

Development of a System for Drawing Test

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Abstract— Various stresses exist in contemporary society. They arise from a number of causes such as human relationships and business and their perceptions differ widely in individuals. In our study, we aim to enable user to take their psychological tests and to have their counseling on the Web in order to solve their mental health problems, with a focus on psychological testing, we constructed drawing test system for the tree test and sand-play therapy. In this paper, we report on our drawing test system. Clients can draw trees by choosing and placing the parts of the tree on a computer. It is possible to determine how the client draws the tree at the beginning and erase the parts. Counselors then can provide psychological support to clients by the drawing test system.

Keywords- counseling system; mental health care; tree test

I. INTRODUCTION

Various stresses exist in the contemporary society. They arise from a number of causes such as human relationships and business. Perception differs widely in individuals. If the risk of suffering mental health problems is high and left untreated, stresses may trigger illness such as dysautonomia, dysfunction and psychosomatic. Counseling using psychological tests in a clinical setting is, as a safeguard against illness, deal. However, counseling is far from widely prevalent people in Japan are afraid about diseases of the mind.

There are various types of psychological tests such as mental status test and personality test. Representatives examples of these are the questionnaire method, rating method, performance test and projective method. There are also a variety of counseling techniques.

Various technologies are being developed in the computer industry. Among them, online services and systems have been proposed in many fields and agile software developments have received a lot of attention [1-4]. There are some researches about online counseling systems [5, 6] and we have developed and operated an online Web counseling system by use of agile software development methodologies to prevent mental health problems from

worsening by early negligences for those assigned overseas in Asia [7]. We constructed the online Web counseling system in cooperation with a clinic. All messages are stored in the data base of the system to prevent the information from leaking outside. Counselors are able to provide a consultation via the Web without going to the client's location and the system does not limit the time.

In our study, we aim to establish counseling services over the Internet, with a focus on psychological testing. We constructed a drawing test system for the tree test [8, 9] and sand-play therapy [10]. In this paper, we explain the drawing test system. Clients draw trees by parts of a tree on a computer display. The tree pieces that the client has moved is saved as a history log file of the system. It is possible to know that how the clients draw the tree at the beginning, erase the parts, and so on. Counselors can provide psychological support to clients by referring to the output of the drawing test system

II. TREE TEST [8, 9]

Tree Test is one of a method of projection and looks self-image. For instance, Rorschacha Test, TAT(Thematic Apperception Test) and SCT(Sentence Completion Test). Tree Test is thought that painted tree can project client's unintentionally desires and feeling.

Generally, the Tree Test uses white paper without a border, the size is 13.5cm × 21cm. The paper is used vertically and its writing tool is ballpoint pen. Psychotherapist normally tell a client to draw a fruit tree.

Tree pieces have psychological meaning, for instance, branches, so-called tree's arms, and leaves have subjective meaning that people look out. It has a lot of meaning by expression of branch and leaves. It is rare that people don't draw branches and leaves such as indicating tree crown. This trait tends to show serious inhibitory emotion between people and the others. The expression of self-image by painting of tree also indicates depressive withdrawal. If compared, trunks and roots and branches, leaves are out of balance, it represents overcompensation of anxiety. Small

size of drawings shows passivity and determent, so a persons overcommitment tends to drop away. The Leafless tree display interaction ineptness and unproductiveness. The crooked and broken branches and leaves show lack of interaction ability and kind of handicap. The long and thin branches display shut oneself into their own territory by their overcompensated fantasy.

Arrangement in space has great meaning. Top and bottom are thought to display spirit and body or conscious mind and unconsciousness each other. Right and left are thought to display future and past, mother and father or internal world and external world. It is also important that pen pressure, strong or weak. Line sequence, discontinuations and painting, careful or rough is also important. Thus parts of the trees have great meaning and it is possible that the constituent can be analyzed in detail by the arrangement of the drawn tree's position, roots, earth, branches, leaves, fruit, landscape and personification.

This research's aim is conducting of psychological test by computer. Clients draw a tree by putting in the tree pieces such as trunks, leaves and roots, and the painting is then analyzed by an expert.

III. SAND-PLAY THERAPY [10]

Sand-play therapy was developed by Lowenfeld, M in 1929, as a way looking at ildren's mental health. After that, Kalfff who leaned Lowenfeld's study developed the therapy. This treatment is very effective with adults in Switzerland.

Sand-play therapy is that a client chooses toys and sets them in a sand box. The box's size is 57cm×72cm×7cm and the outside is black. The inside is blue because it is representative of water. It is necessary to prepare a lot of toys such as humans, animals, trees, flowers, vehicles, architectures, bridges, fences, rocks and monsters.

When the client takes the test, the counselor tells the client "You can use the sand and the toys and make what you like." Then client arranges the toys freely. The counselor also records the order of process and conversation among the client and the counselor.

Arrangement of space is very important. Similar to the Tree test. The upper side represents mind, future and father. The bottom represents body, past and mother. Left side represents unconsciousness and inside. Right side represents consciousness and outside. There is possibility, using Tree test and Sandplay therapy, that we can discover a new criterion judging psychology.

IV. DRAWING TEST SYSTEM

We developed a drawing test system for tree test and sand-play. Here, we explain our tree test system.

A. System Requirements

We realized a system with that anyone can draw, easily. The system has an advantage that differences in culture are few and can be used anywhere. We develop the system that has the following features.

- GUI that anyone can draw easily.
- Overseas clients can use via network.

- Automatic saving of drawing history.
- Analytical functions from the drawing data.
- Accessory function for the drawing test.

The system makes possible to catch subtle changes. Specific requirements for these features are as follows.

- It is possible to move and arrange parts of the tree into the specific frame.
- The tree parts can be moved as many times as the client wishes.
- Movement of the tree parts is recorded in order as a history log file.
- The system does not limit the time and place to the Web server.
- All drawing test data are stored in a data base server of the system to prevent the information from leaking outside.
- The system provides counseling support functions by stored drawn test data.
- It is not necessary that the client install new system in the client's computer. When the system is updated, it is necessary to only change system of the server. The obtained data is controlled at the server.

B. System Overview

In light of system requirements, we developed the system by using JavaScript and SVG (Scalable Vector Graphics) . JavaScript is a script language for dynamic page and dialogicality. Major Web browsers can use JavaScript. SVG is an XML-based graphic description language for two-dimensional vector graphics and is be scaled to any size without image deterioration. Common Web browsers can support and render SVG file. In this system, SVG is manipulated by JavaScript and DOM (Document Object Model) . DOM is application programming interface for HTML and XML document. XML documents can be processed as tree structure by using DOM not strings. It is easy to retrieval and edit. The system conducts image movement, log analysis, history animation and so on by using SVG, JavaScript and DOM. Every single parts movement is recorded in order as history log.

C. Representation by SVG

Our system display images by using SVG and JavaScript. SVG files can be browsed by common Web browser and can be edited by text editor. In SVG representation, x- and y-coordinates of image are specified by a <image> element. The coordinates are the upper left point of the iamge. Rectangular space for arrangement of parts is represented by a <rect> element. A <rect> element has layout information as attributes x, y, width and height for rectangle displaying. Figure 1 shows a SVG file by Internet Explorer. Its display result is shown in Figure 2.

For extracting the drawn tree, the system judges whether parts of the tree are arranged in the rectangular drawing

space or not. Then, the system analyzes how trees are drawn. In the case that the tree part outside rectangle move inside, whether the tree is arranged in the rectangular drawing space or not is judged by x- and y- coordinates of the tree image.



Figure 1. Example of SVG file.

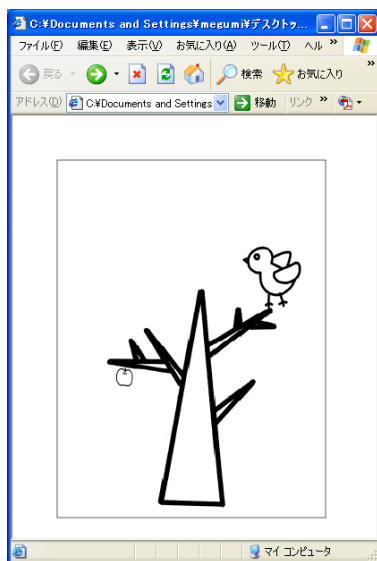


Figure 2. Display of the SVG file shown in Figure 1.

A SVG file used as a log file for history of drawing in the system. Drawing processes of clients are dynamically visualized by an animation function of SVG. Since an animation presents how trees are drawn, drawing processes can be viewed to anyone. Therefore, it is possible to counsel by using the drawing process animation function of the system.

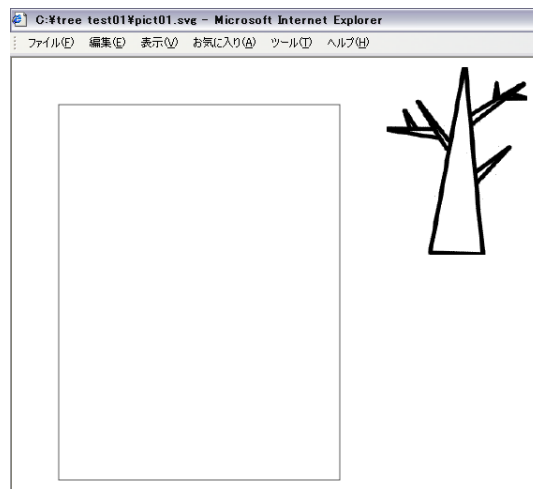


Figure 3. Display of tree selected by a client.

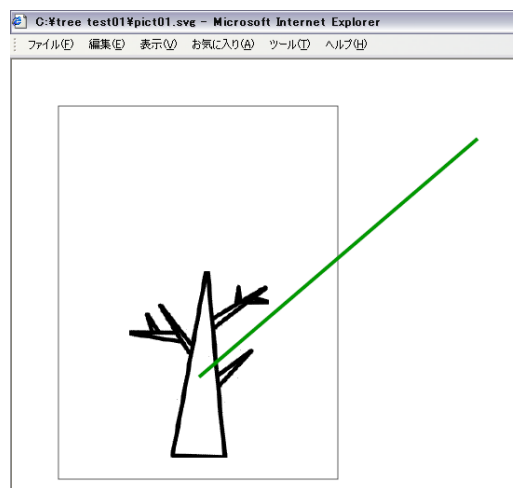


Figure 4. Movement and trajectory of tree

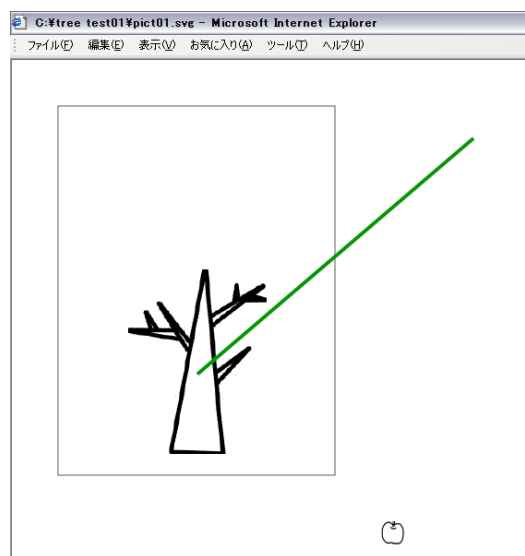


Figure 5. Display of apple selected by a client.

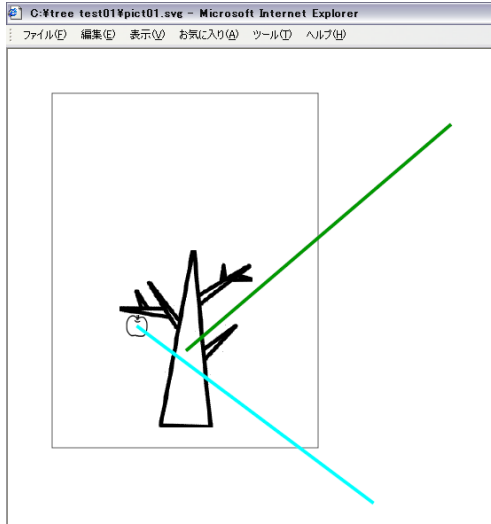


Figure 6. Movement and trajectory of the apple.

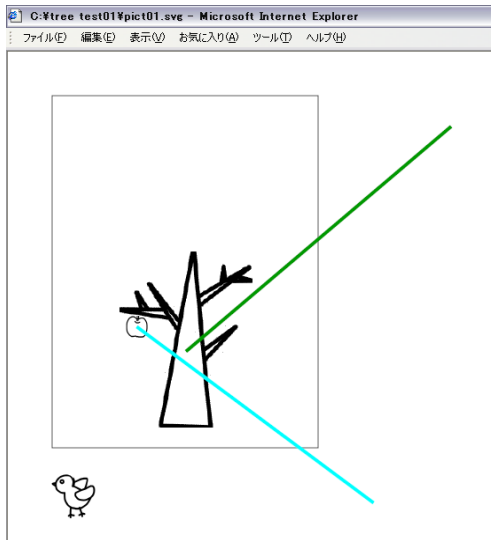


Figure 7. Display of an apple selected by a client.

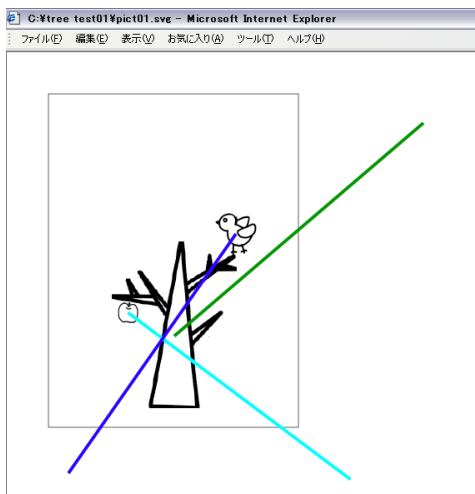


Figure 8. Drawing result.

Here, we explain an example of the animation representation of the drawing process. The animation representation is as follows.

- (1) The tree selected by a client is displayed as shown in Figure 3.
- (2) The tree is displayed at the destination and the trajectory is also displayed as shown in Figure 4.
- (3) The apple selected by the client is displayed as shown in Figure 5.
- (4) The apple is displayed at the destination place and the trajectory is also displayed as shown in Figure 6.
- (5) The bird selected by a client is displayed as shown in Figure 7.
- (6) The bird is displayed at the destination place and the trajectory is also displayed as shown in Figure 8.

Finally, the drawing result shown in Figure 8 can be confirmed by the animation and its trajectories. Figure 9 shows the SVG file of the example of the animation. The SVG file also plays the role of the log file for the history of drawing.

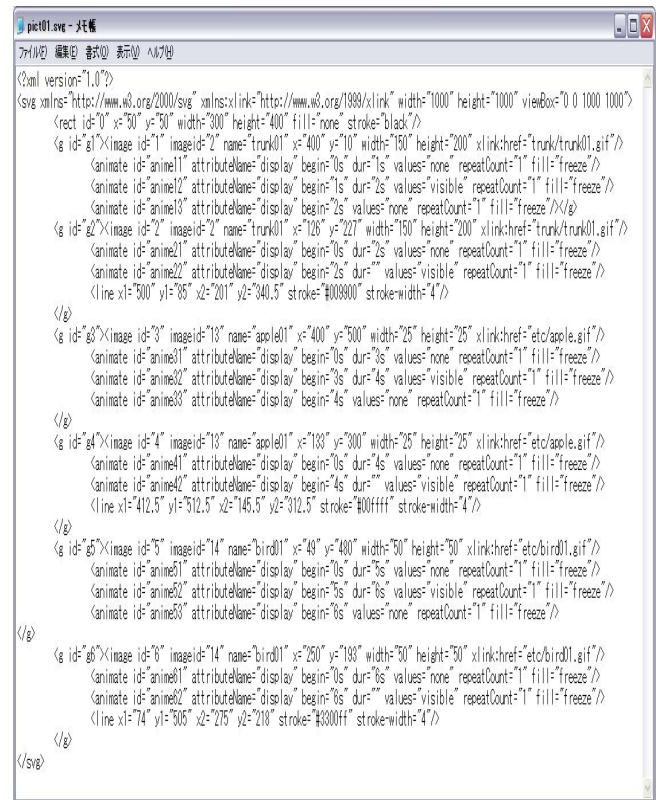


Figure 9. Example of SVG file for an animaion and a history of drawing.

D. Test Procedures

The drawing test is done by the flow chart shown in Figure 10. We describe each step below.

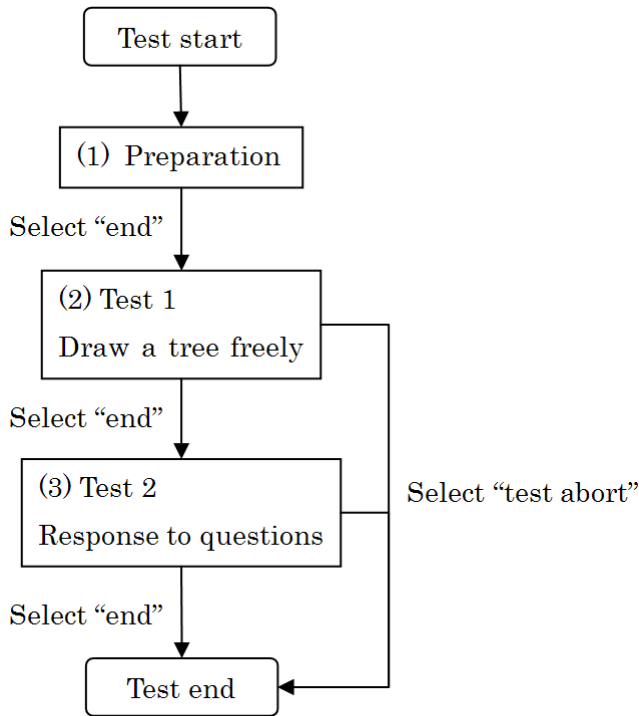


Figure 10. Flow of drawing test.

(1) Preparation: A clients inputs name , age and so on. Then, the client goes to the tree test page. The screen is displayed drawing rectangular space on the upper left of the page. There are parts for drawing outside the rectangular space. Figure 10 shows the tree test page.

(2) Test 1: The system starts a tree test. The client draws a tree freely by arranging parts to the drawing rectangular space. The system records history of the drawing as a SVG file point by point. The log has IDs, x- and y-coordinates and path information for images.

(3) Test 2: The client responses to questions after drwing a tree. The number of characters is not limited. The questions are as follows.

- How old is this tree?
- Is this tree alive or dead?
- Which season is it?

Finally, the client finishes the tree test by select “end”. If the client selects “test abort”, the tree test is aborted and the client goes to top page.

E. Example of Drawing tree

Figure 11 shows the initial screen of a tree test. A client arranges parts in the drawing rectangular space by dragging as shown in Figure 12. The system generates a history of drawing as SVG file point by point.

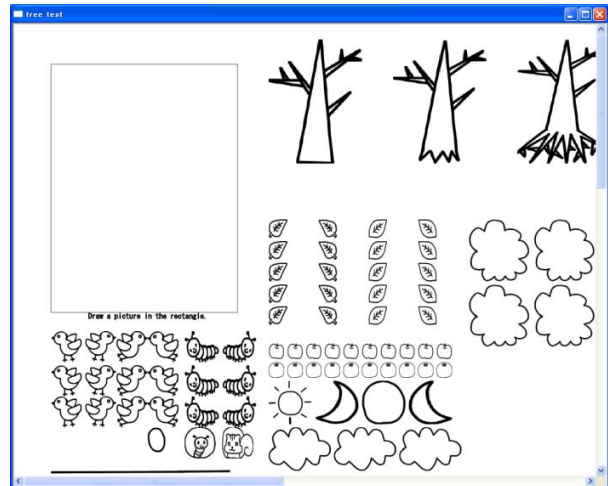


Figure 11. Initial Screen.

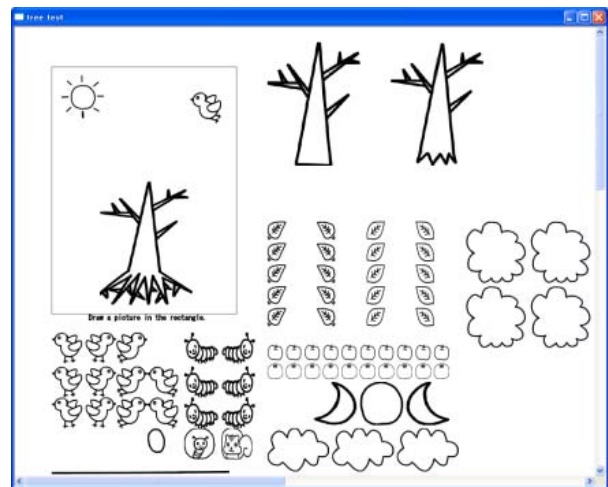


Figure 12. Arrangement for drawing.

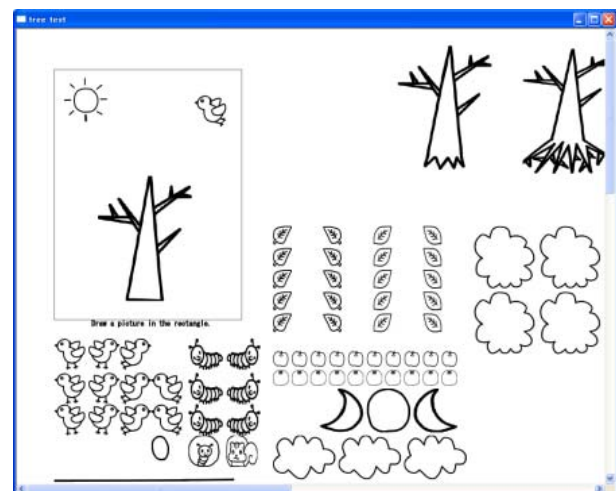


Figure 13. Rearrangement.

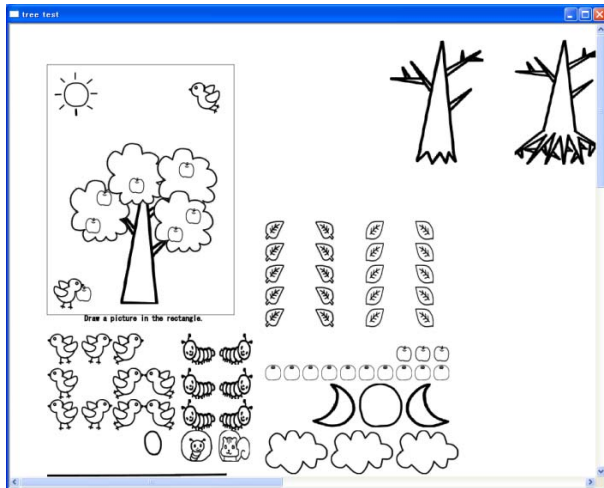


Figure 14. Drawing result.

If clients want to rearrange the tree or make another tree, clients can replace the former tree by a new tree as shown in Figure 14. In this way, the finally completed picture is shown in Figure 14.

F. Evaluation

We asked 5 people to use the tree test system and then answer the questionnaire.

It can be seen as positive opinions from the questionnaires that the system is easy to operate, it is fun, and users can use the system in a lighthearted mood. However, it can be seen as negative opinions from the questionnaires that it is difficult to move small images and it is impossible to draw the expected picture because there are not enough pieces.

Although these results show clients use the system easily, the system has improvements from the negative opinions.

V. CONCLUSION

We constructed a drawing test system for tree test. The system conducts an image movement, a history of drawing log recoding and an animation by using SVG, JavaScript and DOM. It is possible to draw a tree picture by moving and arranging the tree parts into a specific frame. The tree pieces can be moved as many times as the client wishes. Every single part movement is recorded in order as history log.

In the future, we plan to improve the user interface from the psychological viewpoint, to enable from psychological testing to counseling over the Internet and to provide counseling support functions by using stored drawing test data utilizing fuzzy theorem and so on.

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