

Identifying Distinctive Expression Units of Drawing

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Design of this Study

This study is a report of a computer system, that can record and analyze the process of drawing.

I think that the individuality of drawing consists of a rather distinctive unit. This idea is based on Levi-Strauss's double-articulation model. However, this idea is just a hypothesis. The computer system that I will report here is made to prove the idea. This system is to enable one to record digital data of drawing lines and analyze them. The purpose of using this system is not limited. First, I'm going to report the outline of the double-articulation model as a background, and second the outline of the system, and at last some discussion.

Background

In linguistics, it is an important issue to identify the unit of language to understand language as an object of science. In the same way, I think the identifying the unit of visual art is useful to develop concepts about art education. The concept of a linguistic unit is proposed by F.Saussure and developed by A.Martinet.

Martinet found linguistic units both in words and sounds. The unit of a word is called semantic unit. The unit of sound is called distinctive unit. This is the theory of double-articulation. This theory is to explain economy of language. Instead of infinite words, the number of sounds in natural language is less than one hundred. If the language does not have this double unit system, we must have an ability to use many thousands of sounds. The theory of double-articulation can explain the fact that the man, whose physical ability is limited uses limitless meanings.

C. Levi-Strauss adapted the theory of double-articulation to visual art. He compared figures in painting as semantic units and shapes and colors as distinctive units. So, he pointed out figurative paintings are similar to language (Figure 1).

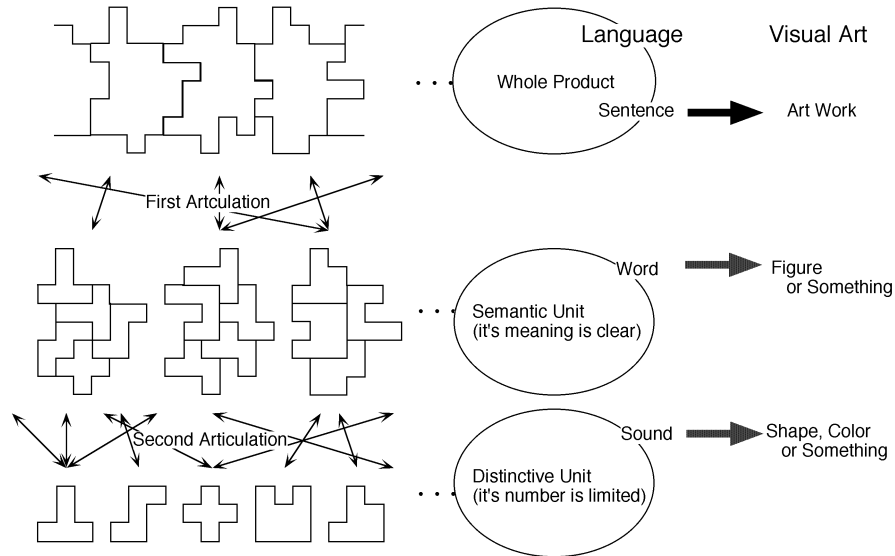


Figure 1. Model of Double-Articulation

There are many criticisms of Levi-Strauss's double-articulation model. For example, P.Francasel denied it for two reasons. First, though semantic unit's meaning is clear, figure's meaning is unclear. That is, a figure can't be regarded as semantic unit because it can accept many meanings. The second, the number of shapes or colors is limitless while the number of distinctive units is limited. In other words, shape and color can't be regarded as distinctive units because they can not be in a small number unit system.

The controversy around the double-articulation model continues now. Anyway, most of the criticisms are from the viewpoint of appreciating art works. However, It is possible to say that double-articulation model can explain the process of visual art expression, as is the same way of explaining the process of language expression. In the case of drawing, for example, there are not many number of lines that a man can control. If a man has a personal characteristic of drawing, a limitless number of lines which he draws derived from the limited number of his own line's units.

However, he can draw a limitless number of figures. So, from the viewpoint of understanding the process of producing visual art, the double-articulation model seems to be very useful(Figure 2).

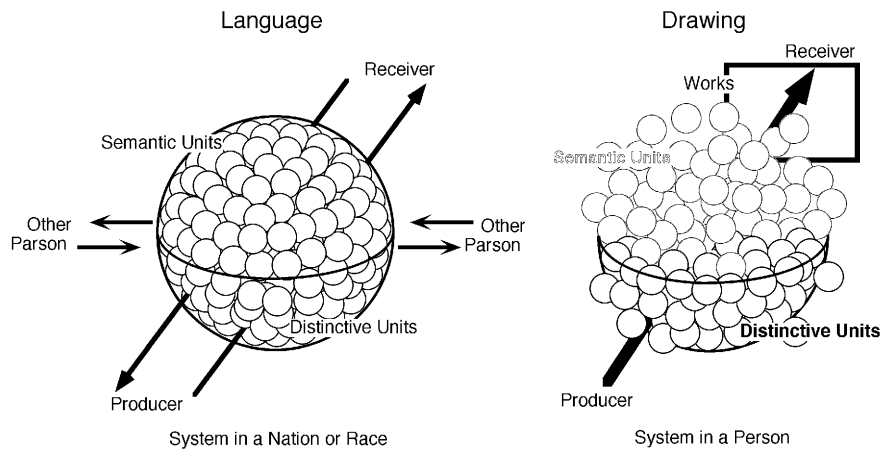


Figure 2. Model of Expression Process

U.Eco is one of the critics of the double-articulation model of visual art. However, he said that there are a few possibilities to prove double-articulation model of visual art by carefully classifying a great deal of data. Also, he suggested using a computer to simulate the units.

Outline of the System

The way to analyze drawing, in general, is just to look at the drawing. The amount and quality of analyzed data does not help in understanding drawing with the idea of a system or a unit. The merits to of using the computer to analyze drawings are to be able to get a huge data as well as time sequenced and to access the data at random, or to refer to the sequential data quickly. Also, the huge data can be analyzed in a very short time.

In this system, you can use the digitizer to put data into computer. The electronic pen for drawing is able to recognize pen pressure and to be used with a common pen cartridge. You can draw with this pen as usual. The computer's tasks are to control the digitizer, to record data, to transform them and to analyze them. The purposes of using the VCR are to get visual data for backup and to get sound data for protocol.

I made the application programs with the BASIC. They are divided into the process of collecting data and analyzing it. These programs can work on MS-DOS with simple transformation(Figure 3).

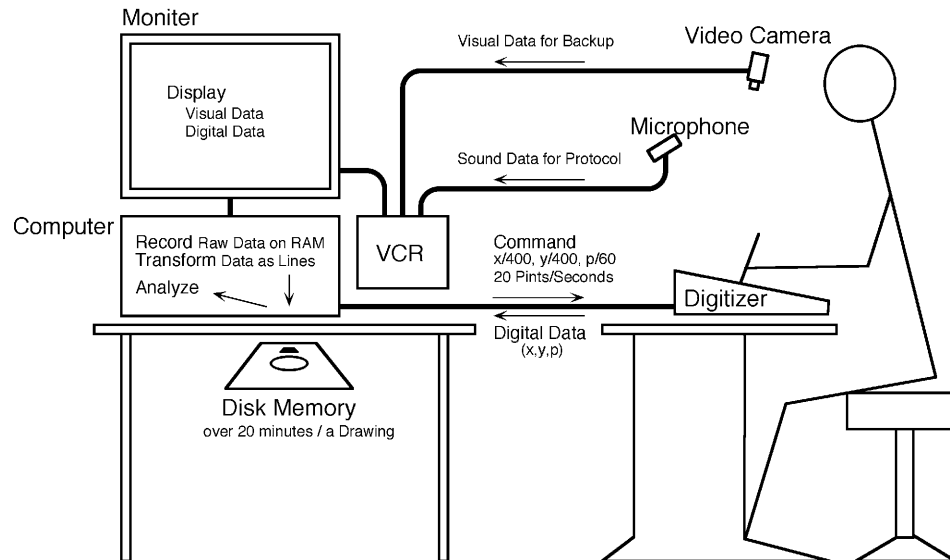


Figure 3. Model of the System

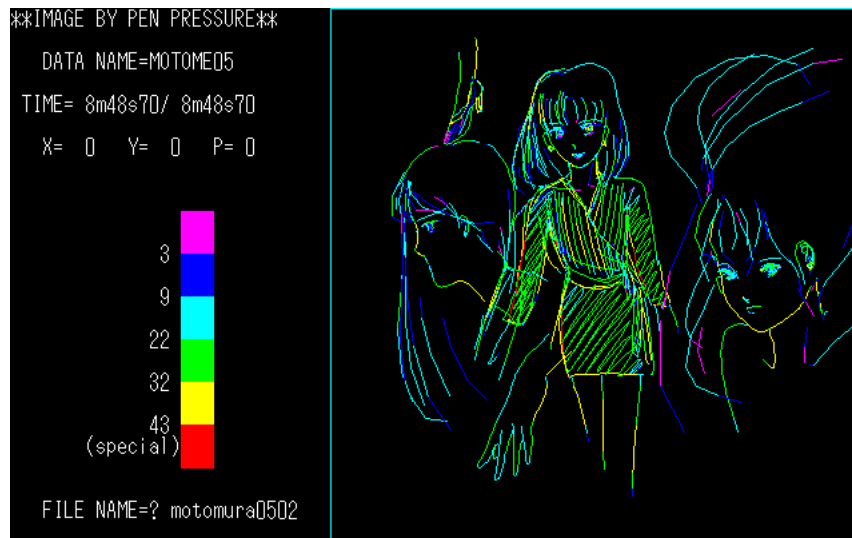
The processes of getting data are the following.

- 1) The computer sends the command for the digitizer so as to return the data of the pen point every 0.05 second. The interval is depend on the ability of the computer. The data that should be returned is the position (in 400 square mesh) and the pressure (in 60 steps) of the pen. The resolution of image is 0.76mm. There is not so large difference between real drawing and simulated drawing.
- 2) The data is once recorded on main memory. You can record data over 20 minutes.
- 3) After the drawing, the data is transformed into lines and recorded as sequential files in disk memory.

The processes of analyzing are the following.

- 1) The whole image is re-drawn by 6 colored lines in the order of making strokes.
- 2) The whole image is re drawn by 6 colored lines about velocity.
- 3) The whole image is re drawn by 7 colored lines about acceleration.

4) The whole image is re drawn by 6 colored lines about pen pressure(Figure 4).



- 5) The bar graphs of all lines in a drawing that show used second, length, maximum velocity and maximum pen pressure are displayed in the scales of making strokes.
- 6) On the subject of a line that you select in a drawing, the digital data of used second, length, maximum velocity, maximum acceleration and maximum pen pressure are displayed with the whole image of the drawing. In this whole image of the drawing, the selected line is colored green.
- 7) On the subject of a line that you select in a drawing, the line graphs that show degrees of pen point movement, velocity, acceleration and pen pressure are displayed. You can choose one of these processes quickly.

Discussion

As you know this report does not show the concrete image of each unit of visual art. However, the following appeared by using this system. In the example of a drawing, you can divide the same formed lines into two groups. These lines are vertical, short and straight. The lines of one group end with decreasing velocity, and the other end with increasing velocity. The lines of the first group are parts of a stalk of a rose, and seconds are outlines of a bottle. So you can see that in the

example the two similar lines form is completely different from each other. Moreover, you can see that the velocity transition should be a rather relevant feature to identify distinctive units of drawing.

To identify each unit is to determine whether the features make a complete unit or not. While I'm now considering what feature and what scale can make distinctive units of drawing, it is necessary to continue to develop the computer system.