

The University of Tokyo Exhibition

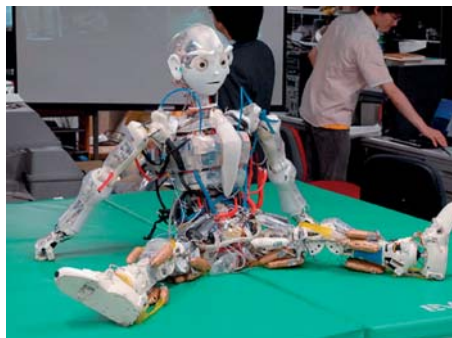
The University of Tokyo was established in 1877 as the first national university in Japan. As a leading research university, the University of Tokyo aims to provide its students with a rich and varied academic environment that ensures opportunities for both intellectual development and the acquisition of professional knowledge and skills. It has a faculty of over 4,000 and an approximate total of 29,000 undergraduate and graduate students enrolled. There were also around 2,300 international students and over 2,700 foreign researchers in 2006. The University of Tokyo is known for the excellence of its faculty and students and ever since its foundation many of its graduates have gone on to become leaders in government, business and the academic world, including Nobel Prize winners. The CAMPUS exhibition and its related events introduce various leading edge projects by students, researchers and professors mainly from the three courses Graduate School of Interdisciplinary Information Studies/Graduate School of Information Science and Technology / Graduate School of Engineering.

■ Kotaro—A Multiple-DOF Variable-Flexible-Spine Musculoskeletal Humanoid

Yoshinao Sodeyama, Naoya Muramatsu, Tomoaki Yoshikai, Ikuo Mizuuchi and Masayuki Inaba with Inaba Lab.



Humanoid robots are still in a process of evolution. We are trying to develop a next-generation robot named “Kotaro”. It is designed in an anatomically-based approach. It has a spine, scapulas, collarbones and ball-and-socket joints like the human skeleton structure. The anatomically-based body is driven by the artificial muscles, which are made of chemical wires and electromagnetic motors. It has over a 100 motors inside the body—more than twice as many found in other robots. The robot can make flexible, human-like characteristic motions, a wide range of movements and safe contact with humans using the complex body.





■ **Ephemeral melody**

Risa Suzuki, Taro Suzuki, Seiichi Ariga, Makoto Iida, and Chuichi Arakawa

Ephemeral melody is a novel musical instrument using soap bubbles. We can listen to unrepeatable music at the time bubbles burst through this instrument. When you turn a handle of this instrument, bubbles come out of a box instead of the sounds. Then bubbles become sounds when they hit copper pipes. We can listen to “once-in-a-lifetime music”. It aims to play music that depends on the environment around this instrument rather than on electronic devices.

■ TORSO—the telexistence system

Kouichi Watanabe, Hideaki Nii, Naoki Kawakami and Susumu Tachi

TORSO acquires natural visual information and accurately tracks the user's head motion. Earlier, conventional devices were only able to express the three-axis rotation of the neck, but *TORSO* goes beyond that capability to also express the neck's translational motion. The device is positioned at a distance from and facing the user, who wears an HMD or HMP and experiences the image transmitted by *TORSO*: a view of the user as seen by a second person.



■ Boxed-Ego

Alvaro Cassinelli



Boxed-Ego is a double trap for the Self. A peep-show box waiting in a corner of the exhibition space first captures the curiosity of the observer—and then the observer himself. In a silent environment, this box would appear empty; however, if someone approaches, talks or breathes, the box readily detects this human prey and traps it in its interior, transforming the observer into its own object of observation. Indeed, a dwarfed three-dimensional version of the observer (peering inside an even smaller box!) will slowly materialize inside the box. In response to light changes in the environment, the space inside the box

may gradually metamorphose (for instance, the observer may appear looking through a doll house window, may be inserted on the 3D space of a vintage stereo card, or a chair that does not exist in reality may be placed just behind him). If the observer stays still, all these illusions will come to an end and the box will gradually empty itself, expelling its prey from the infinite chain of boxed spaces. *Boxed-Ego* seeks to combine several pre-cinematographic techniques in order to create a new magical, “out-of-body” experience (hyper-stereo, stereoscope, diorama, synthetic pepper ghost effect). From the research perspective, this work is a preliminary experiment on the cognitive aspects of what we could call autoscopic telexistence.

■ **Log-Log 2008**

Hideaki Takata, Junghyun Kim, Sho Amano,
Eriko Shiraya, Makoto Iida and Takeshi Naemura

Log-Log is a balance-beam shaped interface that makes use of shifts in the user's center of gravity as the input, and an interlocked interactive video system. Spread under the balance beam is a video image of water that ripples in response to the movement of the person on the beam, such as walking. A strain sensor is attached in two locations on the bottom surface of the wooden beam to measure the flexing and distortion of the wood. This research makes it possible to turn various things around us, e.g. natural objects such as plants, into interfaces by simply attaching sensors to them.





■ Inter-glow

Takuji Narumi, Atsushi Hiyama, Tomohiro Tanikawa and Michitaka Hirose

Inter-glow is a system that facilitates close interaction and communication among users by using multiplexed visible-light communication technology. When users shine lamps on a table in a miniature living room, the system recognizes which lamps are illuminated and produces family conversations.

■ **Plushie**

Yuki Mori and Takeo Igarashi

Plushie is an interactive system that allows nonprofessional users to design their own original plush toys. We avoid the mismatch by constructing appropriate 2D patterns and applying simple physical simulation to it on the fly during 3D modeling. The model on the screen is always a good approximation of the final sewn result, which makes the design process much more efficient. We use a sketching interface for 3D modeling and also provide various editing operations tailored for plush toy design. Internally, the system constructs a 2D cloth pattern in such a way that the simulation result matches the user's input stroke. Our goal is to show that relatively simple algorithms can provide fast, satisfactory results for the user, whereas the pursuit of optimal layout and simulation accuracy lies outside this paper's scope. We successfully demonstrated that non-professional users could design plush toys or balloons easily using *Plushie*.



■ **Optical Camouflage**

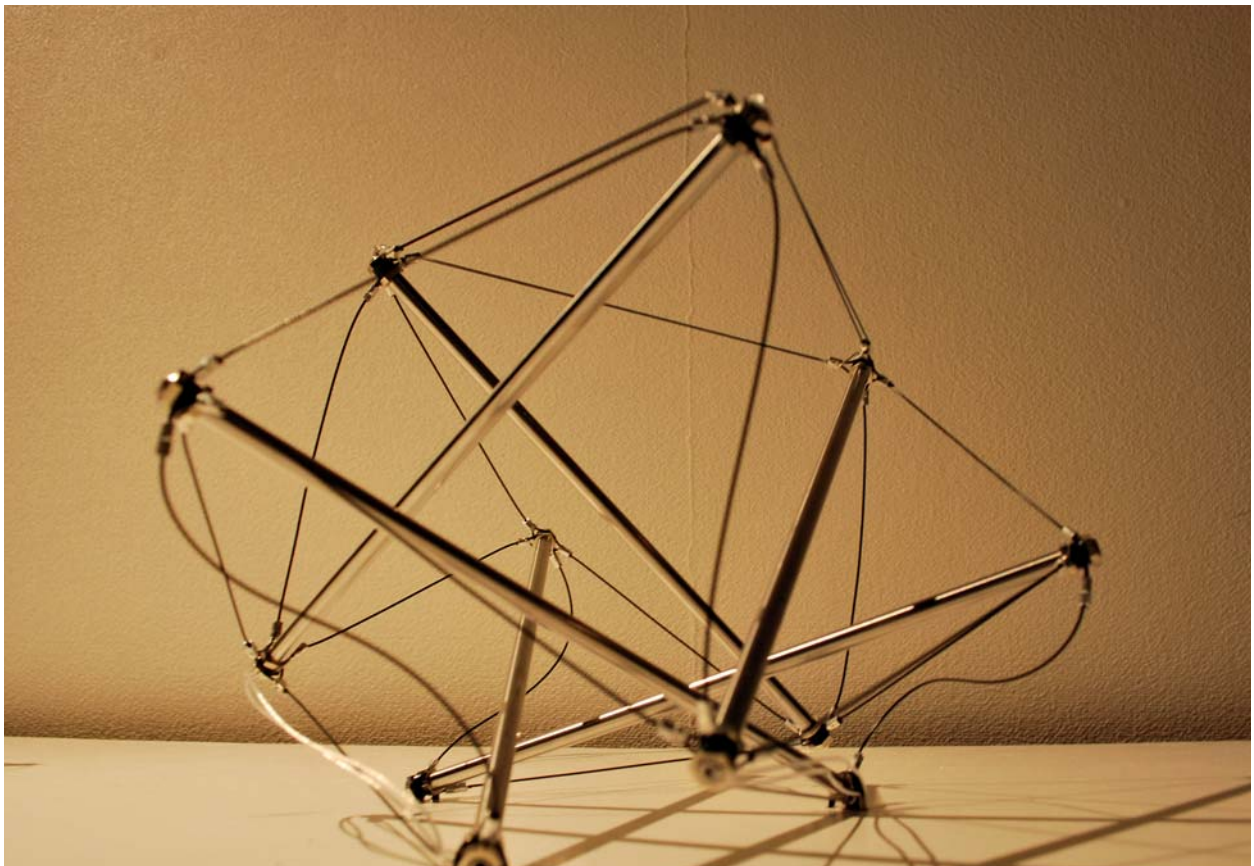
Takumi Yoshida, Hideaki Nii, Naoki Kawakami and Susumu Tachi

Optical camouflage technology makes anyone and anything that has a special piece of clothing on seem to be transparent. The piece of clothing is made of retro-reflective material that reflects light precisely according to the angle of incidence. When an image is projected onto the material, viewers at a specific location perceive a realistic merger of the projected image with the background, thus rendering the material transparent. Potential applications of this technology include tele-communication technology known as mutual telexistence, and various methods of removing optical obstructions, such as vehicles that allow pilots and drivers to see their exterior environment better than through windows.



■ structured creature

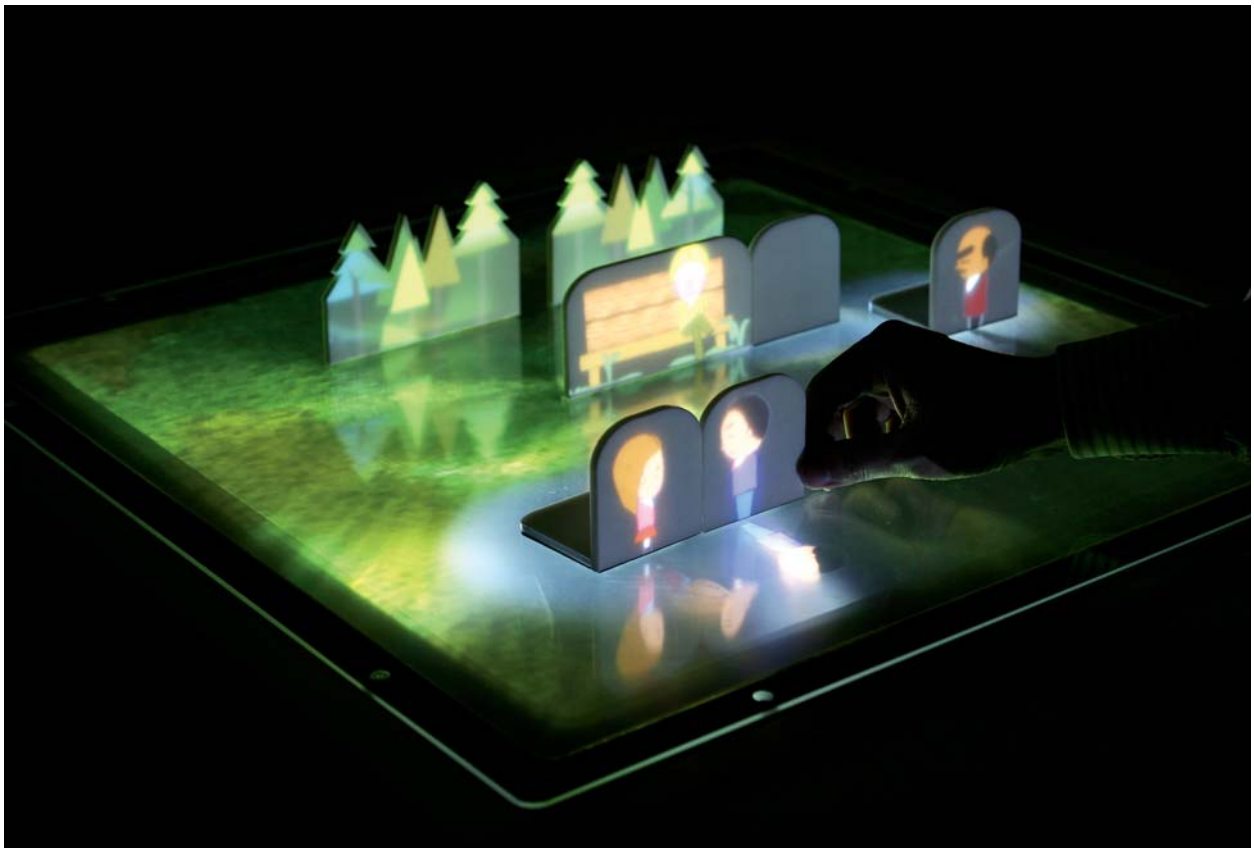
structured creature is a small prototype of a life-scale flexible space structure that could interact with human like sound or light. It can realize the space where physical space completely corresponds to the subjective space that people perceive. *structured creature* wriggles slowly, repeatedly rising and collapsing. This movement is derived from its own structure. This structure is called “tensegrity”, which was invented by Buckminster Fuller in the 1950’s. To realize a tensegrity structure, only the equilibrium state between tension and compression is needed. Thus, *structured creature* transforms by changing the internal tension with artificial muscles that are implemented to some tensional components.



■ **Tablescape Plus**

Yasuaki Kakehi, Takeshi Naemura and Mitsunori Matsushita

Tablescape Plus is an interactive tabletop video theater. Different images are projected onto the respective tiny screens placed upright on the table. As the user moves the screens, the images change. Moreover, users can develop new stories by changing the arrangement of the screens. For example, when the screens are placed side-by-side, the images on the respective screens react to one another. When the user puts the screen beside a bench, the character image moves to sit on it. Users can be involved in the world of these tiny imageries, which is like a living miniature garden.





■ **Feelings of daily details**
Tokihiko Fukao, Noguchi Lab

When you touch and stroke this concrete table, sound is generated and varies according to your stroke. Examining our daily life keenly, we recognize that rich details are already hidden in it. But usually, either consciously or subconsciously, aren't we deadening our senses and denying the contact with the actual sensation of reality? Through the experience of stroking the concrete with sound, I present a metaphor for such contact, and prompt people to reassess their perception of their daily lives. Here, sound is a mechanism for making people re-acknowledge their life as special. Thanks to optical fiber in the concrete, the light condition over the table can be sensed and sent to the sound program. (The iii Exhibition is partly supported by the Content Science Education Program.)

■ **Virtual Asukakyo**
Tetsuya Kakuta, Rei Kawakami, Takeshi Oishi and Katsushi Ikeuchi



The *Virtual Asukakyo* project intends to restore Asuka-Kyo to its original state by using Mixed Reality technology. In this project, we reconstruct the lost buildings of Asuka-Kyo with CG and synthesize them with the real landscape of Asuka village. The technical feature of this project is the real-time shadowing. We create the shadows of the virtual objects in a fast and efficient way by using a set of pre-rendered basic images and shadowing planes, so that we can express soft shadows of virtual objects in the synthesized images. The method is appropriate for static models in outdoor scenes. Therefore, we apply this method to the Virtual Asukakyo project and successfully improve the quality of synthesized image in MR systems.

Related Events and Workshops

Media Exprimo Workshop

Media Exprimo, an interdisciplinary CREST research project that aims to help enrich and sustain citizen media expression, will hold a workshop to link media arts to a general audience from various places in the world.



DPS (Digital Peep Show)

Interactive DPS software and its workshop documents by Tomoe Moriyama, in cooperation with and originally developed by Taizo Matsumura.

■ **Animation Next—presented by CG-ARTS**

in collaboration with CG-ARTS/cooperation with the Japan Media Arts Festival Executive Committee

■ **Straying Little Red Riding Hood**

pecoraped (NISHIO Miyako, SUGIDONO Ikue)

Grand Prize, Animation Division, The 13th Computer Graphics Contest for Students



Special support and special thanks to collaborators / participants and committee members:

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