No.15-206

The 8th International Conference on Leading Edge Manufacturing in 21st Century (LEM21)

Conference Program

Oct. 18 (Sun) to 22 (Thu), 2015
Kyoto, Japan

Venue | Kyoto Research Park

Sponsored by :
The Japan Society of Mechanical Engineers (JSME)
Organized by :
Manufacturing and Machine Tool Division
Welcome to LEM21 Kyoto

Dear Colleagues, Friends, and those who visit us for the first time.

On behalf of conference chairs and the organizing committee, it is our great pleasure to welcome you to the eighth International Conference on Leading Edge Manufacturing in the 21st Century (LEM21), to be held on October 18-22, 2015, in Kyoto, Japan. The conference of LEM21 is organized and sponsored by the Manufacturing and Machine Tool Division of the Japan Society of Mechanical Engineers (JSME). The first LEM21 conference was successfully held in 1997 in Tokyo, and followed by the second in Niigata in 2003, the third in Nagoya in 2005, the fourth in Fukuoka in 2007, the fifth in Osaka in 2009, the sixth in Saitama in 2011, and the seventh in Matsushima in 2013, respectively.

Kyoto is well-known as the former imperial capital of Japan for more than a thousand years, and also known for the international agreement linked to the United Nations framework convention on climate change (Kyoto protocol). It may not be known that this old city has been an incubation for high-tech companies. For example, electric-parts companies come from ceramic industries that have been producing traditional potteries known as "Kiyomizu yaki". Manufacturing technology has been finding new things in old things and the collaboration between manufacturing communities has played an important role.

193 papers have been contributed to this conference from around the world, and each paper was peer-reviewed for originality and quality. We believe that this conference will be useful for active researchers and engineers to learn the newest applicable information and will stimulate further research and cutting-edge developments in manufacturing technology. The stimulation is not only for knowledge but also for establishing new relationships between different fields, different institutions, and different countries, which will play an important role in creating "a manufacturing ecosystem."

Finally, I would like to express my sincere gratitude to all of the participants, supporting members, and sponsors.

Atsushi Matsubara
Chairman of LEM21
Acknowledgements

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Japan Machine Tool Builders’ Association

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Hwa-Soo Lee, Nihon University
Practical information

Venue
Kyoto Research Park (KRP), Kyoto, Japan.

Address: 134 Chudoji Minamimachi, Shimogyo-ku, Kyoto 600-8813, Japan
Tel: +81-(0)75-322-7888 (KRP main office)

KRP buildings and neighborhood map: the registration of the LEM21 conference is on the 4th floor in Bldg. #1 of the Eastern Zone.

City info
Please visit the LEM21 website at: http://me.kyoto-u.ac.jp/lem21/info.html
**Registration**

Registration will be on the 4th floor in East Block Bldg. #1.

**Opening hours**

- Sunday 18th October 17:00-20:00
- Monday 19th October 08:20-18:00
- Tuesday 20th October 08:00-17:00
- Wednesday 21th October 08:20-17:00

**On-site registration fees**

<table>
<thead>
<tr>
<th></th>
<th>JSME member</th>
<th>non-member</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular registration</td>
<td>60,000 yen</td>
<td>65,000 yen</td>
</tr>
<tr>
<td>Students</td>
<td>25,000 yen</td>
<td>35,000 yen</td>
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<tr>
<td>* Proceedings not included.</td>
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**Lunch and coffee breaks**

Lunch is not included in the conference registration fee.

Restaurant “Patio” is open on 1st floor of East Block #1.
A map for other restaurants in the neighborhood is provided in this program.
Refreshments will be served at the entrance of 4th floor in East Block Bldg. #1.

**Oral presentations**

Each paper will be presented for 20 minutes; 15 minutes for the oral presentation and additional 5 minutes for discussion.
A laptop PC with a Windows OS will be available on the site. Each presenter may use his/her own PC but the connection with a projector should be checked by himself/herself in prior to the presentation.
Other information will be provided on the site.

**Banquet**

The conference banquet will be at Kyoto Rihga Royal Hotel (“Shunju” banquet hall on the second floor) from 18:00, October 20th (Tuesday).
Shuttle buses will depart near the east entrance of Bldg. #4 after 17:00 to Kyoto Rihga Royal Hotel (see the map in the previous page).
### Floor plan

<table>
<thead>
<tr>
<th>Room name in the conference program</th>
<th>Room name at the KRP (see the maps below)</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 1</td>
<td>Room AV</td>
<td>4th floor, East Block, Bldg. #1</td>
</tr>
<tr>
<td>Room 2</td>
<td>Science hall</td>
<td></td>
</tr>
<tr>
<td>Room 3</td>
<td>Room A</td>
<td></td>
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<tr>
<td>Room 4</td>
<td>Room B</td>
<td></td>
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<tr>
<td>Room 5</td>
<td>Room C</td>
<td></td>
</tr>
<tr>
<td>Buzz hall</td>
<td></td>
<td>B1 floor, West Block Bldg. #4</td>
</tr>
</tbody>
</table>

### KRP Buildings map:

![Building #1: Registration, technical presentations, and plenary lectures (Oct. 19)](image-url)
**Building #4:** Plenary lectures (Oct. 20)
Multi-tasking machine tools offer increased productivity for complex and difficult machining operations. This is not only due to additional axes and spindles which can be used for various machining processes on the part. Increased productivity can also be achieved by using special machining operations such as rotary turning, turn-milling and parallel turning or milling. In this talk application of these processes will be demonstrated for increased material removal rate, tool life, chatter stability and part quality. Example applications will include difficult-to-machine materials, highly flexible parts, various cooling and cutting conditions etc. Predictive models developed for process geometry and part quality, cutting forces and chatter stability will also be presented.
The influence of the government, environment and business has radically changed the aviation industry products over the years. These influences have immediate implications on what the OEMs that produce aircrafts offer to airline customers.

First generation aircraft was wood and fabric, the second was metal monocoque, third generation was unpressurized reciprocating engine, fourth, pressurized jet powered aircraft with large amounts of non-aluminum. The fifth generation will be jet powered, blended body, predominantly designed to be created from composites and high strength, lightweight, corrosion resistant, refractory metals like titanium.

To create the fifth generation commercial vehicles, high cost alloys like titanium will be used to a greater degree. This high cost alloy will cause the manufacturer to find novel ways to buy and fabricate the requisite parts. No longer will the OEM or its supply base be allowed the inefficiency of buying large lots of forging and plate and creating parts with high buy to fly coefficients. Costly high strength alloys will have to be very thin and increasingly monolithic.

The other great change in the recent past (and it will only increase in the future) is the use of non-metals. These high strength, low weight alternatives to standard aluminum alloys will continue to grow for cost and weight savings. Science and technology will make the use of high strength alloys and composites viable. Next generation evolution in computer control, robotic machining, inexpensive “Non Destructive Inspections” and many other challenges will need to succeed in this environment.

To thrive in metallic manufacture of the future, smaller amounts of commodity material will have to be near net forged or hot formed. In addition, joined materials using solid state welding and joining using techniques like stir welding will be prominent. Great strides in additive manufacturing will be needed to create the numbers of detail parts using techniques like metal laser sintering and other 3D metal printing techniques. Tremendous amount of research and development will be needed to make the future commercial aircraft light enough, environmentally suitable, and cost acceptable for the airlines, passengers and governments of the future.
Though manufacturing is as old as mankind, machine tool design has even in the last decades undergone severe changes in performance and design. By far machine tools are still not covered within dominant design principles. Driving forces are material development, development of electronics, the pressure to higher productivity, lower costs and higher accuracy. Machine tools today are mechatronic products, where mechanics, drives and control form an inseparable entity. The new role of disciplines and devices within this entity needs to be learned and experienced to pave the way to new paradigms and concepts. Mechanical parts of machine tools become aided by electronics, but nevertheless it’s the mechanics of the machine tool which still is of dominant importance. Deeper knowledge of the behavior of the machine tool enables to setup different models of the machine tool, models for the prediction of the behavior, models for the analysis and interpretation of measurement data and models for advanced control of the machine tool. Erroneous movements of the machine tool due to whatever source like assembly of axes, set point generation, dynamics and inertia, thermal influences, process reaction and gravitation need to be mitigated wherever possible. Costs and today also environmental aspects play a major role in the search for technical solutions, which require a paradigm shift from resource based to knowledge based solutions. Compensation seems to be the attractive technology to synergetically solve the multilemma of production machines, for instance where energy efficiency and accuracy meet.
PC-Control delivers a powerful platform for the implementation of control, information and internet related functionality. The integration of PLC, motion (PTP, CNC and Robotics), measurement and vison functionality in one software package implemented on standard MS Operating systems and standard industrial PC Hardware architectures leads to a unified and powerful control architecture. Furthermore the PC-Control philosophy allows the easy combination of high performance control with all standard IT-features and Internet related services or functions. The actual state of this technology will be presented, future technology trends will be investigated and the benefits of the convergent development of all three technologies will be shown.
Prof. Nishio's research clarifies the multiple relationships maintained by "geiko" (Kyoto dialect for "geisha") and "maiko" (geisha-in-training) as they develop into service professionals who are highly skilled at entertaining customers. Their multiple and strong relationships are embedded in a developmental network within the geisha districts (called "hanamachi") in Kyoto. Those areas have maintained their traditions and survived for over 350 years.

Prof. Nishio found maiko's careers are integrated within the larger geisha's community, and in the course of acquiring work experience maiko develop their skills within a network of designated interpersonal relationships that also include customers. She found behavioral, managerial and institutional factors that construct and maintain the developmental network around maiko in the Japanese Traditional Culture Industry.
**Factory Tour**

The tour highlights are two major companies in Kyoto city.

(1) **Date:** Oct. 22, 2015 9:00-16:00

(2) **Factories**

   (a) **Shimadzu Corp.**
   The company is famous for medical and analytical measurement devices.
   http://www.shimadzu.com/

   (b) **Kashifuji Works, Ltd.**
   The company is famous for CNC hobbing machines, gear shaping machines.
   http://www.kashifuji.co.jp/eng/

(3) **Time schedule**

See the LEM21 website at: http://me.kyoto-u.ac.jp/lem21/program.html

(4) **Participation fee:**

3,000 JPN Yen (by cash or credit card (VISA)). Lunch is included.