk 5</b> (Venus 1)		<b>Exhibition</b> (Foyer)		<b>Plenary Talk 4</b> (Venus 1)	
14:30 – 15:00	Tea Break Foyer of Venus Ballroom		Tea Break Foyer of Venus Ballroom		Tea Break Foyer of Venus Ballroom	
15:00 – 16:40	<b>M21</b> Supporting Technologies 1 (Venus 1)	<b>M22</b> Climbing Robots 2 (Venus 3)	<b>T21</b> Climbing Robots 3 (Venus 1)	<b>T22</b> Supporting Technologies 3 (Venus 3)	<b>W21</b> Humanoid Soccer Robots (Venus 1)	<b>W22</b> Supporting Technologies 4 (Venus 3)
16:40 – 17:40					16:40 – 17:40 Farewell Reception (Foyer)	
18:30 – 20:30	End of Day 1		<b>Awards Banquet</b> (Mercury Ballroom) (At Level 5)		End of Conference	
			End of Day 2			

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# Plenary Talks

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## PLENARY TALK 1

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### **Bipedal Humanoid Robot and Its Applications**

**Speaker: Professor Atsuo Takanishi**



Date: 16 July 2007

Time: 8h45 – 9h30

Venue: Venus 1

Session Chair: Osman Tokhi

### **ABSTRACT**

Even though the market size is still small at this moment, applied fields of robots are gradually spreading from the manufacturing industry to the others in recent years. One can now easily expect that applications of robots will expand into the first and the third industrial fields as one of the important components to support our society in the 21st century. There also raises strong anticipations in Japan that robots for the personal use will coexist with humans and provide supports such as the assistance for the housework, care of the aged and the physically handicapped, since Japan is one the fastest aging societies in the world. Consequently, humanoid robots and/or animaloid robots have been treated as subjects of robotics researches in Japan such as a research tool for human/animal science, an entertainment/mental-commit robot or an assistant/agent for humans in the human living environment. Over the last couple of years, some manufactures including famous global companies started to develop prototypes or even to sell mass production robots for the purposes mentioned above, such as SONY, TMSUK, ZMP, TOYOTA, HONDA, etc. Most of those robots have two legs for its mobility. On the other hand, Waseda University, where we belong to, has been one of the leading research sites on bipedal walking robot and humanoid robot research since the late Prof. Ichiro Kato and his colleagues started the WABOT (WAseda roBOT) Projects and developed the historical humanoid robots that are WABOT-1 and WABOT-2 done in the early 70s and 80s respectively. One of the most important aspects of our research philosophy is as follows: By constructing anthropomorphic/humanoid robots that function and behave like a human, we are attempting to develop a design method of a humanoid robot having human two legs to coexist with humans naturally and symbiotically, as well as to scientifically build not only the physical model of a human but also the mental model of it from the engineering view point. Based upon the philosophy, I and my colleagues have been doing researches on bipedal humanoid robots. In my plenary speech I will introduce the research philosophy of bipedal humanoid robotics, the design and the control of the robots and its applications collaborating with robotics companies.

### **ABOUT**

ATSUO TAKANISHI is a Professor of the Department of Mechanical Engineering, Waseda University and a concurrent Professor and one of the core members of the HRI (Humanoid Robotics Institute), Waseda University. He received the B.S.E. degree in 1980, the M.S.E. degree in 1982 and the Ph.D. degree in 1988, all in Mechanical Engineering from Waseda University.

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## PLENARY TALK 2

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**Climbing up the Wall**  
**Speaker: Professor John Billingsley**



Date: 17 July 2007  
Time: 8h45 – 9h30  
Venue: Venus 1  
Session Chair: Gurvinder Virk

### ABSTRACT

A move to inland Australia meant leaving the industrial stimulus of Portsmouth, where walking robots could be sold to the nuclear industry, and concentrating more on agricultural applications. Nevertheless a ceiling runner was successfully developed here (and shown on UK TV) and research is making strides on several other walking projects.

One impetus for precise vision guidance of tractors is the concept of 'controlled traffic', minimising the compressive 'footprint' of the vehicle on the growing zone. Could legged agricultural implements improve on best performance? Australian methods differ in ways that could make them more attractive than in Europe.

### ABOUT

JOHN BILLINGSLEY graduated in mathematics and in electrical engineering from Cambridge University in 1960. After four years working in the aircraft industry on autopilot design, he returned to Cambridge and gained a PhD in control theory in 1968. He led research teams in Cambridge University developing early 'mechatronic' systems including a laser phototypesetting system which was the precursor of the laser printer and the 'acoustic telescope' which enabled sound source distributions to be visualised (this was used in the development of jet engines with reduced noise). He moved to Portsmouth Polytechnic in 1976, where he founded the Robotics Research Group. The results of the Walking Robot unit led to the foundation of Portech Ltd, which for many years supplied systems to the nuclear industry for inspection and repair of containment vessels. Other units in the Robotics group gained substantial funding for research in quality control and in the integration of manufacturing systems with the aid of transputers.

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## PLENARY TALK 3

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### From Micro to Nano and Swarm Robots Speaker: Professor Heinz Woern



Date: 18 July 2007

Time: 8h45 – 9h30

Venue: Venus 1

Session Chair: Jean-Guy Fontaine

#### ABSTRACT

Current research in Micro, Nano and Swarm Robots and results of the European projects MINIMAN, MICRON and I-SWARM will be presented. First, the design and the control of 5 to 10 cm<sup>3</sup> sized mobile-microrobots with five degrees of freedom will be shown. They can handle miniaturized parts as for example an optical component or a biological cell with a size in the micrometre-area with an accuracy of 100nm under a microscope or a raster-electron microscope. Second, the design and the control of a 1 cm<sup>3</sup>-sized mobile untethered microrobot will be demonstrated. Here, the robot consists of five parts: the Piezzo locomotion module, the micro control unit, the communication unit, the navigation system and the micro gripper. The mobile robot can be guided and positioned in an arena with an accuracy of 5 micrometres and can be programmed and controlled over the wireless communication unit. Third, the design and the control of 9 mm<sup>3</sup> sized micro-/nanorobots with 3 degrees of freedom will be presented. The transmission of energy and the communication between the robots is realized via infrared. The robot controller is fully integrated and has limited functionalities. Via basic sensors communication functions and elementary rules and behaviours the microrobot can act in a swarm consisting of hundreds and thousands of robots. Future applications could be monitoring-, inspection-, exploring-tasks etc. of big areas or objects. Principal methods for swarm control, self-organization and collective behaviour of such an "insect-like swarm" will also be shown.

#### ABOUT

Prof. Woern was born in 1948 and studied electronic engineering at the University of Stuttgart. He did his Phd thesis on "multi processor control systems". He is an expert on robotics and automation with 18 years of industrial experience. In 1997 he became Professor at the University of Karlsruhe for "Complex Systems in Automation and Robotics" and also head of the Institute for Process Control and Robotics at the University of Karlsruhe. Prof. Woern lead a group of about 35 scientists research in the field of robotics and the work focused on the areas of industrial robots, humanoid robots, medicine robots, micro and swarm robots.



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## PLENARY TALK 4

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### **Climbing Robots for Nondestructive Testing: Historical Perspective and Future Trends Speaker: Professor Bryan Bridge**



Date: 18 July 2007  
Time: 13h45 – 14h30  
Venue: Venus 1  
Session Chair: Ming Xie

#### **ABSTRACT**

It is perhaps not well known that mobile robots were already deployed in Nondestructive Testing (NDT) in the early 1970's, well before fixed robots came into use on manufacturing plant. The need for NDT robots first arose with the growth in exploitation of the world's oil and gas supplies. Vast lengths of pipeline are involved in transporting these supplies from source to multiple destinations. Sediment and chemicals in the unrefined products cause rapid inner wall thinning from both erosion and chemical attack. Pipe rupture at just one point, anywhere along a pipe can cause a major environmental disaster so there was always a need to inspect complete lengths of long runs of pipe. The handling of inspection sensors by human operators would thus always involve vast and costly numbers of personnel. This situation begged for sensor handling by mobile robot. A second reason for robotic deployment arose from the fact that many pipelines were buried underground, under concrete or ran along the sea bed before rising to the surface (risers). Human placement of sensors is impossible in these cases.

#### **ABOUT**

Professor Bryan Bridge was born in 1941 and graduated in physics at the University of Leeds, where he also was a research student in low temperature physics. From 1965 until 1989 he was successively assistant lecturer, lecturer and Senior Lecturer in Physics at Brunel University. In 1989 he became Professor of Electrical and Electronic Engineering and Head of the Department of the same name at the now London South Bank University. Subsequently he became in turn, Head of the School of Electrical, Electronic and Information Engineering, The School of Engineering and Deputy Dean of the Faculty of Engineering, Science and Technology until 2003. Since then he devoted all his working time to personal research and research management.

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## PLENARY TALK 5

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**A Road from Walking Machines to Surgical Robots: Digital Mechatronics**  
**Speaker: Professor Steven Dubowsky**



Date: 16 July 2007  
Time: 13h45 – 14h30  
Venue: Venus 1  
Session Chair: Kenneth J. Waldron

### ABSTRACT

Digital mechatronic devices approximate the motion of continuous mechanisms by using a larger numbers of binary Degrees-of-Freedom. Digital mechatronic devices have excellent repeatability, are reliable, robust and are simple to control. Artificial muscle actuators that are made of elastomers are ideally suited digital mechatronic devices. These actuators have unique properties such as very large strain and large forces. They are light and inexpensive.

In the work presented here digital mechatronic systems were first considered for planetary exploration walking robots. This study has lead to the development of surgical robots that can function effectively inside of MRI systems with important medical benefits.

### ABOUT

Dr. Dubowsky is a Professor Departments in the Department of Mechanical Engineering and the Department of Aeronautics and Astronautics at the Massachusetts Institute of Technology, Cambridge, Massachusetts. He is the director of MIT Field and Space Robotics Laboratory (<http://robots.mit.edu/>).. He is the Principal Investigator of a number of research programs sponsored by organizations that include DARAP, NASA, The US Navy, The Center For the Integration of Medicine and Innovative Technology, industry, the Japanese Space Agency and the British government. The research of these programs focus on the design and control of robotic systems. Dr. Dubowsky has published over 300 technical and he is a Fellow of the ASME and of the IEEE.

**Program on 16 July 2007  
Monday**

## Monday, 16 July 2007, Morning

8:30 – 8:45	<b>Opening Address, Venus 1, Level 3</b>	
8:45 – 9:30	<b>Plenary Talk 1</b> <b>Bipedal Humanoid Robot and Its Applications by Professor Atsuo Takanishi</b> Session Chair: Osman Tokhi Venue: Venus 1, Level 3	
9:30 – 10:00	Tea Break, Foyer of Venus, Level 3	
<b>10:00 – 12:40</b>	<b>M11 Session: Climbing Robots (1)</b> <b>Session Chair: Osman Tokhi</b> <b>Venue: Venus 1, Level 3</b>	<b>10:00 – 12:40</b> <b>M12 Session: Walking Robots (1)</b> <b>Session Chair: Atsuo Takanishi</b> <b>Venue: Venus 3, Level 3</b>
<b>10:00 – 10:20</b>	A SLIDING SOCK LOCOMOTION MODULE FOR A RESCUE ROBOT  (Luca Rimassa, Matteo Zoppi and Rezia Molfino)	<b>10:00 – 10:20</b>  USING VIRTUAL MODEL CONTROL AND GENETIC ALGORITHM TO OBTAIN STABLE BIPEDAL WALKING GAIT THROUGH OPTIMIZING THE ANKLE TORQUE  (Van-Huan Dau, Chee-Meng Chew and Aun-Neow Poo)
<b>10:20 – 10:40</b>	ROBOTRAIN AS SNAKELIKE ROBOTIC SYSTEM WITH MINIMAL NUMBER OF DOF  (Vladimir Pavlovsky, Natalia Petrovskaya, Vladimir Evgrafov and Vladimir Pavlovsky, Jr)	<b>10:20 – 10:40</b>  THINKING ABOUT BOUNDING AND GALLOPING USING SIMPLE MODELS  (Kenneth Waldron, Joaquin Estremera, Paul Csonka and Surya Singh)
<b>10:40 – 11:00</b>	DEVELOPMENT OF A CLIMBING ROBOT FOR WELD INSPECTION  (Jianzhong Shang, Bryan Bridge, Tariq Sattar, Shymal Mondal and Alina Brenner)	<b>10:40 – 11:00</b>  RESEARCH ON UNDERACTUATED DYNAMICAL WALKING OF 3D BIPED ROBOT  (Sheng Tao and Ma Hongxu)
<b>11:00 – 11:20</b>	DESIGN OF A NEW LEG MECHANISM FOR THE WHEELED WALL CLIMBING ROBOT  (Hejin Yang, Yili Fu, Zhihai Li and Shuguo Wang)	<b>11:00 – 11:20</b>  MOVEMENT SIMULATION FOR MERO MODULAR WALKING ROBOT  (Ion Ion, Ion Simionescu, Adrian Curaj and Alexandru Marin)
<b>11:20 – 11:40</b>	INTELLIGENT SPIDER WALKING ROBOT FOR ROUGH TERRAIN  (Michael McCready, Liqiong Tang and Gurvinder Singh Virk)	<b>11:20 – 11:40</b>  DETECTING SOUND SOURCES WITH THE HUMANOID ROBOT RH-1  (Pavel Staroverov, Ricardo Martinez, Dmitry Kaynov, Mario Arbulu, Luis Cabas and Carlos Balaguer)
<b>11:40 – 12:00</b>	ON THE DESIGN OF A FOUR-BAR MECHANISM FOR OBSTACLES CLIMBING WHEELS  (Antonio González, Erika Ottaviano and Marco Ceccarelli)	<b>11:40 – 12:00</b>  CONSTRAINT BASED TRAJECTORY SIMPLIFICATION OF FULL BODY TRAJECTORIES FOR A WALKING ROBOT  (Hanns Tappeiner and Alfred Rizzi)

<p><b>12:00 – 12:20</b></p> <p>THE CONTROL OF QUADRUPED WALKING ROBOT BASED ON BIOLOGICALLY INSPIRED APPROACH</p> <p>(Choi Hyouk Ryeol, Kang Tae Hun, Koo Ig Mo and Song Young Kuk)</p>	<p><b>12:00 – 12:20</b></p> <p>DESIGN AND PROBLEMS OF A NEW LEG-WHEEL WALKING ROBOT</p> <p>(Cristina Tavolieri, Erica Ottaviano, Marco Ceccarelli and Andrea Nardelli)</p>
<p><b>12:20 – 12:40</b></p> <p>SERVICING SOLAR POWER PLANTS WITH WALLWALKER</p> <p>(Ridha Azaiz)</p>	<p><b>12:20 – 12:40</b></p> <p>A PROPOSAL FOR BIPEDAL LOCOMOTION USING GYROSCOPIC EFFECT</p> <p>(Pulkit Kapur, Rahul Mukhi and Vinayak)</p>
<p>12:40 – 13:45   Lunch, Venus 2, Level 3</p>	

## Monday, 16 July 2007, Afternoon

<b>13:45 – 14:30</b>	<b>Plenary Talk 5:</b> <b>A Road from Walking Machines to Surgical Robots: Digital Mechatronics by Professor Steven Dubowsky</b> Session Chair: Kenneth J. Waldron Venue, Venus 1, Level 3	
14:30 – 15:00	Tea Break, Foyer of Venus, Level 3	
<b>15:00 – 17:40</b>	<b>M21 Session: Supporting Technologies (1)</b> <b>Session Chair: Giovanni Muscato</b> <b>Venue: Venus 1, Level 3</b>	<b>15:00 – 17:40</b> <b>M22 Session: Climbing Robots (2)</b> <b>Session Chair: Manuel Armada</b> <b>Venue: Venus 3, Level 3</b>
<b>15:00 – 15:20</b>	A MODULAR APPROACH FOR CONTROLLING MOBILE ROBOTS  (Kristian Regenstien, Thilo Kerscher, Clemens Birkenhofer, Tamim Asfour, J. Marius Zöllner and Rüdiger Dillmann)	<b>15:00 – 15:20</b>  KINEMATICS, SENSORS AND CONTROL OF THE FULLY AUTOMATED FACADE CLEANING ROBOT SIRIUSC FOR THE FRAUNHOFER HEADQUARTERS BUILDUNG, MUNICH  (Norbert Elkmann, Mario Lucke, Tino Krüger and Thomas Stürze)
<b>15:20 – 15:40</b>	AN APPROACH TO GLOBAL LOCALIZATION PROBLEM USING MEAN SHIFT ALGORITHM  (Giovanni Muscato and Salvatore Sessa)	<b>15:20 – 15:40</b>  GAIT PARAMETER ADAPTATION TO ENVIRONMENTAL PERTURBATIONS IN QUADRUPEDAL ROBOTS  (Elena Garcia, Joaquin Estremera, Pablo Gonzalez de Santos and Manuel Armada)
<b>15:40 – 16:00</b>	CREATING A GESTURE RECOGNITION SYSTEM BASED ON SHIRT SHAPES  (Pavel Staroverov, Silvia Marcos, Dmtry Kaynov, Mario Arbulu, Luis Cabas and Carlos Balaguer)	<b>15:40 – 16:00</b>  ON FOUR LEGS TOWARDS FLEXIBLE AND FAST LOCOMOTION  (Cem Kara, Christian Heckhoff, Thorsten Brandt and Dieter Schramm)
<b>16:00 – 16:20</b>	DESIGNING OF A COMMAND SHAPER USING MULTI-OBJECTIVE PARTICLE SWARM ALGORITHM FOR VIBRATION CONTROL OF A SINGLE-LINK FLEXIBLE MANIPULATOR SYSTEM  (M. S. Alam, M. O. Tokhi and M. A. Hossain)	<b>16:00 – 16:20</b>  PATH PLANNING FOR THE "3DCLIMBER"  (Mahmoud Tavakoli, Lino Marques and Aníbal T. de Almeida)
<b>16:20 – 16:40</b>	PERFORMANCE METRICES FOR IMPROVING HRI  (Yiannis Gatsoulis and Gurvinder Singh Virk)	<b>16:20 – 16:40</b>  TERRAIN-ADAPTIVE LOCOMOTION OF A WHEEL-LEGGED SERVICE ROBOT USING ACTUATOR-BASED FORCE MEASUREMENTS  (Petri Virekoski and Ilkka Leppänen)
<b>16:40 – 17:00</b>	SPARBOT – A ROBOTIC FOCUS MITT TRAINING PLATFORM  (Richard Stokes, Liqiong Tang and Ibrahim A. Al-Bahadly)	<b>16:40 – 17:00</b>  DEVELOPMENT OF AN AMPHIBIOUS HEXAPOD ROBOT BASED ON A WATER STRIDER  (Soh Fujii and Taro Nakamura)

<p><b>17:00 – 17:20</b></p> <p>PARALLEL PARTICLE SWARM OPTIMIZATION FOR NETWORKED CLAWAR SYSTEM COOPERATION</p> <p>(Fabio P. Bonsignorio)</p>	<p><b>17:00 – 17:20</b></p> <p>A WHEELED WALL-CLIMBING ROBOT WITH TWO CLIMBING LEGS</p> <p>(Zhihai Li, Yili Fu, Hejin Yang and Shuguo Wang)</p>
<p><b>17:20 – 17:40</b></p> <p>GA TUNED COLSED-LOOP CONTROL OF SPRING BRAKE ORTHOSIS</p> <p>(M S Huq, R Massoud, M S Alam and M O Tokhi)</p>	<p><b>17:20 – 17:40</b></p> <p>A CPG WITH FORCE FEEDBACK FOR A STATICALLY STABLE QUADRUPED GAIT</p> <p>(Jose Cappelletto, Pablo Estevez, Gerardo Fernandez-Lopez and Juan Carlos Grieco)</p>
<p>End of Day 1</p>	

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**Program on 17 July 2007  
Tuesday**

## Tuesday, 17 July 2007, Morning

8:30 – 8:45	Briefing Session, Venus 1, Level 3	
8:45 – 9:30	<b>Plenary Talk 2:</b> <b>Robots Walking Down Under by Professor John Billingsley</b> Session Chair: Gurvinder Virk Venue: Venus 1, Level 3	
9:30 – 10:00	Tea Break, Foyer of Venus, Level 3	
<b>10:00 – 12:40</b>	<b>T11 Session: Walking Robots (2)</b> <b>Session Chair: John Billingsley</b> <b>Venue: Venus 1, Level 3</b>	<b>10:00 – 12:40</b> <b>T12 Session: Supporting Technologies (2)</b> <b>Session Chair: Gurvinder Virk</b> <b>Venue: Venus 3, Level 3</b>
<b>10:00 – 10:20</b>	A HOPPING MOBILITY CONCEPT FOR A ROUGH TERRAIN SEARCH AND RESCUE ROBOT  (Steven Dubowsky, Jean-Sebastien Plante, Sam Kesner and Penny Boston)	<b>10:00 – 10:20</b>  THE IMPROVEMENT OF STRUCTURAL AND REAL TIME CONTROL PERFORMANCES FOR MERO MODULAR WALKING ROBOTS  (Ion Ion, Luige Vladareanu, Radu Munteanu jr. and Mihai Munteanu)
<b>10:20 – 10:40</b>	A STEP TOWARDS PNEUMATICALLY ACTUATED BIPED LOCOMOTION : A BIO INSPIRED PLATFORM FOR STIFFNESS CONTROL  (Giovanni Muscato and Giacomo Spampinato)	<b>10:20 – 10:40</b>  IMPROVING PNEUMATIC CYLINDER PERFORMANCE FOR LEGGED ROBOTICS  (Graham McLatchey and John Billingsley)
<b>10:40 – 11:00</b>	USING OPTIMIZATION TECHNIQUES FOR THE DESIGN AND CONTROL OF FAST BIPEDS  (Tobias Luksch, Karsten Berns, Katja Mombaur and Gerrit Schultz)	<b>10:40 – 11:00</b>  INTEGRATED INTELLIGENT MECHROBOT SYSTEM  (Liqiong Tang and Gurvinder Singh Virk)
<b>11:00 – 11:20</b>	POSTURAL STABILITY CONTROL FOR ROBOT-HUMAN COOPERATION FOR SIT-TO-STAND ASSISTANCE  (Viviane Pasqui, Ludovic Saintbauzel and Philippe Bidaud)	<b>11:00 – 11:20</b>  MOTION ESTIMATION AND SELF-LOCALIZATION BASED ON COMPUTER VISION AND ARTIFICIAL MARKER DEPOSITION  (Savan Chaniyara, Kaspar Althoefer and Lakmald Seneviratne)
<b>11:20 – 11:40</b>	TRAJECTORY GENERATOR FOR RHYTHMIC MOTION CONTROL OF ROBOT USING NEURAL OSCILLATORS  (Weiwei Huang, Chee-Meng Chew, Geok-Soon Hong and Nithya Gnanassegarane)	<b>11:20 – 11:40</b>  SOFTWARE AND COMMUNICATION INFRASTRUCTURE DESIGN OF THE HUMANOID ROBOT RH-1  (Dmitry Kaynov, Mario Arbulu, Pavel Staroverov, Luis Cabas and Carlos Balaguer)
<b>11:40 – 12:00</b>	LEG CONTROL FOR CHANGING LOCOMOTION BETWEEN LEG-TYPE AND WHEEL-TYPE BASED ON EFFECTIVE USE OF TOTAL POWER  (Tokuji Okada, Wagner Tanaka Botelho and Toshimi Shimizu)	<b>11:40 – 12:00</b>  SPRING-ORTHOSIS ASSISTED FES-CYCLING  (Rasha Massoud, Osman Tokhi and Shafiul Alam)

<p><b>12:00 – 12:20</b></p> <p>A BASIC VARIABLES SET BASED SCHEME OF ONLINE MOTION PLANNING FOR HUMANOID ROBOTS</p> <p>(Wang Jian, Sheng Tao and Ma Hongxu)</p>	<p><b>12:00 – 12:20</b></p> <p>HIL/SIL BY DEVELOPMENT OF CLAWAR</p> <p>(Sergiy Dzhantimirov, Frank Palis, Ulrich Schmucker, Andriy Telesh and Yuriy Zavgorodniy)</p>
<p><b>12:20 – 12:40</b></p> <p>OPTIMIZED ROBOT DURING ELEVATION OF AN OBJECT: COMPARISON KNEE BENDING IMPRESSION</p> <p>(Hamed Ajabi Naeini and Mostafa Rostami)</p>	<p><b>12:20 – 12:40</b></p> <p>DESIGN AND DEVELOPMENT OF MICRO-GRIPPING DEVICES FOR MANIPULATION OF MICRO-PARTS</p> <p>(Z.W. Zhong, S.K. Nah and S.H. Tan)</p>
<p>12:40 – 13:45</p>	<p>Lunch, Venus 2, Level 3</p>

## Tuesday, 17 July 2007, Afternoon

13:45 – 14:30	<b>Exhibition, Foyer of Venus, Level 3</b>	
14:30 – 15:00	Tea Break, Foyer of Venus, Level 3	
<b>15:00 – 17:40</b>	<b>T21 Session: Climbing Robots (3)</b> Session Chair: Philippe Bidaud Venue: Venus 1, Level 3	<b>15:00 – 17:40</b> <b>T22 Session: Supporting Technologies (3)</b> Session Chair: Heinz Woern Venue: Venus 3, Level 3
<b>15:00 – 15:20</b>	STABILITY AND GAIT OPTIMIZATION OF A HYBRID LEGGED-WHEELED ROVER  (Byron Johns and Ayanna Howard)	<b>15:00 – 15:20</b> IN SEARCH OF PRINCIPLES OF ODOUR SOURCE LOCALISATION  (Endre Kadar, Gurvinder Virk and Christodoulos Lytridis)
<b>15:20 – 15:40</b>	DEVELOPMENT OF A SEALING SYSTEM FOR A CLIMBING ROBOT WITH UNDERPRESSURE ADHESION  (Carsten Hillenbrand, Daniel Schmidt, Karsten Berns, Tim Leichner, Tobias Gastauer and Bernd Sauer)	<b>15:20 – 15:40</b> MCA2 - AN EXTENSIBLE MODULAR FRAMEWORK FOR ROBOT CONTROL APPLICATIONS  (Klaus Uhl and Marco Ziegenmeyer)
<b>15:40 – 16:00</b>	AUTONOMOUS CLIMBING MOTIONS FOR CONNECTED CRAWLER ROBOTS  (Sho Yokota, Yasuhiro Ohyama, Hiroshi Hashimoto, Jin-Hua She, Kuniaki Kawabata, Hisato Koabayashi and Pierre Blazevic)	<b>15:40 – 16:00</b> REAL-TIME COMPUTATIONAL COMPLEXITY OF THE ALGORITHMS FOR A SINGLE LINK MANIPULATOR SYSTEM  (M A Hossain, N H Siddique, M O Tokhi and M S Alam)
<b>16:00 – 16:20</b>	AN EVOLVED NEURAL NETWORK FOR FAST QUADRUPEDAL LOCOMOTION  (Irene Markelic and Keyan Zahedi)	<b>16:00 – 16:20</b> A NOVEL MINIATURE ATTITUDE MEASUREMENT SYSTEM FOR CLIMBING AND WALKING ROBOTS  (Guanglong Wang, Chunxi Zhang, Zhaoying Zhou and Rong Zhu)
<b>16:20 – 16:40</b>	DEVELOPMENT OF AN OMNI-DIRECTIONAL MOBILE ROBOT BASED ON SNAIL LOCOMOTION  (Kuniaki Satou and Taro Nakamura)	<b>16:20 – 16:40</b> NEW STANDARDS FOR NEW ROBOTS  (Gurvinder Singh Virk)
<b>16:40 – 17:00</b>	ROBOT FOR MOTION IN TUBE  (Jatsun Sergey, Mishenko Vladimir and Jatsun Andrey)	<b>16:40 – 17:00</b> CONTACT PROCESSING IN THE SIMULATION OF CLAWAR  (Ulrich Schmucker, Vadym Rusin, Mykhaylo Konyev and Tamas Juhasz)

<p><b>17:00 – 17:20</b></p> <p>DESIGN AND CONSTRUCTION OF A ROPE CLIMBING ROBOT</p> <p>(Juan Pablo Martínez Esponda)</p>	<p><b>17:00 – 17:20</b></p> <p>A BIOLOGICALLY INSPIRED ARCHITECTURE FOR CONTROL OF GRASPING MOVEMENTS OF AN ANTHROPOMORPHIC GRIPPER</p> <p>(Sergio Varona Moya, Javier Molina Vilaplana, Alejandro Linares Barranco, Jorge Juan Feliu Battle and Juan Lopez Coronado)</p>
<p><b>17:20 – 17:40</b></p> <p>DEVELOPMENT OF A SUCTION TYPE MINIATURE CLIMBING ROBOT WITH MINIMAL ACTUATORS</p> <p>(Muthu veerappan Vignesh)</p>	<p><b>17:20 – 17:40</b></p> <p>A CONCURRENT PLANNING ALGORITHM FOR DUAL-ARM SYSTEMS</p> <p>(CHIEN-CHOU LIN, JEN-HUI CHUANG and TING-WEI CHAN)</p>
<p><b>18:30 – 20:30</b></p>	<p><b>Awards Banquet</b>  <b>Venue: Mercury Ballroom, Level 5 (next to hotel pool)</b></p> <p>End of Day 2</p>

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**Program on 18 July 2007  
Wednesday**

## Wednesday, 18 July 2007, Morning

8:30 – 8:45	Briefing Session, Venus 1, Level 3
8:45 – 9:30	<b>Plenary Talk 3 :</b> <b>From Micro to Nano and Swarm Robots by Professor Heinz Woern</b> Session Chair: Jean-Guy Fontaine Venue: Venus 1, Level 3
9:30 – 10:00	Tea Break, Foyer of Venus, Level 3
<b>10:00 – 12:40</b>	<b>W11 Session: Walking Robots (3)</b> Session Chair: Jean-Guy Fontaine Venue: Venus 1, Level 3
<b>10:00 – 10:20</b>	A SELF-ADJUSTING UNIVERSAL JOINT CONTROLLER FOR STANDING AND WALKING LEGS  (Axel Schneider, Björn Fischer, Holk Cruse and Josef Schmitz)
<b>10:20 – 10:40</b>	AUTONOMOUS BIPEDAL GAIT ADJUSTMENT UNDER PERTURBATIONS  (Lin Yang, Chee-Meng Chew and Aun-Neow Poo)
<b>10:40 – 11:00</b>	STIFFNESS AND DUTY FACTOR MODELS FOR THE DESIGN OF RUNNING BIPED  (Muhammad E. Abdallah and Kenneth J. Waldron)
<b>11:00 – 11:20</b>	GAIN PROPERTY FOR BIPED WALKING VIA LEG LENGTH VARIATION  (Tetsuya Kinugasa, Shoichi Miwa, Yannick Aoustin and Christine Chevallereau)
<b>11:20 – 11:40</b>	ROTOPOD: A NOVEL APPROACH TO EFFICIENT LEGGED LOCOMOTION  (Damian Lyons)
<b>11:40 – 12:00</b>	FOOT PLANNING MOTION OF HUMANOID ROBOT RH-1 USING LAG ALGORITHM  (Mario Arbulu, Luis Cabas, Pavel Staroverov, Dmitry Kaynov, Carlos Perez and Carlos Balaguer)
<b>12:00 – 12:20</b>	THE DESIGN OF A HUMANOIDAL BIPED FOR THE RESEARCH ON THE GAIT PATTERN GENERATORS  (Przemyslaw Kryczka and Chee-Meng Chew)
<b>12:20 – 12:40</b>	OBSERVER-BASED CONTROL OF A WALKING BIPED ROBOT: STABILITY ANALYSIS  (Vincent Lebastard, Yannick Aoustin and Franck Plestan)
12:40 – 13:45	Lunch, Venus 2, Level 3



## Wednesday, 18 July 2007, Afternoon

<b>13:45 – 14:30</b>	<b>Plenary Talk 4:</b> <b>Climbing Robots for Nondestructive Testing: Historical Perspective and Future Trends by Professor Bryan Bridge</b> Session Chair: Ming Xie Venue: Venus 1, Level 3	
<b>14:30 – 15:00</b>	Tea Break, Foyer of Venus, Level 3	
<b>15:00 – 16:40</b>	<b>W21 Session: Humanoid Soccer Robots</b> Session Chair: Zhou Changjiu Venue: Venus 1, Level 3	<b>15:00 – 16:40</b> <b>W22 Session: Supporting Technologies (4)</b> Session Chair: Yu Haoyong Venue: Venus 3, Level 3
<b>15:00 – 15:20</b>	A DISTRIBUTED EMBEDDED CONTROL ARCHITECTURE FOR HUMANOID SOCCER ROBOTS  (Carlos Antonio Calderon, Changjiu Zhou, Pik Kong Yue, Mike Wong and Mohan Rajesh Elara)	<b>15:00 – 15:20</b>  HIDDEN MARKOV MODEL BASED FUZZY CONTROLLER FOR FLEXIBLE-LINK MANIPULATOR  (M.N.H. Siddique, M.A. Hossain, M.S. Alam and M.O. Tokhi)
<b>15:20 – 15:40</b>	DESIGN OF A HUMANOID SOCCER ROBOT: WUKONG  (Qing Tang, Rong Xiong, Jian Chu and Xinfeng Du)	<b>15:20 – 15:40</b>  CONTROLLING AN ACTIVELY ARTICULATED SUSPENSION VEHICLE FOR MOBILITY IN ROUGH TERRAIN  (Siddharth Sanan, Sartaj Singh and Krishna K Madhava)
<b>15:40 – 16:00</b>	FORMULATION OF DESIRED ZERO MOMENT POINT TRJECTORY USING STATISTICAL METHOD  (Lingyun Hu, Changjiu Zhou, Bi Wu and Tianwu Yang)	<b>15:40 – 16:00</b>  ASYNCHRONOUS LOCAL POSITIONING SYSTEM BASED ON ULTRASONIC ACTIVE BEACONS AND FEED FORWARD NEURAL NETWORKS  (Pablo Estevez, Juan Hernandez, Jose Cappelletto and Juan Carlos Grieco)
<b>16:00 – 16:20</b>	LOCOMOTION CONTROL SCHEME FOR FAST WALKING HUMANOID SOCCER ROBOT  (Weerayut Sawasdee, Pasan Kulvanit and Thavida Maneewarn)	<b>16:00 – 16:20</b>  A SELF ORGANIZING NETWORK MODEL FOR CLAWAR SYSTEM COMMUNICATION COEVOLUTION  (Fabio P. Bonsignorio)
<b>16:20 – 16:40</b>	OPTIMUM PERFORMANCE OF THE FAST WALKING HUMANOID SOCCER ROBOT: EXPERIMENTAL STUDY  (Pasan Kulvanit, Bantoon Srisuwan and Djitt Laowattana)	<b>16:20 – 16:40</b>  WALKER SYSTEM WITH ASSISTANCE DEVICE FOR STANDING-UP  (Daisuke Chugo, Wataru Matsuoka and Kunikatsu Takase)
<b>16:40 – 17:40</b>	<b>Farewell Reception, Foyer of Venus, Level 3</b> End of Conference	

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## ABOUT SINGAPORE

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### Transport

Public transportation, including buses and MRT (Mass Rapid Transit) system provides access for visitors to most areas of the island. There are also taxis which can be hired from taxi stands, hailed by roadside, or booked by phoning the numbers listed below.

CityCab	6552 2222
Comfort Cablink	6552 1111
SMRT Taxi	555 8888

A booking fee is usually charged when hired by telephone.

Website: <http://www.lta.gov.sg>

### Changing Money

The service is available at the airport around the clock, at banks and hotels, and most shopping centers have licensed money changers. Visitors are advised not to change money with unlicensed operator. Most banks open from 9.30am to 3.00pm on weekdays and 9.30am to 11.30am on Saturdays.

### Charge and Credit Cards

Credit cards are widely accepted in Singapore, hotels, retailers, restaurants, travel agents and even some taxis readily accept international credit cards.

### Drinking Water

Water in Singapore is safe enough to drink from the tap.



### Electricity

Singapore's voltage is 220 – 240 AC, 50 Hertz. The plugs for the outlet are three pronged (UK type).

### Medical Facilities

Most hotels have their on-call doctor. In the case of emergency, dial 995 for an ambulance. Pharmaceuticals are available at many outlets including supermarkets, department stores, hotels and shopping centres.

### Lost Passport / Singapore Immigration Service

If you have lost your passport, you need to make a police report, then head to the Immigration & Checkpoints Authority to get a temporary visa. Finally, inform your embassy so you can get through the customs when you reach home.

Website: <http://www.ica.gov.sg>

### Post Office / Telecoms

The Changi Airport Post Office is open from 8.00am to 9.30pm daily. Basic Postal services are available at the Singapore Post Pte Ltd branches.

International Direct Dialing is available at the Comcentre. IDD calls can also be made from the numerous phone card and credit card phones located at the Singapore Post branches and around the city area. Phone cards are available from most money changes stationery shops and post offices in \$3 and \$5 denominations. A 20% levy is normally imposed on IDD calls made from hotels.

Website: <http://www.singpost.com.sg>

## Smoking

Smoking in public areas, taxis, lifts, cinemas, theatres, government offices and air-conditioned restaurants and shopping centers is against the law. First offenders may be fined up to a maximum of S\$1000. The rule of thumb is, if there is an ashtray provided on the premises, you can smoke there.

## Tipping

Tipping is not a way of life in Singapore. It is prohibited at the airport and discouraged at hotels and restaurants where a service charge of 10% is added to your bill.

## Useful Telephone Numbers

Police	999 (no charge)
Ambulance / Fire	995 (no charge)
Ambulance (Non-emergency)	6777 0000
Singapore Tourism Board	800 736 2000 ( <a href="http://www.stb.com.sg">www.stb.com.sg</a> )

## Embassies

American Embassy	6476 9100	Embassy of Ireland	6238 7616
Australian High Commission	6836 4100	Embassy of Japan	6235 8855
Belgium Royal Embassy	6220 7677	Embassy of Mexico	6298 2678
Brazil Embassy	6256 6001	Embassy of The Union of Myanmar	6735 0209
British High Commission	6424 4200	Embassy of Sweden	6415 9720
Canadian High Commission	6325 3200	Germany Embassy	6737 1355
Chinese Embassy	6734 3273	Indian High Commission	6737 6777
Danish Embassy Royal	6355 5010	Malaysian High Commission	6235 0111
Embassy of Chile	6223 8577	New Zealand High Commission	6235 9966
Embassy of Finland	6253 4035	Netherlands Embassy Royal	6737 1155
Embassy of the Republic of France	6880 7800	Sri-Lanka High Commission	6254 4595
Embassy of Greece	6220 8622	Switzerland Embassy	6468 5788

## Sightseeing Destinations

### Asian Civilization Museum

39 Armenian Street

Ancestral heritage of the Eastern Civilizations with important Chinese ceramics, imperial porcelain and aspects of Chinese architecture is on display in this museum.

Open: Mondays 12 noon to 6pm, Tuesdays to Sundays: 9am to 6pm Fridays till 9pm.

### Chinatown Heritage Centre

46, 48, 50 Pagoda Street

This centre showcases the rich heritage of Chinatown. Beautifully restored, highlights include the living cubicles and tailor shop which recreate the bygone era.

Open: Mondays to Sundays 10am to 7pm

**Jurong Bird Park**

Jalan Ahmad Ibrahim

Website: <http://www.birdpark.com.sg>

There are more than 8,000 Birds and a waterfall aviary in this attraction. Enjoy a scenic panorail ride in this breathtaking park and watch the Birds of Prey Show.

Open 9am to 6pm daily

**Singapore Zoological Gardens & Night Safari**

Mandai Lake Road

Website: <http://www.zoo.com.sg> ; <http://www.nightsafari.com.sg>

The Singapore Zoological Gardens, an open-concept zoo which is home to more than 2,000 creatures, has attracted international acclaim because of its clever use of rock walls and streams as natural barriers.

Open 8.30 to 6pm daily

Next to the Zoo is the Night Safari, another world-class attraction, where you can look a single-horned rhinoceros in the eye, prowl through the dark with a pack of striped hyenas and look out for leopards. Strike out on your own along the walking trail or relax in a tram ride - whichever you choose, Night Safari is a wild adventure not to be missed.

Open 7.30pm to midnight daily

**Sentosa Island**

Website: <http://www.sentosa.com.sg>

An island resort, playground for everyone with an assortment of activities – from panoramic rides to nature trails and lots of rich history.

**Singapore Botanic Gardens**

Cluny Road

The Gardens epitomises the tropical island's luxuriant parks. Spread over 52 hectares and close to the centre of the city, the Gardens is a combination of untouched primary forest and specialty gardens displaying frangipanis, roses, ferns and desert plants, to name a few. There are numerous plant species here, including many rare specimens, reflect the Gardens' richness and diversity of plant life.

The present orchid enclosure has 20,000 orchid plants on display. The National Orchid Garden promises sprawling orchid displays, water features, and an exotic bromeliad collection from Central and South America. Other attractions for visitors' enjoyment include Palm Valley, Eco-Lake and outdoor concerts on Symphony Lake.

Open 5am to 12 midnight daily

**More Places of Interest**

Visit Website: <http://www.visitsingapore.com/>

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## Author Index

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<b>A</b>		Daisuke Chugo	W22
Aníbal T. de Almeida	M22	Holk Cruse	W11
Ibrahim A. Al-Bahadly	M21	Jose Cappelletto	M22 and W22
Jatsun Andrey	T21	Juan Lopez Coronado	T22
Kaspar Althoefer	T12	JEN-HUI CHUANG	T22
Mario Arbulu	M12, M21, T12 and W11	Jian Chu	W21
M. S. Alam	M21, M21, T22 and W22	Luis Cabas	M12, M21, T12 and W11
Manuel Armada	M22	Marco Ceccarelli	M11 and M12
Muhammad E. Abdallah	W11	Paul Csonka	M12
Ridha Azaiz	M11	Savan Chaniyara	T12
Shafiul Alam	T12	TING-WEI CHAN	T22
Tamim Asfour	M21		
Yannick Aoustin	W11	<b>D</b>	
		Rüdiger Dillmann	M21
		Steven Dubowsky	T11
<b>B</b>		Sergiy Dzhantimirov	T12
Alina Brenner	M11	Van-Huan Dau	M12
Alejandro Linares Barranco	T22	Xinfeng Du	W21
Bryan Bridge	M11		
Carlos Balaguer	M12, M21 W11 and T12	<b>E</b>	
Clemens Birkenhofer	M21	Joaquin Estremera	M12 and M22
Fabio P. Bonsignorio	M21 and W22	Juan Pablo Martínez Esponda	T21
John Billingsley	T12	Mohan Rajesh Elara	W21
Jorge Juan Feliu Battle	T22	Norbert Elkmann	M22
Karsten Berns	T11 and T21	Pablo Estevez	M22 and W22
Philippe Bidaud	T11	Vladimir Evgrafov	M11
Penny Boston	T11		
Pierre Blazevic	T21	<b>F</b>	
Thorsten Brandt	M22	Björn Fischer	W11
Wagner Tanaka Botelho	T11	Soh Fujii	M22
		Yili Fu	M11 and M22
<b>C</b>			
Adrian Curaj	M12	<b>G</b>	
Chee-Meng Chew	M12, T11 and W11	Antonio González	M11
Christine Chevallereau	W11	Elena Garcia	M22
Carlos Antonio Calderon	W21		

Juan Carlos Grieco	M22 and W22	Thilo Kerscher	M21
Nithya Gnanassegarane	T11	Tino Krüger	M22
Tobias Gastauer	T21	Tetsuya Kinugasa	W11
Yiannis Gatsoulis	M21		
<b>H</b>		<b>L</b>	
Ayanna Howard	T21	Christodoulos Lytridis	T22
Christian Heckhoff	M22	CHIEN-CHOU LIN	T22
Carsten Hillenbrand	T21	Damian Lyons	W11
Geok-Soon Hong	T11	Djitt Laowattana	W21
Hiroshi Hashimoto	T21	Gerardo Fernandez-Lopez	M22
Juan Hernandez	W22	Ilkka Leppänen	M22
Kang Tae Hun	M11	Mario Lucke	M22
Lingyun Hu	W21	Tobias Luksch	T11
M. A. Hossain	M21	Tim Leichner	T21
M S Huq	M21	Vincent Lebastard	W11
M A Hossain	T22 and W22	Zhihai Li	M11 and M22
Weiwei Huang	T11		
<b>I</b>		<b>M</b>	
Ion Ion	M12 and T12	Alexandru Marin	M12
<b>J</b>		Giovanni Muscato	M21 and T11
Byron Johns	T21	Graham McLatchey	T12
Tamas Juhasz	T22	Hongxu Ma	M12 and T11
Wang Jian	T11	Irene Markelic	T21
<b>K</b>		Koo Ig Mo	M11
Cem Kara	M22	Katja Mombaur	T11
Dmitry Kaynov	M12, M21 W11 and T12	Krishna K Madhava	W22
Endre Kadar	T22	Lino Marques	M22
Hisato Koabayashi	T21	Michael McCready	M11
Kuniaki Kawabata	T21	Mihai Munteanu	T12
Mykhaylo Konyev	T22	Rezia Molfino	M11
Pulkit Kapur	M12	Ricardo Martinez	M12
Przemyslaw Kryczka	W11	Rahul Mukhi	M12
Pasan Kulvanit	W21	R Massoud	M21
Song Young Kuk	M11	Radu Munteanu Jr	T12
Sam Kesner	T11	Rasha Massoud	T12

Shymal Mondal	M11	Bernd Sauer	T21
Silvia Marcos	M21	Bantoon Srisuwan	W21
Sergio Varona Moya	T22	Dieter Schramm	M22
Shoichi Miwa	W11	Daniel Schmidt	T21
Thavida Maneewarn	W21	Giacomo Spampinato	T11
Wataru Matsuoka	W22	Gerrit Schultz	T11
<b>N</b>		Ion Simionescu	M12
Andrea Nardelli	M12	Jianzhong Shang	M11
Hamed Ajabi Naeini	T11	Jin-Hua She	T21
S.K. Nah	T12	Jatsun Sergey	T21
Taro Nakamura	M22 and T21	Josef Schmitz	W11
<b>O</b>		kuniaki satou	T21
Erika Ottaviano	M11	Ludovic Saintbauzel	T11
Erica Ottaviano	M12	Lakmald Seneviratne	T12
Tokuji Okada	T11	M.N.H. Siddique	W22
Yasuhiro Ohyama	T21	N H Siddique	T22
<b>P</b>		Pavel Staroverov	M12, M21 T12 and W11
Aun-Neow Poo	M12 and W11	Pablo Gonzalez de Santos	M22
Carlos Perez	W11	Richard Stokes	M21
Frank Palis	T12	Surya Singh	M12
Franck Plestan	W11	Salvatore Sessa	M21
Jean-Sebastien Plante	T11	Siddharth Sanan	W22
Natalia Petrovskaya	M11	Sartaj Singh	W22
Vladimir Pavlovsky	M11	Tariq Sattar	M11
Vladimir Pavlovsk Jr	M11	Tariq Sattar	M11
Viviane Pasqui	T11	Thomas Stürze	M22
<b>Q</b>		Toshimi Shimizu	T11
<b>R</b>		Ulrich Schmucker	T12 and T22
Alfred Rizzi	M12	Weerayut Sawasdee	W21
Choi Hyouk Ryeol	M11	<b>T</b>	
Kristian Regenstein	M21	Cristina Tavolieri	M12
Luca Rimassa	M11	Hanns Tappeiner	M12
Mostafa Rostami	T11	Liqiong Tang	M11 M 21and T12
Vadym Rusin	T22	M. O. Tokhi	M21 T12 T22 and W22
<b>S</b>		Mahmoud Tavakoli	M22
Axel Schneider	W11	Marco Ziegenmeyer	T22
Qing Tang	W21	Rong Zhu	T22
Sheng Tao	M12 and T11	Yuriy Zavgorodniy	T12
S.H. Tan	T12	Z.W. Zhong	T12
<b>U</b>		Zhaoying Zhou	T22
Klaus Uhl	T22		
<b>V</b>			
Gurvinder Singh Virk	M11, M21, T12 and T22		
Javier Molina Vilaplana	T22		
Luige Vladareanu	T12		
Muthu veerappan Vignesh	T21		
Petri Virekoski	M22		
Vinayak	M12		
Javier Molina Vilaplana	T22		

**W**

Bi Wu	W21
Guanglong Wang	T22
Kenneth Waldron	M12
Kenneth J. Waldron	W11
Mike Wong	W21
Shuguo Wang	M11 and M22

**X**

Rong Xiong	W21
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**Y**

Hejin Yang	M11 and M22
Lin Yang	W11
Pik Kong Yue	W21
Sho Yokota	T21
Tianwu Yang	W21

**Z**

Chunxi Zhang	T22
Changjiu Zhou	W21
J. Marius Zöllner	M21
Keyan Zahedi	T21
Matteo Zoppi	M11