

## IWMF 2002 Held in the U.S.A.

The 3<sup>rd</sup> International Workshop on Microfactories (IWMF) was held at the University of Minnesota, Minneapolis, through the joint sponsorship of Carnegie Mellon University and the University of Minnesota, for three days, September 16 through 18, 2002.

The former Mechanical Engineering Laboratory of the Agency of Industrial Science and Technology took the initiative to hold the 1st IWMF in December 1998. In October 2000, the 2<sup>nd</sup> IWMF was held in Switzerland.

The program at this year's workshop included the following sessions: (1) System Architectures for Microfactories, (2) Micro Assembly Systems, (3) Micro Assembly Techniques, (4) Micro Fabrication, (5) Micro Fluidic Systems, (6) Micro Actuation and Sensing, and (7) Toward Nanofactories.

The breakdown in number of presentations given per region had America with 8, Europe 9, Japan 5, and other regions 2. Fifteen presentations were given in the poster session.

The Japan side featured a presentation by Takayuki Hirano, Executive Director of the Micromachine Center, entitled "Micromachine Technology Trends in Microfactories," which covered the results of METI's Industrial Science and Technology Frontier (ISTF) Program, the fusing of micromachines with nanotechnology, and the like. In addition, the National Institute of Advanced Industrial Science and Technology presented several research findings.

Here, we will summarize some of the more memorable parts of the presentations.

The Fraunhofer-Institute for Manufacturing Engineering and Automation, (IPA Department for New Applications) announced research findings on a "mini-factory," similar to the micro-factory concept developed in

the ISTF Program. The mini-factory is configured of handling modules arranged around a conveying plate. For conveying, a two-dimensional planar motor with a wire is used for power supply. However, the positioning precision is  $\pm 20 \mu\text{m}$ , which is equivalent to that in the micro-factory of the ISTF Program using a stopper, and a precision of 200 nm is achieved when using a magnetic sensor. Each module is provided with a controller using distributed JAVA, which is advantageous for its suitability in an Internet environment through the use of Ethernet. Designing tools have been developed for designing the system. Research is currently being conducted on a system using a micro fluidic injection module. There is a plan to develop a system for assembling laser diodes of different specifications by 2004.

As a new venture, France's Laboratoire d'Automatique de Besançon is researching a proposed concept on plug-and-play devices called microrobots on chip. While the research is aimed at developing an inexpensive high-resolution device that is compact and can be used immediately, research to date has focused on mounting a two degrees-of-freedom gripper on a SmartCard Reader and verifying its functions. The laboratory is also studying a linking construction for accurately positioning an end effector. Manipulation by sensors is apparently not performed in order to protect the object being manipulated.

At this workshop, there were a lot of presentations on measurement and evaluation technology in particular, such as a study on capturing the shape of objects based on CAD data and methods for taking wide images using multiple cameras.

The 4<sup>th</sup> IWMF has been scheduled for Shanghai in September 2004.

