

Integration of Expression and Analysis using Constructive Scrapbook

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Abstract

In this paper, we present how to use the Constructive Scrapbook to integrate expression and analysis and propose that its design is effective for learning.

Constructive Scrapbook is a computer application in which the user arranges compositions of pictures in a two-dimensional space, makes various compositions, and switches them freely. Although subjective expression and objective analysis are treated as different activities in the educational world today, we have designed a tool that handles both types of activities simultaneously through constructive learning. Our objective is to have children and ordinary persons use various facets to analyze their expressions and then create new expressions.

We held a workshop using the Constructive Scrapbook. The results show that the tool has the potential to make the user analyze expressions, extract significances to consider them deeply, and then create new expressions.

1 Introduction

In today's educational world, classes for expression such as painting and those for analytic study such as science or social studies are very different. Moreover, there is no cooperation between the classes. Subjective expression and objective analysis are regarded as totally different activities. The tools that support these studies are also separate. The drawing of a picture is a subjective expression and is supported by painting tools. On the other hand, the text, tables and graphic charts that are used for objective analysis are supported by documentation tools and numerical analysis tools. Expression is derived from personal experience, while analysis is based on universal law that transcends the personal. Therefore, these two activities appear to be very different.

However, humans do not think objectively from the beginning. Jean Piaget found that objective cognition is achieved gradually through a process of many misunderstandings made by subjective cognition [1]. Moreover, Seymour Papert advocated computer-based microworlds and developed the LOGO programming language as a learning environment to make a direct connection between subjective expression and mathematical knowledge; children can interact emotionally and physically with this tool [2]. LOGO's success showed that subjective expression and objective analysis could be connected within the world of geometry. However, a tool that can support activities to connect expression and analysis in other worlds has not been developed to date.

Multivariate analysis is widely used as an important scientific method in both natural science and in the humanities. These multivariate analysis tools require the user to have expert knowledge and are too difficult for ordinary persons. There are many situations where we want to analyze time and space, price and quality, or various other measures in our everyday life. If we had a tool for thinking with different ways of analysis, we would be able to apply it broadly to everyday matters.

2 Concept

This project aims to implement a tool that supports expression and learning and that handles subjective expression and objective analysis simultaneously. The targeted users are children and non-experts.

This tool uses standardized card-type objects which are digitized from the real world by a camera or scanner to handle the user's activities. Therefore, the activities are not simply those performed within the computer world; they are also various kinds of activities in the real world. The tool provides a field where the user can express something through the composition of the cards. The main objective of the design is to have the user concentrate on the

composition of the cards and find meaning or rules through that composition.

In addition to making a static arrangement of the cards, the user can switch from one arrangement to another arrangement that uses the same cards. As a result, the user is able to express his/her ideas by making and combining two or more aspects and contexts in which to arrange the cards. If desired, the user can also perform a multi-faceted analysis. The purpose of this analysis is to enable the user to obtain a deeper interpretation of and to extract significance from the expressions made, as well as to get new expressions from these activities.

3 Related Work

There are many painting tools available for personal computers. Some painting tools such as Kid Pix [3] do not require the user to have any special skills. The main purpose of these tools, however, is to support the user's free expression. They do not have any functions for analysis of the contents.

Some idea processors arrange pictures and text in a two-dimensional space. "Inspiration" is a typical example of such tools [4]. Although this tool arranges a composition of the cards, it cannot be used to easily change from one composition to other compositions.

Multivariate analysis tools such as SPSS are too difficult for ordinary persons [5]. Users cannot get analysis activities from their expression activities.

4 Design of the Constructive Scrapbook

4.1 Base Architecture

We designed the base architecture of the Constructive Scrapbook (CSbook) for today's ordinary personal computers. This tool is a desktop application tool. The user uses a pointing device such as a mouse or tablet digitizer to manipulate the objects in the two-dimensional display in the computer.

This tool uses digitized photos or pictures as cards. The user creates his/her work by arranging these cards into a unique composition. All of the cards are always displayed on the screen to enable them to be handled easily by the user.

All of the objects are created by Morphic in Squeak [6]. This format enables the user to move, resize and rotate the objects directly with the pointing device.

4.2 Proto-card

This tool makes card-type objects, called "proto-cards", from digitized photos or pictures. The user then

manipulates these cards to create his/her work, using a pointing device to move, resize, and rotate the cards.

Each card has a figure state and a ground state. The user can use the pointing device to change these states at any time.

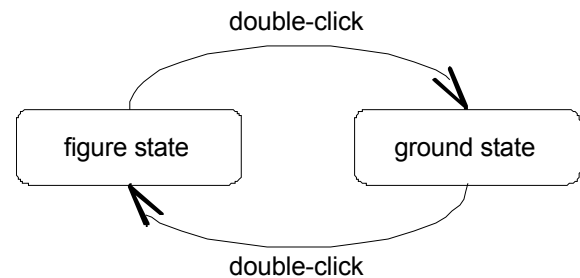


Figure 1: State transition of a card

4.3 Composition of Proto-cards

The user chooses a card for the ground card from the proto-cards and changes the state of the card to "ground state". He/she then creates a "composition" by laying other proto-cards, called "figure cards", upon the ground card. A card can be both a ground card for one composition and a figure card of another composition.

A composition made by a user is recorded in an object called a "locator". A locator is a button-type object. After the user records a composition in a locator, he/she can reproduce the recorded composition by clicking that locator.

Although figure cards are located upon a ground card, they are not embedded. Thus, a figure card can be located upon different ground cards at the same time.

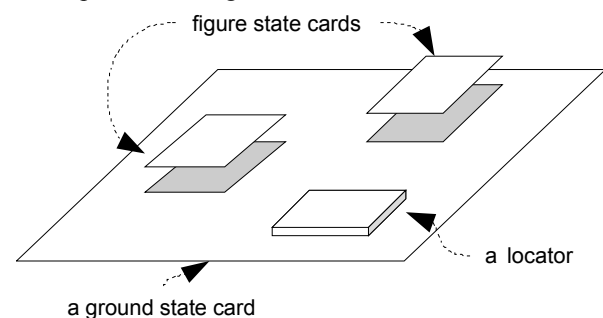


Figure 2: Concept image of the relation of objects

Reproducing a recorded composition is referred to as "activating a locator". When a locator is activated, the figure cards move to the recorded positions.

Each card moves slowly to enable the user to follow it with his/her eyes. We designed this feature so that

the user could visually experience that the composition was changed by the movement of the card.

A card can be recorded in different locators. When a card has been recorded at different positions in several locators, each locator moves the card to its own position at the same time. The result is that the card quivers.

The locator records the position of each card as absolute coordinates and then reproduces the position at the absolute coordinates or coordinates relative to the locator's position. In addition, the locator's effect can be switched on the X coordinate or the Y coordinate separately.

We provide three types of locator: position locator, scale locator, and attribute locator.

Position Locator

This locator records the positions of the cards and reproduces them.

We designed this feature to enable the cards to be put on a map or to be classified by an arbitrary position.

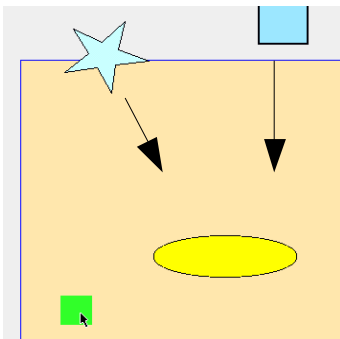


Figure 3: Position Locator

Scale Locator

The Scale Locator sets a ruler for a continuous value of a certain range and arranges cards. The user can change the range of the value and can adjust the range and distribution interval of the placements by freely changing the position and the size of the ruler with a pointing device.

For example, a date and time locator made with the Scale Locator arranges cards that have the date and time attribute. If the user changes the date and time at both ends of the ruler, he/she can adjust the range to display. If the user changes the length of the ruler, he/she can change the density of the distribution.

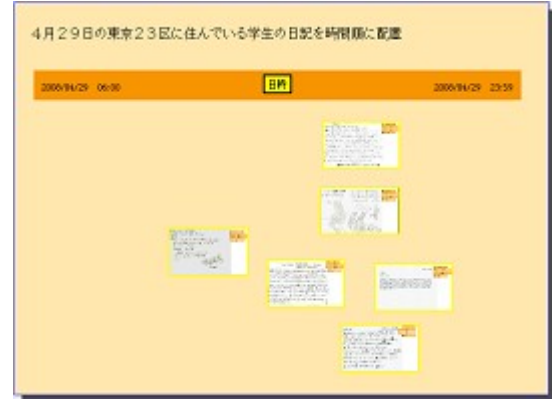


Figure 4: Scale Locator (time line)

Attribute Locator

The Attribute Locator moves the cards detected as having the specified attribute by string matching.

The user can make a new attribute label at any time, edit the key and the value of an existing attribute label, or delete a label.

We designed this locator to be used for classification by words or for analysis by discrete values.

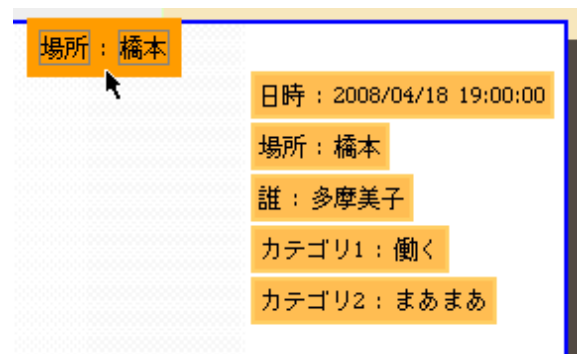


Figure 5: Attribute Locator

4.4 Changing the Composition

The user makes different compositions with the same cards and can switch them freely. Changes in the compositions indicate that the user has a variety of viewpoints or describe state transitions.

Set of Locators

An activated locator reproduces the composition of the cards recorded in it for independence from other locators. When the same card is posted at different positions in plural locators and the user activates plural locators at the same time, these cards quiver repeatedly. The movement of these cards attracts the

attention of the user and reveals the user's different intention of the locators carrying.

Composition Activators

We have provided a structure called a “composition activator” in which a set of locators that were activated at the same time is recorded. The user creates a composition activator in the state where the locators were activated on the ground card. He/she can then reproduce the ground card and the activation state of the locators at the time the composition was generated by putting the composition activation cursor on a composition activator.

Proto-card Pool

The proto-card pool is an area on a screen holding proto-cards. Proto-cards, which were not arranged by a change of Composition Activator, returns to the proto-card pool automatically. Proto-card pool displays the cards without hiding them. The user can understand the quantity of the proto-cards at a glance. It is similar to getting the quantity of a book from its thickness.

5 Experimental Workshop

5.1 Workshop

We had an experimental workshop on making and reading compositions with the CSbook implemented. The purpose of the workshop is to explore how the users integrate their expressions and analysis, also create new compositions with using the tool.

The workshop was held as an Ethnomethodology class project at design school. Objectives of the workshop are follows.

- 1) To have an opportunity of recapturing everyday living, students express diary of their daily life with writing and/or drawing.
- 2) To have comprehensive views of collected living with compositions of the diaries on the CSbook.
- 3) Students extracted significance of their living expressed in the various stories of the diaries through browsing and reading the compositions with CSbook at the presentation in the class.

The workshop project called "Maps of life (MOL)" was practiced during two months, from April to June, in the spring semester of 2008. This project consists of these three stages.

1) Diary stage: To write diaries for two weeks. Attributions of the diary are writer, date and time, place and two keywords are noted.

2) MOL Making stage: To make MOLs with collected diaries and geographical map images using CSbook.

3) MOL Reading stage: Through reading collected diaries on MOLs, students grasp various meaning of their living and having next idea to express the living.

The diaries submitted from 73 students shows 902 stories. Process of the reading diaries on MOLs and interpretations of the diaries are discussing in the next section.

5.2 Results of the Experiment

(1) Expression with CSbook

We made two expression-works from 55 articles of a day.

First, we arranged the articles on a map according to each place mentioned by that. (Figure 6)

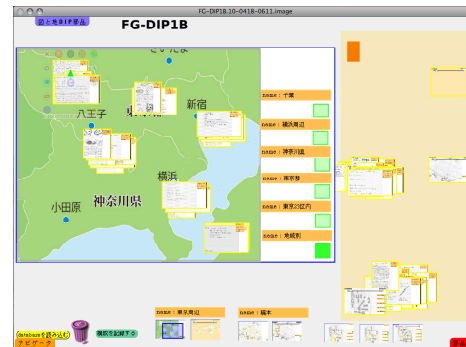


Figure 6: An example of the spatial placement

We made a time placement expression of the same articles next. On this expression-work, these articles are put on a place automatically corresponding to its attribute value of date and time.

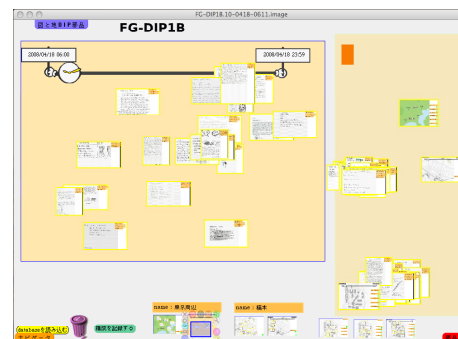


Figure 7: An example of the time placement

(2) Browsing and Reading of the Expressions with CSbook

We operated these expression-works, read, and interpreted the diaries through that. Then, we made new expressions.

A user read an article from "space placement" on a map "... I went to the Tama animal park to observe the movement of animals with five friends... "(MS). In there with "with five friends..." the reader paid attention to that and searches the diaries with an Attribute Locator for "Tama Animal Park" of Attribute Label. As the result, three articles reacted to the Locator. One of the articles said that two people are late for nearly 30 minutes, the time appointed for meeting was 11:00... (UM).

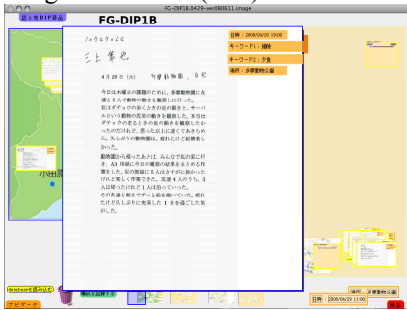


Figure 8: Read an article

Next, the reader paid attention to the description "11:00". He used Composition Activator of CSbook and read "placement expression of time" to overlook what other students did in that time of the day. The reader discovered an article of another animal observation in the domain of "11:00". It was "...Because homework was given, I went to the aquarium. The aquarium of Sagamihara..." (IT). From this description, we understood that these activities of the students at different places were connected by the same homework of a class.

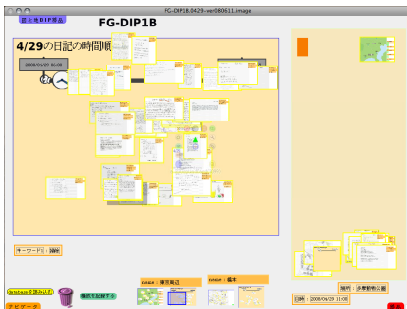


Figure 9: Search articles by "time of contents"

The chain of interactive reading to be seen in the CSbook helped the reader analyze, extract, and interpret the expressions. CSbook gather the diaries that are subjective expression, and the user constitutes them freely and can overlook the whole. The user reads

a meaning of the activity of people written in the diary from there, connects several articles, and reads a new message that was not written in each of them.

We tried that we brought a newer expression based on such a new meaning interpretation. As a result, one of the members pictured a graph of the hard work degree that showed the group that observed animals, and the group that they spent at home.



Figure 10: A new expression from analysis

6 Conclusions

We discussed a tool to integrate subjective expression and objective analysis in this paper. We realized that the tool could handle both activities of expression and analysis with the card type standardization form the result of the workshop.

We named a viewpoint of the multivariate analysis "facet". In the analysis activity, we found significance "the homework of a class" by several facets, by putting time scales and hand arrangement with attribute labels, from dozens of diaries by unrelated people.

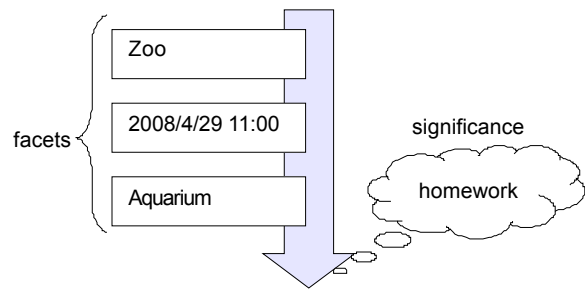


Figure 11: Finding a significance from facets

In this way, we think, the user refine his/her expression and analysis spirally with finding facets on the expressions and constructive analysis by hand arrangements of locators and cards.

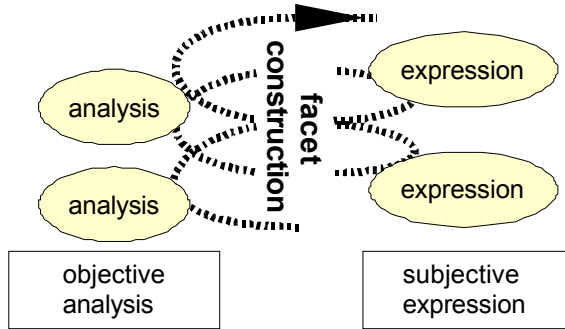


Figure 12: Spiral of expression and analysis

7 Future Work

University students did the process of the analysis at this time. We do not inspect the usability for children or ordinary people. We will study and refine the user interface.

We have a new field to study of the process of that the user understands things deeply using this tool. We want to investigate it in the various subject matters and analysis methods.

Acknowledgements

This paper is partly supported by the Core Research for Evolutional Science and Technology (CREST) of Japan Science and Technology Agency.

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