

# To See and to Touch the Light Source

Mizuno Masanori  
Nagoya University  
m\_m@sa3.so-net.ne.jp

Motoyama Kiyofumi  
Nagoya University  
motoyama@nagoya-u.ac.jp

## There is no image, in the traditional sense

Lev Manovich (2001) classifies the screen into four types: the classical screen, the dynamic screen, the real-time screen, and the interactive screen. He also takes the image on the screen into consideration. There is no traditional image on the real-time screen and interactive screen because the image is ceaselessly updated in real time. In his argument, although we often use the terms television “image” or computer “image,” they are not really images. This raises the question: What is the image on the real-time and interactive screen?

Since the invention of CRT, we have been able to control electrical light freely and, accordingly we have continued to look at electric light in myriad ways. Any change in what we see is likely to be deeply related to the fact that we have been able to see the light source itself. We don't look at the image but the light source. This change in light might lead us to drastically change our interactive action with the environment. In this case, the drawing action, when combined with electric light, makes the screen interactive.

However, we don't have a theory of this new type of drawing. In order to consider the new drawing action, this paper focuses on Ivan Sutherland's Sketchpad because he connected CRT, a light pen, and computer in order to make a new communication system between man and computer, centered on the drawing action.

## No ink, no mark

Sketchpad was created in 1963 by Sutherland as a comprehensive system of “Computer-Aided Design”, a research project at the Lincoln Laboratory of the Massachusetts Institute of Technology in the 1960's. Sutherland (1966) describes the characteristics of Sketchpad as: “unlike an ordinary pencil, the stylus itself does not make any direct mark on the display. The

computer is placed, in effect, between the ‘point of the pencil’ and the ‘paper.’”

In a famous demonstration, Sketchpad displays the letters INK on the screen at start-up, but it is not physical ink but rather light radiating from the CRT. When the light pen captures that light, our drawing action starts. Light directly links the light pen and the CRT without making a mark in this drawing system. The CRT radiates light and the light pen receives it. The computer then freely controls that light. Here, light itself is the ink and the mark in a figurative sense. As a result, something is drawn on the radiant surface without a mark. Yet, what makes it possible to draw something with light itself?

## Looking at the light source

We must think about how the Sketchpad is able to draw something using light itself without a mark. For that, we must define what is the radiant surface of the CRT. In order to achieve this, we will first refer to George Berkeley's theory of vision. Berkeley (1963) indicates in “the new theory of vision” that what we see is made up of two senses called vision and tactile perception, which are combined by our experience. However, this suggests that there is also a rupture; our experience is merely one of holding vision and tactile sense together in what we see.

Jonathan Crary (1992) pointed out that 19th century physiologists handled these two senses as different things in what we see. The rupture suggested by Berkeley became an actuality. As a result, we cannot believe that what we see is something tangible, it's just “light, shade, and colors”(Berkeley, 1963). However, a new question emerges here. How can we fill the loss of tactile sense with light?

With that, we will consider the properties of the light from the viewpoint of J.J. Gibson's ecological optics. The most important aspect in J.J. Gibson's ecological optics

(1979) is “the information in light.” He wrote that the light source shows minimal information, which presents a “presence or non-presence”. It gives us indeterminate information which cannot be clearly analyzed to say what is there. Therefore, if we can precisely control the “on/off” of the light source, we create a presence of something by only ‘light, shade, and colors’. This makes up for the loss of tactile sense. The CRT can manipulate and show the flickering of the electrical light source. Therefore it is a device which completely controls the indeterminate information and represents “the presence of something” by the flickering of the light source. Moreover, the simple format of turning light on and off is the same format as the binary code, the format the computer uses to handle information. The computer, then makes the CRT control its own flickering of thousands light sources.

## To touch the light source

Man creates “the presence of something” from the information he can perceive, although the viewer cannot usually perceive everything, due to the minuteness of flickering light. However, with Sketchpad, users have the benefit of a light pen as a sensory perception tool, which can respond to the flickering of the light source within minute intervals, which cannot be perceived by man alone. Therefore, the minute flickering of the light source makes two circulations of information: one is for the human and the other is for the system. In this way, everything necessary for the computer-mediated drawing action is controlled by the minute flickering of the light source in Sketchpad.

According to Paul Virilio (1994), this minute flickering of the light source, which cannot be detected by humans, has created new energy and, simultaneously, presented

the problem of a new reality. Although this problem appeared originally with the invention of the photograph, the CRT and computer make it obvious because they operate at the speed of light. Sketchpad connects these two devices via computer in order to create a new reality of drawing.

Looking into the minute flickering of the light source by the light pen on Sketchpad, the relationship of “draw/drawn” determines “the presence of something” presented by the light source. This presence of something cannot be reached or touched by humans because it exists only at the speed of light. In other words, we don’t draw anything which we can touch. There is only a mosaic of the minute light source flickering via CRT, and the only thing we can do is watch it. However, Sketchpad can touch “the presence of something” by controlling capability of the light source. This makes it possible to re-set our sense ration between of visual and tactile. As a result, we receive a new reality: Drawing with light.

---

Berkeley, George. 1963. *Works on vision*. Indianapolis: The Library of Liberal Arts, p. 143.

Crary, Jonathan. 1992. *Techniques of the observer*. Cambridge, Massachusetts: MIT Press, pp. 58-59.

Manovich, Lev. 2001. *The Language of New Media*. Cambridge, Massachusetts: MIT Press, pp. 95-103.

Gibson, James J. 1979. *The ecological approach to visual perception*. Boston: Houghton Mifflin, p. 102.

Sutherland, Ivan E. 1966. “Computer inputs and outputs.” In *Scientific American* 215 (3), p. 95.

Virilio, Paul. 1994. *The vision machine*. Rose, Julie trans. Bloomington: Indiana University Press, p. 74.