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## Features

### Multimodal interaction: Humanizing the human-computer interface

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## Contents

Top  
News  
Features  
Research highlights  
Club Activities  
Excursions  
Tech-Overtures

## Archive

News  
Features  
Research highlights  
Club Activities  
Excursions  
Tech-Overtures

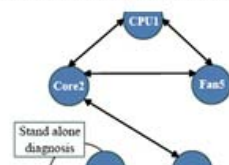


## News

Toyohashi Tech commemorates its 35th anniversary with guests from the international community

The 9<sup>th</sup> International University Students Exchange Program in Indonesia International Exchange Day

Asia-Pacific Interdisciplinary Research Conference 2011: Scientists, engineers, entrepreneurs, and policy makers gather at the first truly interdisciplinary conference held in Asia-Pacific



## Research highlights

Compilation of recent research at Toyohashi Tech



## Club Activities

Toyohashi Tech Tea Ceremony Circle: An alcove of serenity



## Excursions

Industrial Tour of Denso Corporation in Aichi organized by Toyohashi University of Technology

Toyohashi Festival 2011



## Tech-Overtures

Spoken Term Detection: On-line tool for rapidly detecting spoken words in speech and video

## Features

### Multimodal interaction: Humanizing the human-computer interface

In everyday life humans use speech, gestures, facial expressions, touch to communicate. And, over long distances we resort to text messages and other such modern technology. Notably, when we interact with computers we rely exclusively on text and touch in the form of the keyboard/mouse and touch screens.

Kouichi Katsurada is an associate professor at Toyohashi Tech's Graduate School of Engineering with a mission to 'humanize' the computer interface. Katsurada's research centers on the expansion of human-computer communication by means of a web-based multimodal interactive (MMI) approach employing speech, gesture and facial expressions, as well as the traditional keyboard and mouse.

"Although many MMI systems have been tried, few are widely used," says Katsurada. "Some reasons for this lack of use are their complexity of installation and compilation, and their general inaccessibility for ordinary computer users. To resolve these issues we have designed a web browser-based MMI system that only uses open source software and de facto standards."

This openness has the advantage that it can be executed on any web browser, handle JavaScript, Java applets and Flash, and can be used not only on a PC but also on mobile devices like smart phones and tablet computers.

The user can interact with the system by speaking directly with an anthropomorphic agent that employs speech recognition, speech synthesis and facial image synthesis.

For example, a user can recite a telephone number, which is recorded by the computer and the data sent via the browser to a session manager on the server housing the MMI system. The data is processed by the speech recognition software and sent to a scenario interpreter, which uses XISL (extensible Interaction Scenario Language) to manage the human-computer dialogue.

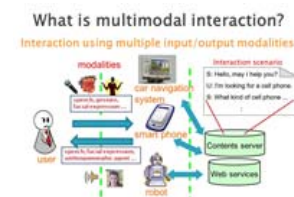
"XISL is a multimodal interaction description language based on the XML markup language," says Katsurada. "Its advantage over other MMI description languages is that it has sufficient modal extensibility to deal with various modes of communication without having to change its specifications. Another advantage is that it inherits features from VoiceXML, as well as SMIL used for authoring interactive audio-video presentations."

On the downside, XISL requires authors to use a large number of parameters for describing individual input and output tags, making it a cumbersome language to use. "In order to solve this problem, we will provide a GUI-prototyping tool that will make it easier to write XISL documents," says Katsurada.

"Currently, we can use some voice commands and the keyboard with the system, and in the future we will add both touch and gestures for devices equipped with touch displays and cameras," says Katsurada. "In other words, it is our aim is to make interaction with the computer as natural as possible."



Kouichi Katsurada



Description of multimodal interaction

## News

### Toyohashi Tech commemorates its 35th anniversary with guests from the international community

Events were held on November 16 to commemorate the 35<sup>th</sup> anniversary of Toyohashi University of Technology. In a commemorative speech Toyohashi Tech president Yoshiyuki Sakaki looked back on the successes of the University's 35 year history as well as introducing new initiatives including the Electronics-Inspired Interdisciplinary Research Institute (EIIRIS), the Research Center for Collaborative Area Risk Management, and the Research Center for Human-Robot Symbiosis Research. President Sakaki emphasized the importance of these new research facilities for the development of new fields, including medicine, nursing care, and disaster prevention.

President Sakaki also spoke about the importance of enhancing international collaboration by strengthening existing contacts with universities in Asia, as well as the creation of new partnerships with institutes in other regions of the world. Finally, President Sakaki asked for the continuous support of the guests for Toyohashi Tech in the 21<sup>st</sup> century.

On this occasion President Sakaki awarded the University's first honorary doctorates to Professor Dr. Nguyen Ngoc Binh, Rector of Vietnam National University, Hanoi, and University of Engineering and Technology, and Mr. Nobuo Kamino, Senior Adviser of Chubu Gas Co., Inc.

Prof. Dr. Nguyen Ngoc Binh was the first international student from Vietnam to study at Toyohashi University of Technology and he is currently the President of Vietnam National University, Hanoi, and the University of Engineering and Technology. He is also the Chairman of the Association of Vietnamese students studying in Japan.

The day's events also included a symposium—"The Future of International Cooperation in Engineering Education—Toward Strengthened Inter-University Networking"—commemorating the 10th Anniversary of ICCEED (International Cooperation Center for Engineering Education Development), with invited talks by researchers from partner universities in Indonesia, Malaysia, and Vietnam.

The main events to commemorate the 35<sup>th</sup> anniversary of Toyohashi University of Technology:

15 November 2011

13:30–18:30: Symposium in Commemoration of the 10th Anniversary of International Cooperation Center for Engineering Education Development (ICCEED)

<http://icceed.tut.ac.jp/forum10e.html>

18:40–20:20: International Exchange Day

<http://www.cir.tut.ac.jp/students/pdf/Int%27Exchange2011Nov.pdf>

16 November 2011

13:30–16:15: Memorial ceremony and commemorate lecture by Akira Fujishima, President of Tokyo University of Science on his research on the photo-catalytic properties of tungsten oxide.

[http://www.tut.ac.jp/docs/111116\\_prestige.pdf](http://www.tut.ac.jp/docs/111116_prestige.pdf)

17–18 November 2011

Asia-Pacific Interdisciplinary Research Conference 2011

<http://www.apirc.jp/>

13:00–17:00: Lab tours as part of the Toyohashi Tech Academic-Industry collaboration Day.

[http://www.tut.ac.jp/35th/pdf/sangaku\\_day.pdf](http://www.tut.ac.jp/35th/pdf/sangaku_day.pdf)

18:30–20:00: Response to massive damage caused by an earthquake in the Tokai region.

19–20 November 2011: The Japan Joint Automatic Control Conference

<http://rengo54.me.tut.ac.jp/>

<http://www.jstage.jst.go.jp/browse/jacc>

19 November 2011

13:15–14:15 : Seven years of the 'Hayabusa' space flight—from launch to landing back on earth.

<http://www.tut.ac.jp/cooperation/docs/h23kokaikoza-hayabusa.pdf>



Invited speaker for AP-IRC 2011 -Prof. Sandra Hirche, Technische Universität München, Germany



Invited speaker for AP-IRC 2011 -Prof. Quentin Pankhurst, Director of Research, The Royal Institution of Great Britain, UK



Dr. Nguyen Ngoc Binh, Rector, University of Engineering and Technology, Vietnam National University gave a special speech during the ICCEED symposium



More than 200 people participated to the ICCEED symposium. (President Sakaki gave a speech to the participants)



During the 35th Commemoration Ceremony, Toyohashi Tech gave honorary doctorate for the first time to the Dr Nguyen Ngoc Binh, and Mr Nobuo Kamino, Advisor to Chubu Gas Co.



## The 9<sup>th</sup> International University Students Exchange Program in Indonesia

12 students of Toyohashi Tech with 2 students from technical colleges visited Bandung, Indonesia to participate the 9<sup>th</sup> International University Students Exchange Program.

Toyohashi Tech launched this project to provide opportunities for interaction with foreign universities in order to cultivate international understanding. This year Toyohashi Tech students visited Bandung in Indonesia to take part in lectures and discussion on the theme of 'Aiming at a safer and more sustainable future'.

For last two years the seminars were held in Toyohashi, but this year the workshops were held at Institut Teknologi Bandung (ITB) in Indonesia. Participants included 12 Toyohashi Tech students, 2 technical college students and 25 students from ITB, and 3 high-school students from the local Madania high school, one of the top high schools in Indonesia.

On each day, after lectures on a theme given by the instructors from ITB, the students discussed issues related to natural disasters that have occurred in both Japan and Indonesia. Active discussions resulted in a broadening of mutual understanding. The discussion was followed by presentations on how engineers may be able to address natural disasters.

After the four-day workshop, both Japanese and Indonesian students visited a traditional Indonesian farming village.. This visit enriched their view of traditional ways in which people live with in harmony with nature.

On September 25, the participant invited many people who had taken part in this program to attend an event featuring the performance of traditional Japanese and Indonesian dances.

In spite of the limited time available for this program, participants from both Japanese and Indonesian students had an extremely fruitful time.



Students of Toyohashi Tech and ITB are having discussion for their presentation.



Field studies in Cikapundung river area, near ITB campus



All the participants for this program



Field trip to traditional Indonesian village.

## International Exchange Day

The fifth International Exchange Day was held on 15 November 2011 as part of events to celebrate Toyohashi Tech's 35th anniversary

The International Exchange Day was launched in 2010 to enhance understanding between international and Japanese students. This year students welcomed distinguished guests and alumni from overseas who had been invited to other events to commemorate Toyohashi Tech's 35<sup>th</sup> anniversary. Folk dances, songs, and martial arts performances by both international and Japanese students entertained guests while they were renewing the old friendships.

Among the alumni included were Dr. Nguyen Ngoc Binh (Rector, University of Engineering and Technology, Vietnam National University Hanoi), Dr. Phan Dinh Tuan (Vice Rector, Vietnam National University Ho Chi Minh City University of Technology), and Dr. Samsul Rizal (Vice Rector, Syiah Kuala University, Indonesia).

The event highlighted the University's strong links with the international community.



Toyohashi Tech alumni Dr. Nguyen Ngoc Binh gives an opening speech welcoming participants to the International Exchange Day.



International students from Malaysia dressed in traditional costumes.



President Yoshiyuki Sakaki and his wife enjoying a conversation with international students.



The Toyohashi Tech Budou-Bu, give a demonstration at the International Exchange Day

## Asia-Pacific Interdisciplinary Research Conference 2011: Scientists, engineers, entrepreneurs, and policy makers gather at the first truly interdisciplinary conference held in Asia-Pacific.

The first Asia-Pacific Interdisciplinary Research Conference 2011 was held at Toyohashi University of Technology (Toyohashi Tech) on 17–18 November 2011. The conference is a forum for enhancing mutual understanding between scientists, engineers, policy makers, and experts from a wide spectrum of pure and applied sciences to resolve the daunting global issues facing mankind.

This inaugural gathering attracted 280 participants including delegates from France, Germany, India, Indonesia, Korea, Malaysia, Russia, Sweden, UK, Vietnam, and USA. The AP-IRC 2011 was chaired by Dr Yoshiyuki Sakaki, the president of Toyohashi Tech, who opened the proceedings by stressing the importance of an interdisciplinary approach to research to resolve global scientific and technical issues. And, recalling his own experience as the leader of Japan's efforts in the Human Genome Project, Sakaki encouraged participants make an effort to try to understand the sometimes difficult concepts and terminology of other areas of research.

Highlights of AP-IRC 2011 included a firsthand account of the damage caused by the massive earthquake in March 2011 to experimental facilities at Tohoku University by Masayoshi Esashi; the fascinating world of bees and the inborn numerical competence of humans and animals, by Hans J. Gross; research on robots and cognition-enabled technical systems at Technische Universität München by Sandra Hirche; the history of events leading to the invention of world's strongest NbFeB magnet by Masato Sagawa; novel method for the synthesis of graphene using bacteria extracted from a riverside near Toyohashi Tech campus; and Hideomi Koinuma described ambitious plans on harvesting energy by laying massive numbers of solar cells in North Africa as part of the 'Sahara Solar Breeder (SSB) Plan' for global clean energy superhighway.

Sakaki concluded his opening address by announcing that this conference will be held annually at the same time of year, with AP-IRC 2012 scheduled for 15–16 November 2012 at the Irago Sea-Park & Spa Hotel in Aichi Prefecture.

In addition to the technical sessions, the conference banquet included a short session during the invited speakers described notable trends in research and policy in their part of the world. The short speeches led to animated discussion between the delegates, especially young scientists and graduate students, who were able to talk directly with veteran researchers for a firsthand view of the issues raised during the day's presentations.

Refereed papers will be published in the Institute of Physics *Journal of Physics* Conference Series (<http://iopscience.iop.org/1742-6596>).

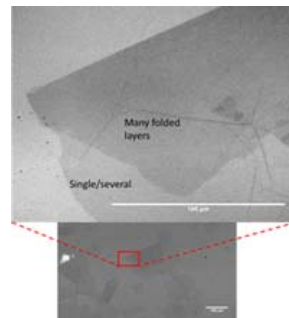
Further information

AP-IRC 2011 website: <http://www.apirc.jp/invited.html>

Institute of Physics Journal of Physics Conference Series

<http://iopscience.iop.org/1742-6596>

Irago Sea-Park & Spa Hotel: <http://www.irago.net/>



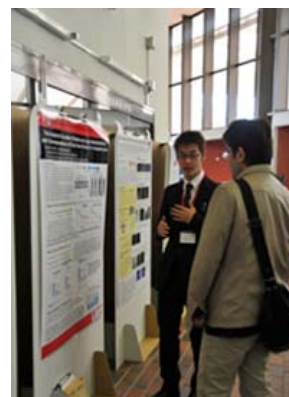
Toyohashi Tech Graphene Group reported on the use of microorganisms to reduce graphene oxide flakes (photograph) to yield graphene.



Hideomi Koinuma described the launch and goals of the SSB Plan (<http://www.ssb-foundation.com>)



Quentin Pankhurst describing his work at University College London.



The poster session



Delegates at the first Asia-Pacific Interdisciplinary Research Conference 2011 held at Toyohashi University of Technology 17–18 Nov. 2011.

No. 4, September 2011

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## Research highlights



→ Sensing technology: Motherboard monitoring inspired by the immune system

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→ Piezoelectric actuators: Why cubic?

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→ Neuroscience: Insights into why we feel jetlag?

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→ Sound interface with two microphones

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## Research highlights

### Sensing technology: Motherboard monitoring inspired by the immune system

The prevalence of computer networks for sharing resources places increasingly high requirements on the reliability of data centres. The simplest way to diagnose abnormalities in these systems is to monitor the output of each component but this is not always effective.

Now Haruki Shida, Takeshi Okamoto and Yoshiteru Ishida at Toyohashi University of Technology have drawn inspiration from biological immune systems to develop a new model for detecting abnormal operation of network components more accurately.

Their model mimics biological immune systems where cells test each other to protect against disease. In the immunity-based diagnostic model, the sensors for the individual components are also linked for mutual testing. An algorithm determines the credibility of each sensor from comparisons of output from other sensors in the network.

The researchers tested the approach in a simulation of a mother board where they monitored the temperature, voltage and fan speed of the central processing unit and core. The immunity-based diagnostic model identified abnormal nodes more accurately than isolated sensors.

The researchers also developed a hybrid network combining isolated and immunity-based sensing. Here the immunity-based diagnostic model used a correlation-based network, which removes connections between sensors that have weakly correlated output. Compared with the fully connected network, the hybrid model further improved the accuracy of the tests.

The work will contribute to identifying abnormal component behaviour to avoid system failure.

#### Reference:

Haruki Shida<sup>1</sup>, Takeshi Okamoto<sup>1</sup> and Yoshiteru Ishida<sup>2</sup>

Immunity-based diagnosis for a motherboard

*Sensors*, **11**, 4462–4473 (2011).

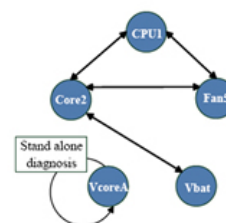
Digital Object Identifier (DOI): 10.3390/s110404462

<sup>1</sup>Department of Information Network and Communication, Kanagawa Institute of Technology 1030, Shimo-ogino, Atsugi, Kanagawa 243-0292, Japan

<sup>2</sup>Department of Knowledge-Based Information Engineering, Toyohashi University of Technology, 1-1, Tempaku, Toyohashi, Aichi 441-8580, Japan



Yoshiteru Ishida



[Enlarge Image](#)

Example of a hybrid diagnostic model.



## Research highlights

### Piezoelectric actuators: Why cubic?

The possibility of designing a cubic stator in a rotary-linear piezoelectric actuator is intriguing and technically challenging. Theoretically, the vibrational behaviour of cubic stators remains unclear when modeled using the finite element method (FEM).

Here, Tomoaki Mashimo and Shigeki Toyama analyzed the vibrational behavior of cubic stators based on an energy method, which distinguishes components of mechanical energy.

By changing the design of stators—especially the length in the direction of the through-hole axis—the researchers clarified how the vibrational modes are in accordance at one equal frequency in cubic shape.

The energy method described in this paper showed that the mechanical energy of two specific vibrational modes is in equilibrium. The shape for which the stator achieves equilibrium energy was found to be a cube.

This approach should be useful for not only studies on vibration, but also for design the stators with an easy-to-use modal analysis method.

#### Reference:

Tomoaki Mashimo and Shigeki Toyama.

Vibration Analysis of Cubic Rotary-Linear Piezoelectric Actuator.

*IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control* **58**, 844–848, (2011).

Digital Object Identifier (DOI): 10.1109/TUFFC.2011.1877

Tomoaki Mashimo is now at the Electronics-Inspired Interdisciplinary Research Institute, Toyohashi University of Technology.

Department website: Electronics-Inspired Interdisciplinary Research Institute (EIIRIS) <http://www.eiiris.tut.ac.jp/>



Tomoaki Mashimo



An actual cubic actuator

## Research highlights

### Neuroscience: Insights into why we feel jetlag?

Human biochemical processes are controlled by internal body clocks with an approximately 24 h period—circadian rhythms. In mammals, the suprachiasmatic nucleus (SCN) contains self-sustained circadian oscillator as master pacemakers. The expression of clock gene *Period1* (*Per1*) oscillates autonomously in the SCN and is induced immediately after a light pulse. *Per1* is an indispensable member of the central clock system, since the constitutive expression of *Per1* in the SCN modifies physiological and behavioral rhythms [1]. The SCN and peripheral tissues are compared about the ability of phase shift using realtime monitoring system from same animal.

Now, Shin Yamazaki, Rika Numano, Michikazu Abe and colleagues at University of Virginia and University of Tokyo constructed *Per1:luc* Tg rats in which firefly luciferase was rhythmically expressed under the control of the mouse *Per1* promoter [2].

Rhythmic emission from the cultured *Per1:luc* SCN slices persisted for some months *in vitro*, while those from peripheral tissues such as the liver damped after two to seven cycles. These results show that a self-sustained circadian pacemaker in the SCN entrains circadian oscillators in the periphery.

Next, the researchers compared the phase shift ability of light and dark (LD) cycles between the SCN and peripheral tissues. The phase-shifting paradigm is closely analogous to trans-Atlantic flights from west to east (6 h advance) and from east to west (6 h delay).

The emissional rhythms in the SCN shifted 6 h most rapidly within one day, while those in peripheral tissues took more than two days. Circadian oscillators in the periphery were temporarily lost following large and abrupt shifts in the environmental light cycle.

Notably, jetlag can be explained as a condition where the rhythms in the SCN and peripheral tissues are desynchronized.

[1] Rika Numano *et al.*, *Proc. Natl. Acad. Sci. U S A*, **103**, 3716, (2006)

[2] Shin Yamazaki<sup>1\*</sup>, Rika Numano<sup>2\*</sup>, Michikazu Abe<sup>1\*</sup>, Akiko Hida<sup>2</sup>, Ri-ichi Takahashi<sup>3</sup>, Masatsugu Ueda<sup>3</sup>, Gene D. Block<sup>1</sup>, Yoshiyuki Sakaki<sup>2</sup>, Michael Menaker<sup>1</sup>, Hajime Tei<sup>2</sup> \*These authors contributed equally to this work.

Resetting central and peripheral circadian oscillators in transgenic rats.

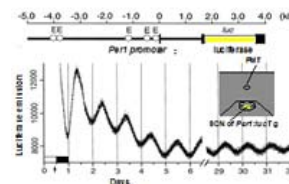
*Science*, **288**, 682, (2000).

DOI: 10.1126/science.288.5466.682

<sup>1</sup>NSF Center, Univ. of Virginia, <sup>2</sup>Inst. of Medical Science, Univ. of Tokyo, <sup>3</sup>Y.S. New Technology Institute Inc.



Rika Numano



[Enlarge Image](#)

Rhythmic emission in the SCN of *Per1:luc* Tg rats

## Research highlights

### Sound interface with two microphones

In late years, the development of a human robot and the use of the portable information terminal become popular. Sound interface plays an important role in it. Sound interface is usually comprised of speaker (sound) localization, the sounds separation with the environmental sound, noise cancellation and sound recognition. Of these, our study focuses on the sound localization and sound separation.

About sound localization, in our binaural model shown in Fig.1, the sound source direction is represented by using the horizontal angle  $\alpha$  and the vertical angle  $\beta$ . Furthermore, the sound localization techniques by the binaural model using the Self-organizing map (SOM) shown in Fig.2 was proposed and correct answer 98.7% was obtained in the anechoic room.

On the other hand, for the sound separation in the true environment including the reverberations, a new method showing in Fig.3, which combining Independent Component Analysis (ICA) with the complex discrete wavelet transform, is proposed and verification of source separation in relation to the problems of permutation and scaling in the ICA are performed. Through comparison of the results according to the Signal Noise Ratio (SNR), the effectiveness of the proposed method is confirmed.

In this study, in order to achieve the sound interface with simple structure and high processing speed, two microphones were used. Furthermore, sound localization method using binaural model and the sound separation method by combining Independent Component Analysis (ICA) with the complex discrete wavelet transform were proposed, their effectiveness have been confirmed. In future, these methods will improve for true environment and achieve the sound interface.

Zhong Zhang, Kazuaki, Tetsuo Miyake, Takashi Imamura  
Three-Dimensional Sound Localization by Binaural Model Using Self Organizing Map  
International Journal of Innovative Computing, Information and Control, **6**, 361–371, (2010)  
Instrumentation Systems Laboratory, Toyohashi University of Technology  
Profile of Zhong Zhang: (<http://www.tut.ac.jp/teach/main.php?mode=detail&article=67>)

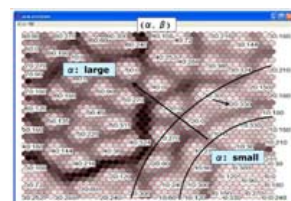


Zhong Zhang



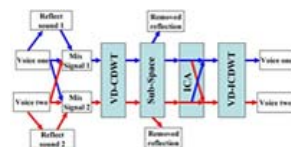
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Fig. 1: Definition of sound direction in the binaural model



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Fig.2: Example of SOM map of sound direction



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Fig.3: Flow chart of sound separation by combining the independent component analysis (ICA) and the complex discrete wavelet transform

## Club Activities

### Toyohashi Tech Tea Ceremony Circle: An alcove of serenity

There is nothing half-hearted about participating in the Toyohashi Tech Tea Ceremony Circle. While it is expected that the teacher will wear a kimono during lessons, many of the male members also wear traditional clothes—an indication of their eagerness to enter into the spirit of this traditional ceremony.

The Circle has 26 members, from which as many as sixteen participate twice a week for the two-and-a-half hour classes. Not one but two female teachers of the Urasenke School of tea ceremony instruct the students enabling different levels students to practice at the same time. Classes take place in a atmospheric 12-tatami room known as the *chashitsu* at the University, which is equipped with a tokonoma or traditional alcove for displaying items of beauty. Notably, the *chashitsu* also happens to be the only tatami room on the campus.

Kanako Yamamoto is a senior studying material science, and is the leader of the Circle. "I had not studied tea ceremony before coming here. But I immediately liked the quietness and the serenity of the *chashitsu*. The members of this club were extremely friendly and it all made a good impression on me. So I decided to join the Circle."

Tea ceremony utensils and equipment can be very expensive. However, when the first teacher of the class passed away, she graciously donated a number of personal items to the Circle. The University also provides kimono for members to wear and a few students own their own traditional garments, although casual clothes are also acceptable.

"Participating in the tea ceremony means learning about many things," says Kimiko Takahashi, one of the tea ceremony teachers. "It creates an atmosphere that helps the mind become peaceful for appreciating the truth and beauty of things."

Kohei Tanizaki is a third-year student majoring in manufacturing systems. "Here I am learning more about traditional Japanese culture, manners and polite conversation," he explains. "When I start working in industry after graduating, I think that the things I learn here this will help me to communicate better with my elders."

Members of the Circle give several formal presentations each year, including a demonstration at the Toyohashi Tech student festival and graduation ceremony, as well as performances for the general public in Toyohashi.



The student wearing the traditional 'hakama' clothing is Tsubasa Okada, a 4<sup>th</sup> student majoring in Knowledge-based Information Engineering.



Toyohashi Tech's Tea Ceremony Circle from left to right: Takashi Koderu, third-year majoring in Production Systems Engineering; Kazuya Adachi, third-year Production Systems Engineering; Kanako Yamamoto, fourth-year Materials Science; and Kohei Tanizaki, third-year Manufacturing systems.



## Excursions

### Industrial Tour of Denso Corporation in Aichi organized by Toyohashi University of Technology

A message from Mr Ermansyah Sitorus, a short term exchange student from Institut Teknologi Bandung in Indonesia who stayed at Toyohashi Tech from May to October 2011.

Visits to industry are an important element of education at Toyohashi Tech. These tours give students a valuable insight into the working environment of companies.

Toyohashi Tech arranges a wide range of industrial visits each year. For me the visit to Denso Corporation was really instructive and memorable.

During the visit, we were first given a presentation about the Greater Nagoya Initiative (GNI) by general manager Mr. Tetsuo Hirayama and assistant manager Ms Kiyono Watanabe. This presentation gave us a good overview about the GNI before entering the plant.

After lunch we went by bus to the Takatana Plant of Denso Corporation. Before entering the Takatana Plant, we were given a tour of the Denso Gallery, which included information about the company's history, as well as its key technologies and products. Inside the Takatana Plant we were given a direct look at the production process of the plant from the stage of part manufacture to final packaging. I was impressed with how the humans interacted with advanced equipment and technology during the manufacturing process.

This trip complemented my lecture courses, and I learnt and experienced things that would not have been possible in a classroom. As a student I realized how engineers improve technology and how technology improves the skills of engineers.

Further information

Denso Gallery: <http://www.globaldenso.com/en/aboutdenso/hall/gallery/>



Mr Ermansyah Sitoru on the bus to Denso with fellow students from Toyohashi Tech.



Toyohashi Tech students visit the Denso Gallery.

## Toyohashi Festival 2011

Wu Xiangqin is an international student from China studying for a master's degree in Environmental and Life Sciences at Toyohashi Tech. Here, she recalls her experience of taking part in the Toyohashi festival in October 2011.

I am a first year master's student studying environmental and life sciences. Six months have passed since arriving in Japan from Jilin Province in northern China. Coming to Japan was the realization of my dream to study at one of the finest technology-based universities in Japan.

In the beginning, I was very excited about studying and living in Japan. However, I was also worried about my poor Japanese language ability and sometimes wondered whether I would be able to adapt to life in Japan. Fortunately, the administration staff, teachers, and my new found friends at Toyohashi Tech were extremely supportive, in not only academic matters but also for my daily life. The University support enabled me to feel very comfortable at Toyohashi Tech.

Toyohashi Tech and the international association organize regular activities for international students, including opportunities of experiencing Japanese culture and enriching our academic life. I have enjoyed participating in almost all of those activities. On October 15 the Toyohashi festival was held in Toyohashi Mae Odori, the main street adjacent to Toyohashi Station. Around 1000 people take part in this annual festival, with some participating in traditional Japanese dancing. Many girls—including me—wore yukata, the traditional Japanese cotton kimono. But some girls dressed up in funny costumes of monsters or animated character costumes. When the musicians started beating their drums and playing their music the participants along the road of the festival started moving and dancing. Even the slight rain towards the end of the festival did not dampen the spirits of the participants who continued to dance and enjoy the event.

I had a wonderful time dancing to the music. The Toyohashi festival was a truly wonderful experience that will live with me forever.



Ms Wu Xiangqin (second from the left) and international students at TUT.



Ms Thandar Oo, from Myanmar (left) wearing a traditional yukata and dancing at the Toyohashi festival in October 2011.

## Tech-Overtures

### Innovative method for controlling the electrical conductivity of composite materials

Toyohashi Tech researchers develop a low cost and time saving method for producing electrically conducting composites based on electrostatic adsorption of CNTs onto resin and ceramic particles.

Hiroyuki Muto and colleagues at the Toyohashi University of Technology (Toyohashi Tech) have developed an innovative method for producing CNT (carbon nano-tube) resin composite material [1] that only requires 1/100 [2] of the conventional amount of CNT additive to produce electrical conductivity in the composite material.

In this method, CNTs were mixed in an electrolyte solution and added to the composite, where the CNTs were adsorbed onto the surfaces of the resin particles due to electrostatic adsorption [3]. Thus, high electrical conductivity was obtained by the addition of a small quantity CNTs. Importantly, the electrical conductivity of the composite materials was readily controlled by changing the amount of electrolyte added to the composite; namely, the degree of CNT adsorption onto the resin particles.

In addition, this approach enables significant reductions in both the production costs and the production time compared with conventional methods for manufacturing conductive resins.

Notably, the use of particles with charged surfaces will enable the production of various combinations of composite materials such as metals, ceramics, and polymers. The researchers expect this method to find applications in the production of enzymes and cosmetics.

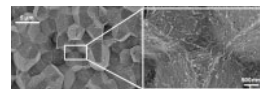
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#### Further information

[1] This is a composite material comprising of resin particle with the addition CNTs. By utilizing the high conductivity of CNTs, practical products such as robust, anti-static components for clean rooms in the electronics industry, could be manufactured. The ability to control the electrical conductivity of the composite materials by this production method is expected to lead to a wide range of applications in the electronics industry, including use as alternatives for indium-tin-oxide transparent conductive film for displays, as plates for rechargeable batteries, and in semiconductor devices. Furthermore, the composite resin particles can be used in the production of for plastic materials, such as injection molding or extrusion.

[2] When imparting electrical conductivity to insulating ceramics or polymer materials, the introduction of conducting additive materials that can be linked within the resin structure is required. In conventional methods, the amount of additive is greater than 1% by weight. However, this new method only requires the addition of 0.01% CNT to impart conductivity.

[3] This method adsorbs CNTs onto the matrix resin particles by an electrostatic attractive force, which is a result of charging them positive or negative in appropriate electrolyte solutions. By controlling the concentration of the electrolyte solution added to the composite, the charge-volume of the surfaces of the particles can be changed, thus controlling the degree of adsorption of the CNTs.



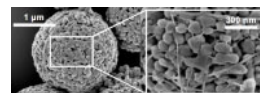
[Enlarge Image](#)

Cross-section of PMMA resin composite material showing the networks of CNTs on the surfaces of the resin particles. The CNTs are added to induce electrical conductivity.



[Enlarge Image](#)

Prototype system for producing PMMA-CNT composite materials



[Enlarge Image](#)

Ceramic particles with electrostatically attached CNTs fibers.