

# Cover Page

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Being Mondrian: the public installation for interactive drawing with tangible interface

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# Being Mondrian: the Public Installation for Interactive Drawing with Tangible Interface

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## **Abstract**

“Being Mondrian” is a public installation aimed for interactive drawing utilizing a novel tangible interface. Abstract painting has been conceived as a monopoly permitted to professional artists with special techniques. However, at the same time, such art works are so apparently simple that ordinary people dare to think to simulate them.

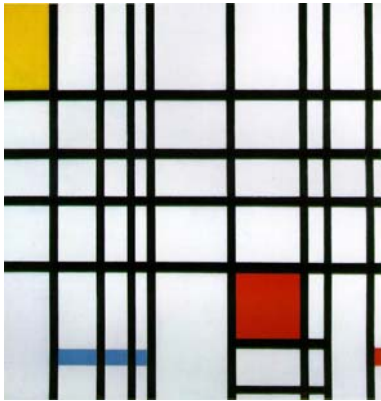
To substantiate the dream of being an artist, we proposed a set of interactive drawing system composed of “Drawing Kit” and “Mondrian Stage”. People can draw black lines and colored rectangles generated by the intersection of the lines as they put the Kit, the tangible interface, on the Stage which plays a role as both a functional and a representational space. Through this interactive drawing system, we did not intend to let people to merely copy Mondrian’s masterpiece, but create their own digital artworks.

## **Keywords**

Public Installation, Tangible Interface, Digital Art, Design Implementation, Augmented Reality

## **Project Statement**

Through history, the ability to make masterpieces has been strictly restricted to talented artists. Many art-lovers had to accept this situation which made them reluctant to create artworks on their own. Through a



**Figure 1.** Piet Mondrian, *Composition with Yellow, Blue, and Red*, 1939-42, oil on canvas, 72.5 x 69 cm, Tate Gallery, London

public installation called “Being Mondrian”, we tried to challenge this long-held prejudice, opening up opportunities for everyone to participate in the process of art-making by offering a new kind of tangible interface.

A Dutch painter Piet Mondrian (1872-1944), whose name was taken for the title of our work, is famous for his non-representational paintings that he called “compositions”, consisting of rectangular forms of red, yellow, blue, white or black, separated by black rectilinear lines (Figure 1) [9]. The most impressive trait of his artwork may be the apparent simplicity. In this respect, outsiders dare to think it is possible to imitate this masterpiece ignoring the precedent phase of abstraction. As the process of Mondrian’s abstraction is the most distinguished artistic achievement, only mimicking his final output may not implicate Mondrian’s inner mental process. Especially, mechanical copying with traditional tools such as oil colors and canvass, which were exactly what he used, may be meaningless activity.

However, should it still be meaningless if we reproduce Mondrian-like pictures utilizing an unconventional interface? The novelty of interface can generate a different form of experience while people are interacting with the medium. Without mastering of techniques, a medium itself helps people to understand the experience of digital design [1].

In order to both substantiate the dream of being an artist and explore a new drawing interface through an unhackneyed medium, we proposed a set of interactive drawing system employing digital technology. This work can be installed in public spaces such as educational

parks and participatory galleries so that people can enjoy regardless of age, gender and the level of art education. They can draw abstract paintings and finally will feel they get ‘Being Mondrian.’

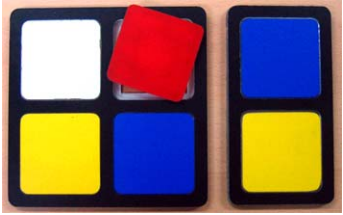
### **Background**

Being Mondrian had started as an interactive media design project for a course at Graduate School of Culture Technology, KAIST(Korea Advanced Institute of Science and Technology) and the first implementation was exhibited at a science-art collaboration called “10 years after vol.2” in 2004. From ideation to the prototype development, it took about 3 months (from April to June 2004.) After the end of the academic semester, we spent one more month to elaborate the prototype feasible enough to be exhibited.

Total three members have participated from the phase of the ideation. After confirming the direction of design concepts and the methods of implementation, two of the members were in charge of mocking up physical installation, and the third one, the developer programmed the algorithm to make the installation actually work. Finally they all together co-worked to install the final result at the exhibition site.

### **Challenge**

Both the goal of the academic course and the theme of the exhibition were not narrowly restricted, we were free to imagine the form of the final output. This situation could give us satisfying idea, but we struggled to embody it. Embodiment phase consisted of three steps – 1) mocking up all parts of the whole installation, 2) programming (vision processing for interface detecting and projecting a drawing on a stage), and 3) installation at a public space.



**Figure 2.** Drawing Kit: two kinds of frames with different color chips inside them



**Figure 3.** Color chips with markers on their rear sides

The most challenging part was installation since subtle difference of distance between the entities of the entire system caused considerable distortion of the final result (See Solution Details). In addition, vision processing for detecting a drawer's movement was not easy because the web camera installed to track the Kit above the Stage required sufficient light, but unfortunately the overall light at the exhibition was somewhat dark in order to make futuristic mood (See Result).

## Solution

### A. Process

With the vague concept of drawing Mondrian-like paintings with unconventional tools, we first analyzed the elements of Mondrian's exemplary paintings, the "composition" series (Figure 1) and how the painting was completed procedurally and logically. We found out that his painting was composed of black lines with same thickness and sub-spaces colored in red, blue, yellow or white. In addition, this composition could be reproduced as we repeated to divide the original space and color the intersection generated by the lines.

As the next step, we contrived a set of interactive drawing system composed of "Drawing Kit" and the "Mondrian Stage": a drawer puts the Kit and the Stage reflects the result of the interaction between her and the Kit (See Solution Details).

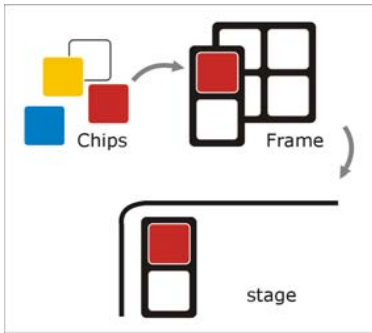
After we decided the specific elements of the system, we proceeded to actually build the system: mocking-up and programming were done in parallel. Then we combined physical artifacts and computer programming and optimized the entire installation for the exhibition environment.

### B. Solution Details

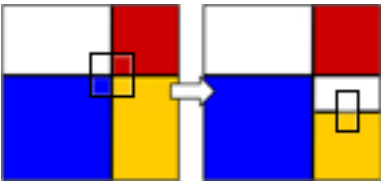
Being Mondrian is composed of two major parts: Mondrian Stage and Drawing Kit. A Stage, which is basically a translucent acrylic board, enables a participant to locate the tangible interface on it. It also functions as an interactive canvas representing her action with the interface. Drawing Kit is a set of tangible interfaces, i.e. a package of two frames and different colored chips made of acryl.

Two kinds of frames are provided to a drawer. One has four blank spots where colored chips can be inserted in. The other has two blank spots for chips, whose colors are blue, red, yellow, and white. These colors are chosen according to our precedent analysis of Mondrian's works (Figure 2). Each colored chip has a distinct marker on its rear side (Figure 3). Then connected computer recognizes the position of the frame and the colors of chips through tracking the markers via a camera. The technology to detect the different objects (chips of four colors) is 'ARToolkit', which tracks the markers and generate virtual objects [6]. In our case, the virtual objects are the lines and drawing finally resulting in a Mondrian-like painting.

To create her artwork, the drawer starts to choose either four-spot-frame or two-spot-frame. Then she picks up chips according to the frame and put them onto the spots of the frame. Now the tangible drawing interface is completed and ready to be located on the Stage (Figure 4). For instance, when she places the interface with four-spot-frame on the Stage, one horizontal and one vertical lines are generated virtually on the surface of the translucent white Stage forming the boundaries of four 'new-born' colored fields. And those fields are assigned to the colors of the chips. The



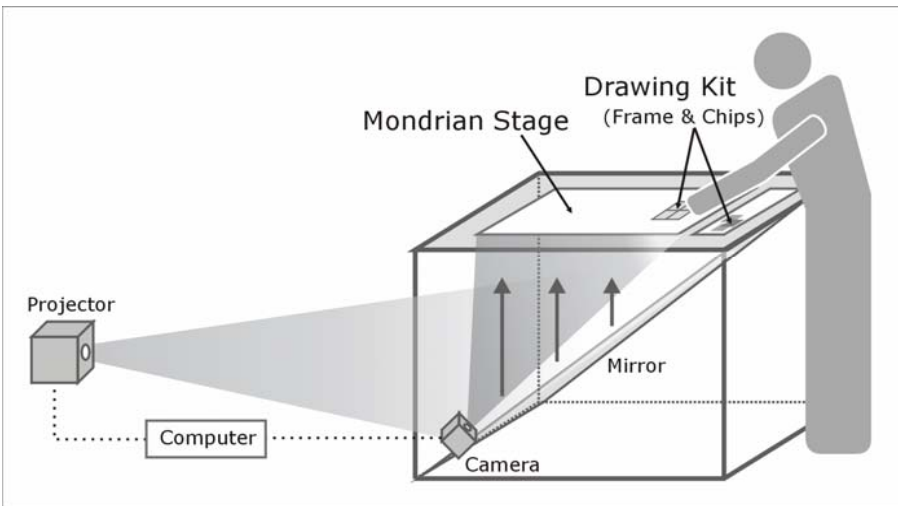
**Figure 4.** Drawing procedure



**Figure 5.** Drawing generating mechanism on Stage

result of this is immediately projected on the Stage. This input-output process is repeated as the drawer continuously locates the Kit onto one of the divided spaces (Figure 5).

The size of the Mondrian Stage is 1m\*1m. Below the Stage a camera is fixed at the bottom, and recognizes the colors of the frame placed above the Stage through vision processing (Figure 6). The colors (signals) received via this camera are transferred to the computer attached to it. After analysis of the data, the result will be projected by the projector installed in front of the Stage onto the translucent board through the reflection of the mirror in-between. Color detecting and projecting were implemented with C programming and OpenGL [7].



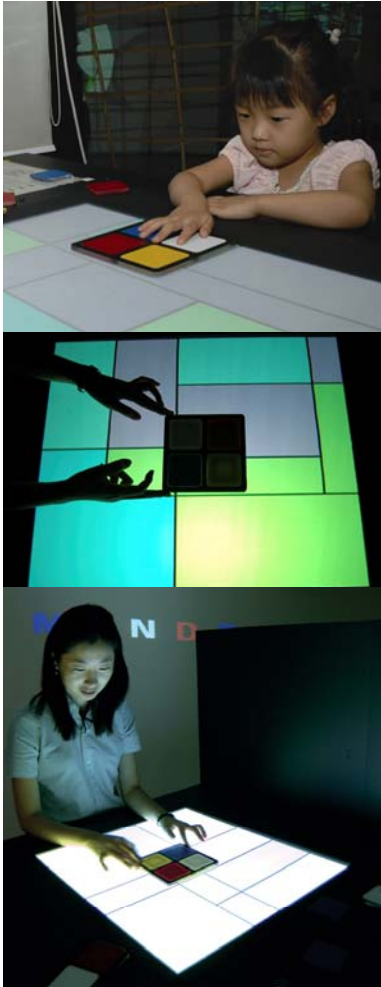
**Figure 6.** Entire system structure

### C. Result

The aim of being digital is not a mere substitution for human beings. The true power of digital is a promotion of human's creativity [5]. In truth, however, digital art and even self-named interactive art do not provide audiences with substantial space to enable direct participation. Instead audiences play a mere role as a trigger to open up the author's pre-defined work. But we believe digital technology has more potential beyond this limited role. One prospective role of being digital may be to allow a sphere where people have new experience and outstretch their own abilities.

Our installation work, a sphere where people can participate actively, had been exhibited at a science-art collaboration titled "10 years after vol.2" for a month in 2004 and drew much attention (Figure 7)[10]. While enjoying the installation, participants did not just pretend to be artists but actually became artists. We witnessed the moment a simple digital interface made people free from the complicated artistic techniques and reveal their creativity. This installation digitized the process of painting and gave her opportunities to be Mondrian: it was the audience who actually draw a painting. After drawing their own artwork, some participants even requested us to print out their result on a sheet of physical paper.

Drawing Kit, the tangible interface, played a vital role to make this work meaningful to audiences. Tangibility offered them sensation of doing 'something' actively and performed as mediators between reality and virtuality [3][4]. Ishii, H. insisted that tangible interface bridge the gaps between cyberspace and physical environment, as well as the foreground and background of human activities [2]. Also IO-coupling display,



**Figure 7.** Participants interacting with the system. Photographed at '10 year after vol.2'

Mondrian Stage, enhanced the audiences' immersion to a process of painting.

As the further step, we need to elaborate the algorithm of tracking (position and color): in the first implementation described in this paper, we were not able to perfectly represent the colors which Mondrian used in his original painting. In fact, the brightness of the three colors was higher and saturation was lower because we needed more light to track the movement of the markers on the Kit. To solve this problem, we should devise a method to calibrate the colors without lower the tracking performance.

From this work, we expect other possibilities to digitize artworks. For example, Pollock's paintings can be represented through the iteration of same action, scattering [8]. Once the action is digitized and audiences can choose the color, direction, and the degree of scattering strength, 'Being Pollock' will be able to come into the world. Namely, if we analyze his artworks elaborately and design and implement appropriate tangible interface, the solving process employed in making Being Mondrian can be applied.

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