Sensory Vision — Development of Toolkits and Training Course Using an I/O Module and Sensors

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Introduction

Multi-media communication rests on the premise that both sides, transmitter and receiver, use computers. Students learning new types of communication should cultivate their ability to create and comprehend expressions using media technology. We developed a course and toolkits for training their expressive capability. Sensing human actions is a key technical factor for creating interactive works in the field of media art and design. This course using these toolkits enables students to create an interactive installation easily and learn how to interrelate the response by sensing human actions.

Objectives

Our study aims to develop a course for education on media art and design in a society infiltrated by media technology; this course has the same intention as the Bauhaus's preliminary course (Vorkurs), which established a new style of creative education in industrialized society in the early twentieth century.

The immediate objective is to create a work that reacts interactively with human actions using sensors; the program involved in the work controls graphics, sounds, lights, or motors responding to human actions. One work is comprised of three elements: human actions, input from sensors, and response. It is not just a converter from input to output and not a transmitter to convey a certain message in a specific context. The interaction transforms the normally recognized pre-established signification into a new perceptual relationship. The course enhances students' ability to manipulate media technology.

This course addresses not only limited fields like product design or contemporary art, but also broad fields involved with the creative exploitation of media technology beyond existing media frames.

Hardware toolkit for sensory experience

To create a work for sensing human actions and processing it to a response, knowledge of electronics and programming is required. However, students of departments of design, arts, or human sciences normally lack this knowledge. It is quite difficult for them to collect and assemble sensors and electronic parts. To avoid this difficulty, we developed a hardware toolkit (Figure 1) that includes an I/O module and the parts shown in the second column of Table 1. The toolkit enables students to utilize analog and digital input from sensors without soldering.

Table 1: Contents of the hardware toolkit

	First version	Second version
I/O module	Gainer (developed by IAMAS) + Original circuit board	Original I/O module (four ports for analog input)
Parts for Input	Touch sensor, photo sensor, sound sensor, infrared sensor, rheostat, micro switch, read switch, mercury switch	Touch sensor, photo sensor, sound sensor, infrared sensor, rheostat
Parts for Output	LED, vibrating motor, solid state relay, small motor, a set of gear	NONE
Cables, etc.	USB cable, screwdriver set, circuit tester, three-core cable	USB cable, screwdriver set, circuit tester, three-core cable

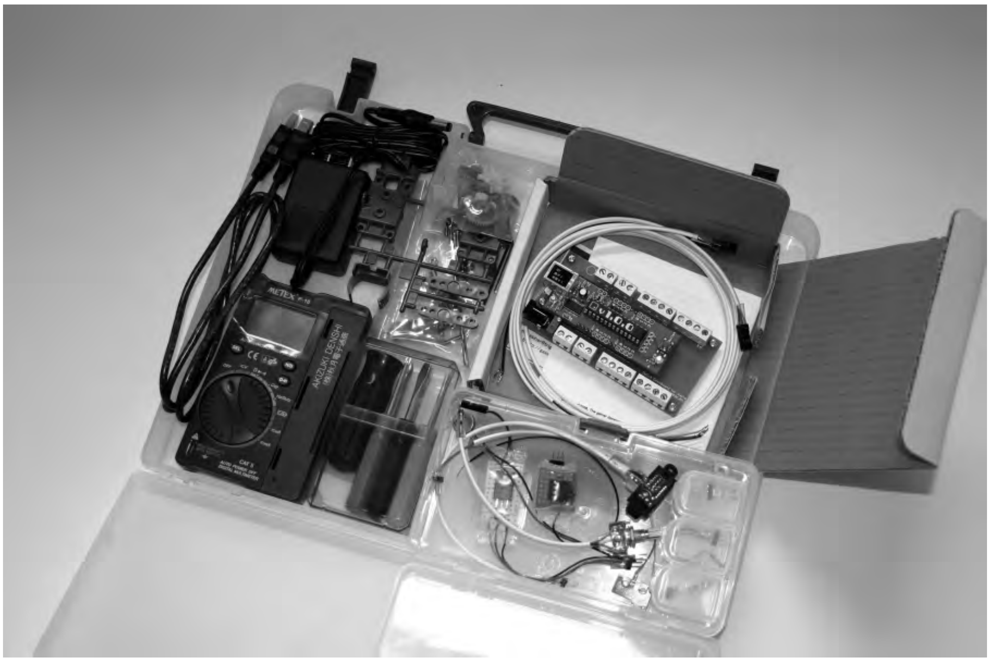

Figure 1: The first version of the hardware toolkit

Contents of the course

The course is organized in a project-based format: two students make an interactive installation as a team. The course is taught for one semester with fourteen weekly class sessions. It consists of: (1) understanding the objectives of the project, (2) understanding the hardware toolkit and basic electronics, (3) experimenting with the toolkit, (4) understanding the basics of computer programming, and (5) planning and creating the interaction.

Besides toolkits, we also prepared square wooden boxes for exhibition; their top size is 50cm×50cm and their height is 80cm. (Figure 2). Graphics as the response should be projected on the top board, or real physical things as interface should be exhibited on the box. This constrains students from making large-scale works beyond what they can manage and encourages them to formulate sensuous transfiguration by interaction within a simple construction.

Moholy-Nagy, who taught the preliminary course in the Bauhaus 1923-1928, wrote: "Their training this first year is directed toward sensory experiences, enrichment of emotional values, and the development of thought."[1] Moholy-Nagy thought that the sensory experience would be acquired though the basic knowledge of material characteristics, understanding of technology, plastic handling, and work with tools and machines. The basic principles of our learning course for sensory training share Moholy-Nagy's intentions. We name it in the media technological era the sensory vision.

Practice and results in class

This course has been taught for two years (2006 and 2007). In the first year, we required students not to use a computer monitor or projected graphics as output because we attached importance to the sensory relation between human actions and physical things without a virtual metaphor. By the restriction that physical materials should be used as interface, we expected

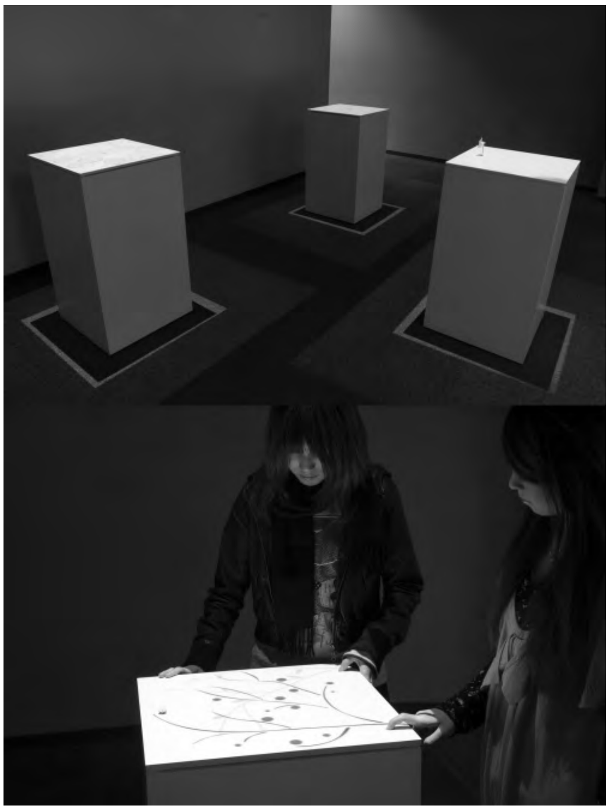

Figure 2: The box for an exhibition

an interrelation between human actions and natural phenomena or movements by the nature of physical materials like sand and water. However, works by sixteen teams revealed that students tended to bring a specific context in the interface using physical things; for example a miniature town lights up when one moves a hand over it. In addition, the appropriate craftsmanship for the physical interface was not achieved because of lack of sufficient craft skills.

To concentrate on transfiguration of aesthesia, in the second year we decided to eliminate the physical existence and adopt a virtual metaphor; that is, we made a new requirement that the installation should be performed only by projecting graphics on the top board. Sensors had to be embedded in or under the top board, and the viewer interface with the top board of the box.

Of fifteen teams in 2007, eleven teams generated animations composed of primitive graphics like circles and rectangles. Their works showed motion of graphic elements that reacted to human actions. Others used image files; for example, an animation in which a tree grows is shown when a viewer touched a small hole on the top board. In the case of using images, the response tends to be context-dependent compared to the case of generating graphics by a program.

Enhancing the hardware toolkit and developing the software toolkit

It is necessary to avoid intruding narrative or signification on the interaction from the viewpoint of training creation of interrelations beyond ordinary aesthesia. Practice in class indicated that it is appropriate to confine the aspect of the response to movement of primitive graphics generated by a program. To suit this, the hardware toolkit has been revised. Table 1 shows the difference. We have developed an original I/O module with only analog inputs. Further, we have developed a software kit consisting of numerous sample programs that show various patterns of simple movements of primitive graphics such as circles. The examples of basic patterns are one-direction, shuttle, rotation, and oscillation. To make many derivative motions, we have caused variations in each pattern by moving elements, their size and traces. The software kit could give students sensory experiences and lead students to consider how to create new interrelations of graphics movements and human actions.

The revised hardware toolkit and the software kit particularly focus on sensory training by eliminating narrative or semantic context so that they can work effectively as basic training for various fields in media art and design.

Acknowledgement

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Reference

1 Moholy-Nagy, Laszlo. 2005. *The New Vision*. New York: Dover Publications, p. 18. Originally published 1938.