I-FE01 Micro Systems

15:20-17:20 **Chair : Park Gwi Tae (Korea Univ.)**
Room : C105 **Co-Chair : Choi Hyouk Ryeol (Sungkyunkwan Univ.)**

15:20 – 15:40 **I-FE01-1**

Design and Analysis of an Electro-Magnetic Micro Gripper for Grasping Miniature Sized Objects

Jaehong Shim(Korea Polytechnic Univ.), Won Choe(Samsung Co.), Kyunghwan Kim(KIST)

This paper presents the development of a micro gripper for grasping miniature sized parts in micro-assembly. Particularly, we have paid attention to the problem of manipulating objects of a well defined size range: the one between 1 mm and 0.1mm. In fact, objects larger than 1 mm can be easily handled by conventional precise grippers, while objects smaller than 1 μm can be manipulated with special tools like AFM or STM. In this range, we can distinguish between mechanical and biological objects. We have focused our gripping research on the micro mechanical objects. We started from a 1 degree of freedom planar configuration. The structure of the micro gripper was a type of the elastic flexure hinge and was fabricated in...

15:40 – 16:00 **I-FE01-2**

Compliant Micro Actuator made from Dielectric Polymer

Sunghwi Cho(AIST), Sungmoo Ryew, JaeWook Jeon, Hunmo Kim, Jae-Do Nam, Hyoukryeol Choi and Ryutaro Maeda (Sungkyunkwan Univ.)

In this paper, we discusses compliant actuators those are made of electrostrictive polymer. Electrostrictive polymer actuators(EPAs) are based on the deformation of dielectric elastomer polymer in the presence of an electric field. We address actual design and fabrication method of an actuator using the electrostrictive polymer. We have developed primitive prototypes of the actuator using elastic restoring force. And they actuators have 1 to 3 DOF, 1 DOF actuators are simple linear actuators and 3 DOF actuator has linear actuation and steering capability. They are simple in structure with lightweight, high trust, force and large stroke. Basic design principles and experimental procedures for confirming their performance will be introduced.

16:00 – 16:20 **I-FE01-3**

Realization of Cilia Motion of Annelida by Distributed IPMC Actuators

Kwangmok Jung, Sungmoo Ryew, Hunmo Kim, Jae-do Nam, Jae wook Jeon, Hyoukryeol Choi(Sungkyunkwan Univ.)

Recently Electro active polymer has been discussed in various researches as new actuators replacing the human muscles. Since they have confronted a limitation of more advanced application with traditional actuator. IPMC (Ion exchange Polymer Metal Composite) is one of candidate materials for new actuators. In this paper, we propose a new approach and design principle for the IPMC polymer actuator to conquer the weaknesses of IPMC that is intrinsic weak structural stiffness and low trust forces. In the first we performs some experimental works about how the basic specific characteristics of IPMC vary and what the optimal operating conditions are. And we have applied IPMC as active cilium for realization of annelida motion like...

16:20 – 16:40 **I-FE01-4**

Teleoperated Microassembly and its Application to Peg-in-Hole Task

Deok-Ho Kim, Yoon-Kyong Kim, Kyunghwan Kim(KIST), Won Choe(Samsung Co.)

This paper presents a scaled teleoperation scheme for 3-D microassmbly on the experimental microassembly workcell. A workspace mapping between a master and a slave microrobot system is presented to teleoperatively control the microrobot system for microassembly such as peg-in-hole task. Based on this result, a scaling factor is designed and applied to the teleoperated micromanipulation for peg-in-hole task in a mesoscale. Using 3-D virtual simulator, the workspace of microrobot system, and the working path trajectory for microassembly is visually represented. The proposed method is validated through the execution of 3-D microassembly such as peg-in-hole task on the experimental microassembly workcell. The proposed method in the developed...

16:40 – 17:00 **I-FE01-5**

Multiple Vision Based Micromanipulation System for 3D-Shaped Micro Parts Assembly

Seok Joo Lee, Gwi Tae Park(Korea Univ.), Kyunghwan Kim, Deok-Ho Kim, Jong-Oh Park(KIST),

This paper presents a visual feedback system that controls a micromanipulator using multiple microscopic vision information. The micromanipulation stations basically have optical microscope. However the single field-of-view of optical microscope essentially limits the workspace of the micromanipulator and low depth-of-field makes it difficult to handle 3D-shaped micro objects. The system consists of a stereoscopic microscope, three CCD cameras, the micromanipulator and personal computer. The use of stereoscopic microscope which has long working distance and high depth-of-field with selective field-of-view improves the recognizability of 3D-shaped micro objects and provides a method for overcoming several essential limitations in micromanipulation. Thus, visual feedback information is very important in handling micro objects for overcoming those limitations and provides a mean for the ...

17:00 – 17:20 **I-FE01-6**

A New Valve Actuator for a Glaucoma Treatment by Using MEMS

Byunghoon Bae, Nakhoon Kim, Kyihwan Park(KJIST), Hongseok Kee, Seonho Kim, Yeon Lee(Lee yeon ophthalmic hospital)

Glaucoma is an eye disease which is caused by abnormal high IOP (Intra Ocular Pressure) in the eye. High IOP is caused by the aqueous humor which is produced consistently but not drained due to the malfunction of the trabecular system which has a role of draining the aqueous humor into the venous system. Currently, there are some methods to treat glaucoma, Among these, the use of implants is increasing in these days due to many problems in other methods. However, conventional implants are passive implants and have critical disadvantage. Therefore, it is needed to develop a new implant using MEMS structure which is capable of controlling the IOP actively and copes with personal difference of patients. An active glaucoma implant consists of the valve actuator, pressure sensor, controller, and power supply. In this paper, the valve actuator is considered. We make experiments and simulations with the fabricated...