



A KFD web database system with an object-based image retrieval for family art therapy assessments

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ABSTRACT

In this paper, we apply the DataBase Management System (DBMS) to Kinetic Family Drawing (KFD), which is a widely used assessment tool in family art therapy. We developed a prototype of the KFD Web database for managing large amounts of KFD assessment data, and supporting an efficient KFD assessment process by analyzing the requirements of family art therapists. We also devised and implemented a novel object-based image retrieval algorithm by using high-level features that are recognizable by humans in the context of the KFD Web database system. Consequently, a family art therapist can more consistently and objectively assess family problems by referencing the existing assessment content that was obtained with object-based image retrieval and a systematic knowledge management system in the KFD Web database system. We explain the proposed system's functions, and illustrate using case studies of object-based image retrieval. Our proposed system can be used as a useful supplementary tool, and it will aid humans in KFD sessions.

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Introduction

Family art therapy is built upon art therapy theory in conjunction with family system theory (Landgarten, 1987), and the latter emphasizes the influence that family members have upon one another (Bowen, 1978). Consistent with the family systems perspective, the goal of family art therapy is to provide families the opportunity to illustrate their family history, and with using the illustrations, they will discover a new alternative for ending their problems. Riley and Malchiodi (2003, pp. 102–103) asserted that the main goal of using art in family therapy is to help families become “open to broader perspectives, and to support a change in redundant, dysfunctional patterns of behavior” through art. By observing patterns of family behaviors, the therapists learn about family members' relationships with one another and about the system of which they are a part. Riley and Malchiodi believe that

therapists are able to gather more data by using art as a technique rather than using verbal interviews alone.

Kinetic Family Drawing (KFD) that was developed by Burns and Kaufman (1970, 1972) is the most frequently used assessment tool in the field of family art therapy. In KFD, a child is asked: “draw everyone in your family, including you, doing something, some types of action”. The KFD allows the therapist to get a meaningful glimpse of the child's view of the dynamic relationships among family members, and of the child's adaptive and defensive responses to the forces and actions of various family members. According to Burns (Burns, 1982; Burns & Kaufman, 1970, 1972), the KFD allows us to see the self as it is reflected and expressed in the family; it enables the child to depict the family as a functioning, active unit, and it allows the therapist to see the child's impressions of these interactions among family members (Handler & Habenicht, 1994).

Image data sketched by the patient and the assessment data that is conducted by the family art therapist are not systematically managed in current family art therapy sessions. Moreover, conducting KFD offline may be restricted by time and space, and each family art therapist may differently interpret the same picture depending on the personal subjectivity and the experience of the family art therapist. Betts stated that the House-Tree-Person draw, the Draw-A-Person and the KFD, which are known as psychological projective tests, all have highly questionable validity (Betts,

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2006). The reason why most psychologists no longer use such tests may be the complexity of people and art. The causal relationships between the characteristics of drawings, personal traits and environments, and psychological symptoms can be complicated, diverse and even conflicting, such that art therapists and psychologists are often forced to proceed with their work on the basis of subjective and rather uncertain knowledge, relying on professional observation and judgment rather than any theory or existing method (Kim, 2008). Accordingly, we recommend applying current computer technologies to address the aforementioned problems.

Very few studies have been conducted for using computer technologies with the KFD, but interesting studies have recently been reported in the field of general art therapy. In an effort to apply computer graphics to art therapy, Hartwich and Brandecker (1997) directed clients to draw with using a tool such as Adobe Photoshop (Adobe Creative Team, 2004), and then they examined the responses. This attempt showed the innovative use, although on a limited level, of computer technology applications in art therapy. Kim, Kim, Lee, Lee, and Yoo (2006) developed an expert system for art therapy. This system is capable of processing drawn characteristics, psychological symptoms, individual environments and psychological disorders, and it is expected to achieve significant progress in systemizing the knowledge of art therapy. Kim, Ryu, Hwang, and Kim (2006) improved the system by increasing its capacity of maintenance consistency, reliability evaluation and machine learning. Kim, Yoo, and Kim (2007) presented a framework for the expert system knowledge base in art therapy. Kim, Bae, and Lee (2007) applied the technologies available in the field of digital image processing to develop a computer system for automatically rating two elements, number of colors and the list of colors used, as well as the area of each color painted, the number of clusters, the length of edges, etc. Kim (2008) delineated the development of a computer system that judges both the main color and the placement category in a drawing by applying the available methods in the field of digital image processing.

Unlike the abovementioned studies, the focus of this paper is applying DataBase Management System (DBMS) (Silberschatz, Korth, & Sudarshan, 2006) to the KFD. We propose a prototype for a KFD Web database for managing large amounts of KFD assessment data, and for achieving an efficient KFD assessment process by analyzing the requirements of family art therapists. The proposed system is divided into a client module and a family art therapist module. First, the client module provides a familiar drawing board to enable the client to easily draw online. In the KFD, the time and the order of drawing pictures are especially important observations for assessing family problems. Therefore, the proposed system stores the client's drawing process in a database, so that the family art therapists can replay the whole sketching process when they perform a KFD assessment. This function is helpful because it offers more detailed and efficient problem assessment by offering replaying and reviewing the order of a drawing and/or scenes that the family art therapist may miss in the assessment process. Second, the family art therapist module is comprised of an assessment support module, a search module and a knowledge search module with the object-based image retrieval: (1) The assessment support module provides the assessment form of Burns and Kaufman. Moreover, the distance between family members, the size of the family member and the location of family member (important factors that reflect family relations) can be automatically calculated with simple mouse operation. (2) The search module provides the family art therapist with the search function for the KFD data and the assessment's contents; furthermore, it enables treatment follow-up and it confirms the client's treatment results. (3) The knowledge search module accumulates KFD related knowledge in a database, and then it makes this knowledge available for assessment. Moreover, the accumulated data can be referred to, since similar image retrieval

enables referring to the existing assessment summary, which is easily performed through object-based image retrieval during the assessment. Consequently, consistency and objectivity can be more or less elaborative in the process of KFD assessment.

Traditional image retrieval methods are keyword-based, content-based and object-based methods: (1) Keyword-based image retrieval requires that a human assigns a subject keyword to the image, and then retrieval is conducted by using this keyword. Keywords that well express the images should be stored in a database in advance. Retrieval may be difficult if the users do not know the keywords that were established for the corresponding images (Baxter & Anderson, 1996). (2) Content-based image retrieval is the extraction of low-level features; including shape; color and texture from the image (Do & Vetterli, 2002; Huang, Kumar, Mitra, & Zabih, 1997; Saykol, Gudukbay, & Ulusoy, 2005; Zhang & Lu, 2002); however; it has a disadvantage because low-level features are different from the characteristics that humans can recognize. (3) Object-based image retrieval is the use of high-level features that humans can recognize such as expressing the locations of objects and images with using a character string (Huang & Jean, 1994); and comparing objects by expressing them with a graph (Bilodeau & Bergevin, 2003). Object-based image retrieval is now being actively researched.

In this paper, we also propose a novel object-based image retrieval algorithm that expresses the location, the size and the distance of objects as numerical meta-data in the context of the KFD, and this is accomplished in the KFD Web Database System. The objects and their relations are expressed in an image, and the images are then searched and compared by using a reciprocal of the Euclidean distance as a similarity measure. Our proposed method achieves the retrieval of most similar images that are stored in the KFD database by using the location of family members, the size of a family member and the distance between family members with basic mouse operation. The assessment results and the image search data are provided to the family art therapist in real time. Thus, family art therapists can more objectively and consistently assess problems by retrieving and referencing the existing assessment contents.

This paper is organized as follows. In Section 2, we introduce the proposed KFD Web database system. In Section 3, we describe a novel object-based image retrieval system in the KFD, and we present retrieval cases. In Section 4, we present our discussion and the conclusion.

The KFD Web database system

Table 1 describes the development environment of the KFD Web database system. MySQL 5.0 is used as a database and the MVC pattern-based system is built by using JSP and JavaBean for easy system expansion. Fig. 1 shows the overall architecture of KFD Web database system.

The client module

The client module is implemented for drawing pictures by using a drawing board, as is shown in Fig. 2a. Since capturing the entire

Table 1
The development environment of the KFD Web database system.

Items	Specification
CPU	Pentium4 3.4GHz
RAM	1024 MB
OS	WindowsXP Professional
Database	MySQL 5.0
Web server	Apach Tomcat 5.x
Development tools	EditPlus2, VisualStudio 6.0, Eclipse Sdk 3.x

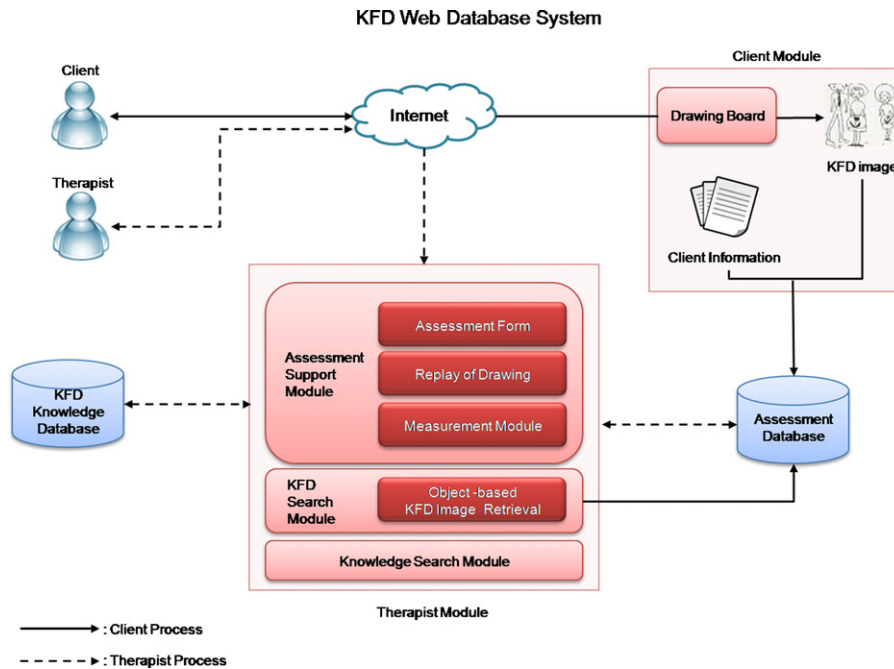


Fig. 1. The overall architecture of the KFD Web database system.

sketching process and tracking the time needed for completing the picture are important factors for the client’s assessment, the client module is implemented for storing the entire drawing process (No, 2008; Seo, 2004). The questionnaire in Fig. 2b is comprised of 5 profile items and 5 picture items, which is the information that is needed for the assessment. Requesting the assessment with a scanned image that was drawn on paper is also possible.

The family art therapist module

Assessment support module

Family art therapists review the lists of new assessment requests, and then they perform the assessment with the KFD assessment form (Burns & Kaufman, 1970, 1972), as is shown in Fig. 3. The assessment form includes the following unique func-

tions: the sketch replay function, the knowledge search function, the object-based image retrieval function and the measurement function. The sketch replay function shows the whole process of KFD artwork, and it tracks and displays the time that was needed by the client throughout completing the picture. Consequently, our proposed system offers family art therapists accurate time measurement of the whole drawing process. In the KFD assessment, the length of a family member and the distance between family members are important information for inferring psychological relations between family members and the mental state of children (Burns & Kaufman, 1972). Our system enables family art therapists to measure the length of an object (family member) and the distance between objects with using the measurement function. The measurement module outputs the objects’ lengths for as long as the mouse cursor is being dragged on the picture. Therefore, the size

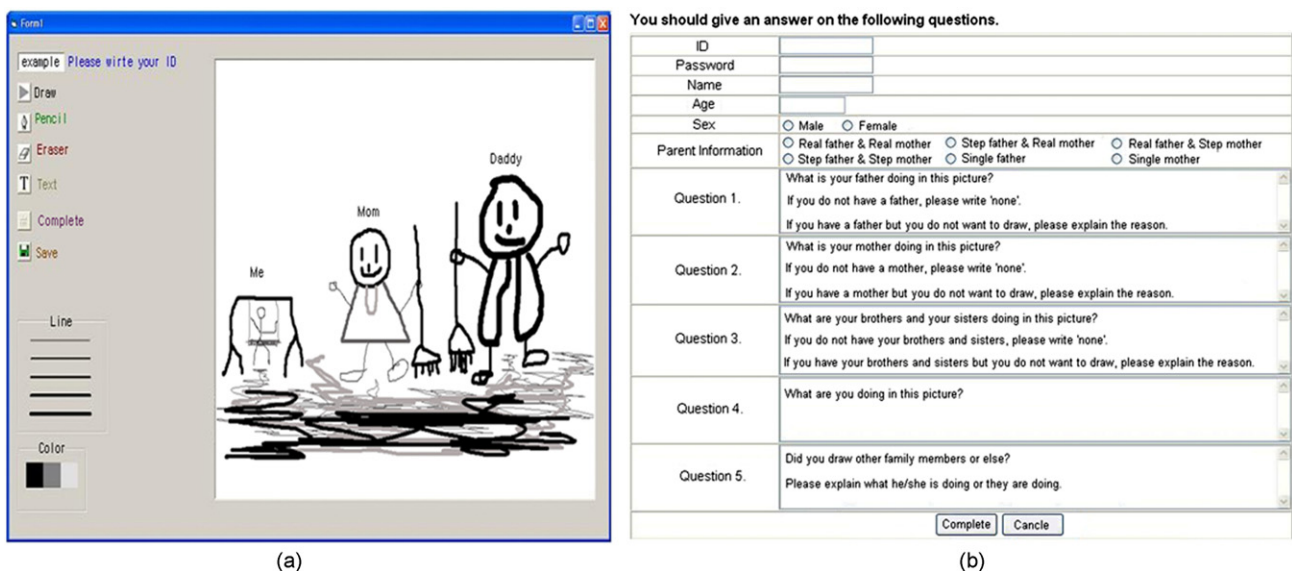
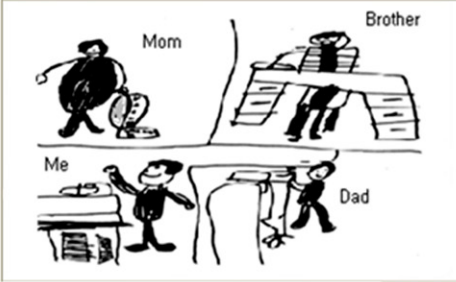


Fig. 2. The client module: (a) the client drawing board, (b) the client questionnaire.



See full size image

Father

Fixing boat motor

Mother

Vacuuming.

Sibling

Brother doing home-work.

Self

Listen to music.

Other

None.

[Replay of Drawing](#) [Help for Therapist](#) [Image Retrieval](#)

Client Information

ID : Name : Age : Sex :

Parents info : Request Date :

I. Style

<input type="checkbox"/> Compartmentalization	<input type="checkbox"/> Folded Compartmentalization
<input type="checkbox"/> Edging	<input type="checkbox"/> Lining on the Bottom
<input type="checkbox"/> Encapsulation	<input type="checkbox"/> Lining on the Top
<input type="checkbox"/> None	<input type="checkbox"/> Underlining Individual Figure

II. Symbol

A. B. C.

D. E. F.

III. Action

A) Action of Individual Figures

Figure	Action
1. Self <input type="text"/>	4. Older Brother <input type="text"/>
2. Mother <input type="text"/>	5. Older Sister <input type="text"/>
3. Father <input type="text"/>	6. Younger Brother <input type="text"/>
	7. Younger Sister <input type="text"/>
	8. Other <input type="text"/>

B) Action between Individual Figures

Figure	Action	Recipient
1. Self <input type="text"/>	<input type="text"/>	<input type="text"/>
2. Mother <input type="text"/>	<input type="text"/>	<input type="text"/>
3. Father <input type="text"/>	<input type="text"/>	<input type="text"/>
4. O.B. <input type="text"/>	<input type="text"/>	<input type="text"/>
5. O.S. <input type="text"/>	<input type="text"/>	<input type="text"/>
6. Y.B. <input type="text"/>	<input type="text"/>	<input type="text"/>
7. Y.S. <input type="text"/>	<input type="text"/>	<input type="text"/>
8. Other <input type="text"/>	<input type="text"/>	<input type="text"/>

IV. Characteristics of Individual KFD Figures

A. Arm Extensions
 Self Mother Father O.B. O.S. Y.B. Y.S. Other

B. Elevated Figures
 Self Mother Father O.B. O.S. Y.B. Y.S. Other

C. Erasures
 Self Mother Father O.B. O.S. Y.B. Y.S. Other

D. Hanging
 Self Mother Father O.B. O.S. Y.B. Y.S. Other

E. Omission of Body Parts
 Self Mother Father O.B. O.S. Y.B. Y.S. Other

F. Omission of Figures
 Self Mother Father O.B. O.S. Y.B. Y.S. Other

G. Picasso Eye
 Self Mother Father O.B. O.S. Y.B. Y.S. Other

H. Rotated Figures
 Self Mother Father O.B. O.S. Y.B. Y.S. Other

V. KFD Grid Measure of Length

A. Height

1. Self cm 2. Mother cm 3. Father cm 4. O.B. cm

5. O.S. cm 6. Y.B. cm 7. Y.S. cm 8. Other cm

B. Distance of Self Form

1. Mother cm 2. Father cm 3. Other cm

VI. Result

Complete

Fig. 3. A KFD assessment form.

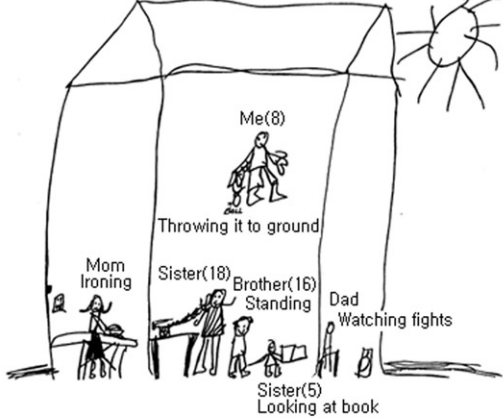
Menu	Submenu
<p>Object</p> <ul style="list-style-type: none"> <input type="radio"/> Bed <input type="radio"/> Cat <input type="radio"/> Broomstick <input type="radio"/> Cardle <input checked="" type="radio"/> Balls <input type="radio"/> Heat, Light, Warmth <p>Characteristic of figure</p> <ul style="list-style-type: none"> <input type="radio"/> Length of Arm <input type="radio"/> Omission of body parts <input type="radio"/> Picasso Eye <input type="radio"/> Erasures <p>Action of figure</p> <ul style="list-style-type: none"> <input type="radio"/> To lover <input type="radio"/> To rival <input type="radio"/> Complications <input type="radio"/> Melancholy <p>Style</p> <ul style="list-style-type: none"> <input type="radio"/> Elavated Figures <input type="radio"/> Lining on the Bottom <input type="radio"/> Lining on the Top <input type="radio"/> Underlining Individual Figures <input type="radio"/> Compartmentalization <p style="text-align: center;"><input type="button" value="Simbol Input"/></p>	<p>Case 1. <input checked="" type="radio"/> Ball Bouncing Case 2. <input type="radio"/> Circular Ball Case 3. <input type="radio"/> Ball on The head</p> <p>Case 4. <input type="radio"/> Barriers and Ball</p> <p style="text-align: center;"><input type="button" value="Browsing"/></p> <div style="border: 1px solid black; padding: 5px;"> <p>Ball : Many of our drawings will reflect a "field of force" within the picture or between the figures. These forces may be conceptualized in a number of ways. Most frequently in drawings, the force will take the form of a ball.</p> <p>Case 1. Ball Bouncing Often competition or jealousy is depicted by the path of the ball. For example this theme is repeated in KFD, produced by 8-year-old David, an extremely competitive boy, who places himself high above the other members of the family. But, because of a threatening father (compartmentalized and "watching fights"), David dares not compete directly and is "throwing the ball in the ground".</p> <div style="text-align: center;">  </div> <p style="text-align: center;">See full size image More example...</p> </div>

Fig. 4. An example of a knowledge management system (Burns & Kaufman, 1972).

of the object and the distance between the objects, which are the main items for the KFD assessment, can be automatically calculated with simple mouse operation.

The KFD search module

The KFD search module enables the family art therapist to track clients' treatment and to complete the assessment by providing the family art therapist with both the KFD client data and the search function. When the KFD assessment is completed, the stored final assessment result can be confirmed by clicking on the corresponding item.

The knowledge search module

When using KFD for making the diagnosis in family art therapy, different diagnostic results from the same KFD can be generated depending on the subjectivity and experience of the family art therapist. Accordingly, in this paper, KFD related knowledge is stored in a database and this is provided to family art therapists for easily accessing the corresponding knowledge for any case. Since the KFD assessment analyzes the image by classifying the image into objects, the characteristics of the objects, the action of the figures and a style; the corresponding KFD knowledge is prepared for the same categories (see Fig. 4).

Object-based image retrieval

In this section, we propose a novel object-based image retrieval algorithm in the context of KFD Web database system. We hope

to simplify the explanation of the proposed object-based image retrieval algorithm and present its features for general readers.

The commonly used low-level features, such as color, texture, and shape features may not be directly mapped to human visual perception. In addition, such features cannot effectively describe a single image that contains multiple objects of interest. As a result, the research on feature descriptions has shifted to focus on higher-level features, which support representations more similar to human visual perception like spatial relationships between objects (Joo, Chung, Park, Lee, & Kim, 2007). Object-based image retrieval is the use of high-level features that humans can recognize such as expressing the locations of objects and images with using a character string (Huang & Jean, 1994).

The procedure of object-based image retrieval

The overall block diagram of the proposed object-based image retrieval is shown in Fig. 5.

More detailed explanation of each phase is as follows:

Phase 1. Query by object: The object image query displays the queried image as a rectangle. For example, the query can be conducted when the family art therapist directly draws the necessary image such as 'a picture in which a client is drawn on the left corner', 'a picture in which a father is away from me' and 'a picture in which a father is relatively bigger than a mother' on the drawing board. Here, the object in an image query means family members.

Phase 2. Meta-data representation: Meta-data is structured information that describes, explains, locates, or otherwise makes

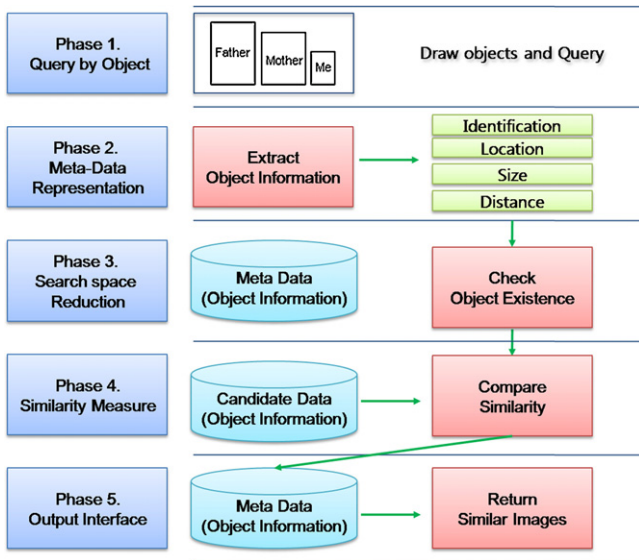


Fig. 5. The block diagram of object-based image retrieval.

object are extracted and stored as a two-dimensional data structure, as is shown in Fig. 6b.

Phase 3. Reducing the search space: If a search is conducted for all the stored images in the KFD database at once, then the search time will be increased and efficiency will deteriorate. Our system addresses this by inspecting the images' similarities, including the objects that are only expressed in a query.

Phase 4. Similarity measure: Similarity is measured by the distance between the objects, by the size and location between the selected candidate images from the KFD database and the images that are queried by the family art therapist. For example, in the case of 'a picture in which a father is positioned in the left center', the similarity for the object location of a queried image and the location information of images that are stored in the KFD database are measured. In this paper, the reciprocal of the Euclidean distance was used as a similarity measure.

Phase 5. Output interface: Images that match the query image and the assessment contents of the corresponding image are provided to the family art therapist after measuring the similarities between the images.

Case studies of object-based image retrieval

In this section, a variety of case studies of object-based image retrieval are illustrated.

Retrieval by location

The family art therapist tries to search for 'an image in which a father is drawn in the left side of the center'. The family art ther-

it easier to retrieve, use, or manage an information resource. Meta-data is often called data about data. The object information in an image is transformed into meta-data after indexing, as is shown in Fig. 6a. The object that is included in the image is recognized, and the distance between objects and the size and location of each

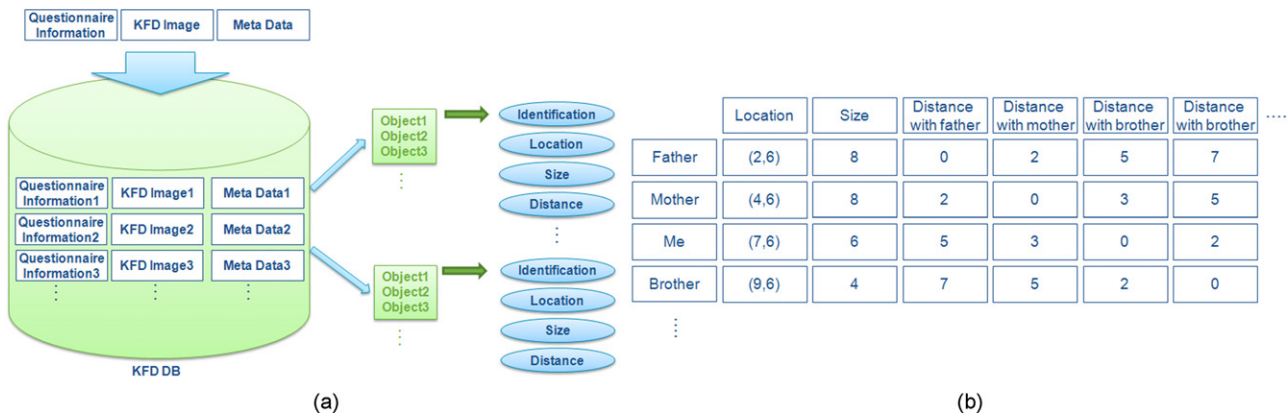


Fig. 6. The meta-data representation: (a) KFD database structure, (b) two-dimensional meta-data for object information.

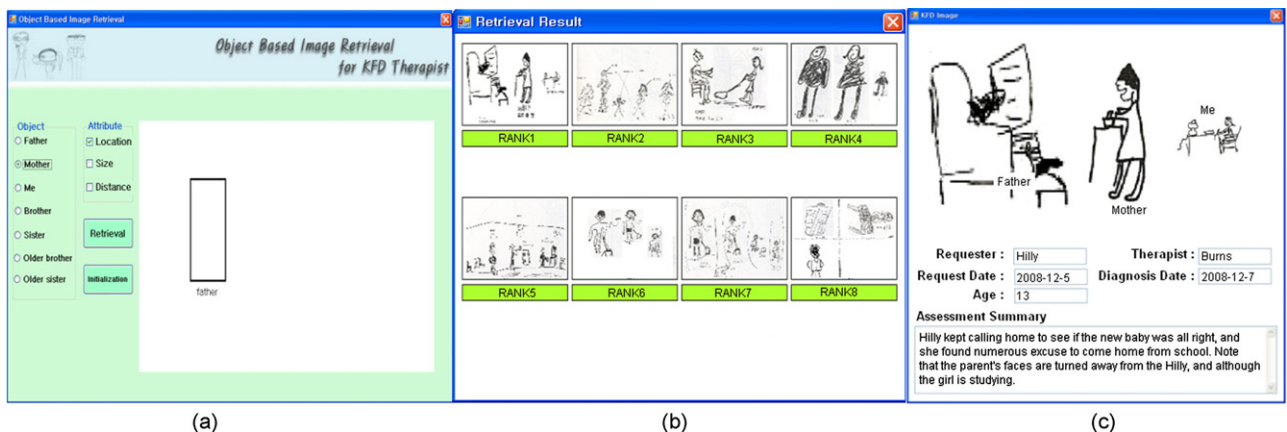


Fig. 7. Case study 1: (a) query-by-object with location, (b) retrieval results, and (c) assessment summary of the selected image.

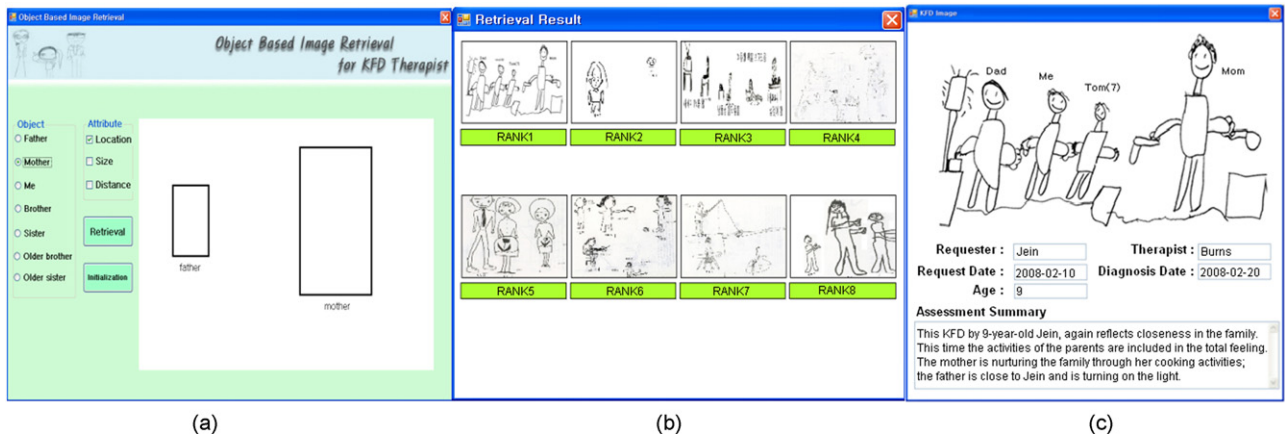


Fig. 8. Case study 2: (a) query-by-object with location, (b) retrieval results, and (c) assessment summary of the selected image.

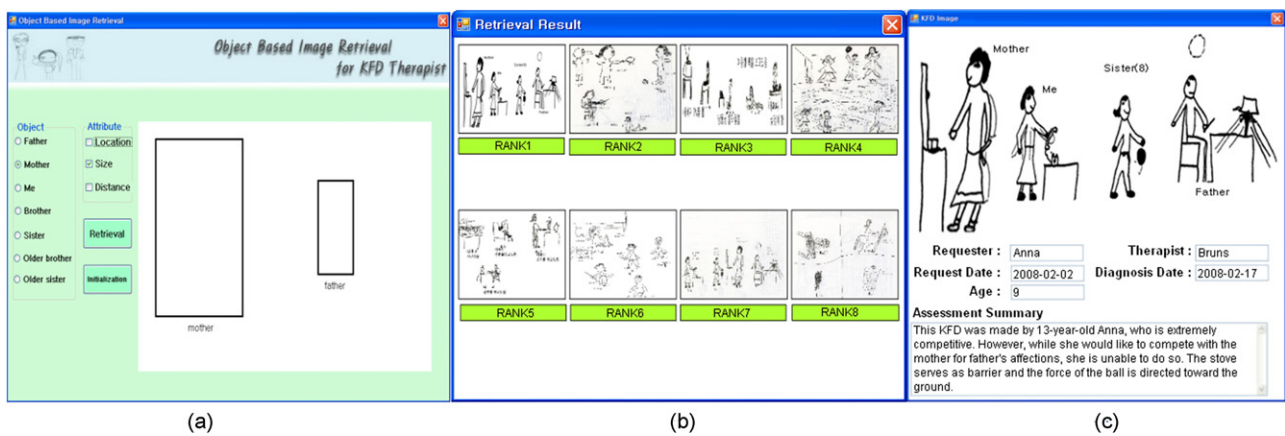


Fig. 9. Case study 3: (a) query-by-object with size, (b) retrieval results, and (c) assessment summary of the selected image.

apist expresses the father rectangle through query-by-image as in Fig. 7a, and then the therapist obtains 8 similar images with the highest relevance, which are displayed in the order of left-right and then top-down according to the similarity measure in the KFD Web database as a search result (see Fig. 7b). Moreover, the family art therapist can refer to the assessment summary, for example, by clicking the first picture in which a father is reading a newspaper in an image (see Fig. 7c). Meanwhile, the family art therapist expresses two rectangles, as shown in Fig. 8a, in order to search images by the location of a father and a mother, and the family art therapist refers

to the detailed assessment contents of similar images (see Fig. 8b and c).

Retrieval by size

The family art therapist tries to assess ‘the image in which the size of a mother is relatively bigger than that of a father’. Accordingly, the family art therapist draws the image in which the mother rectangle is relatively bigger than the father rectangle, as is shown in Fig. 9a. The assessment for the image in which a mother is relatively bigger is performed with reference to precedent assessment

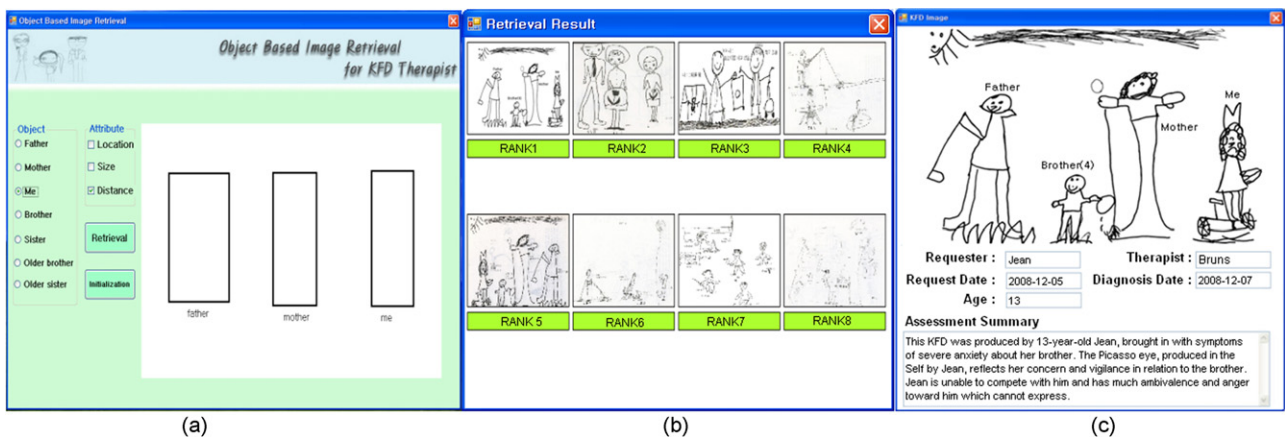


Fig. 10. Case study 4: (a) query-by-object with distance, (b) retrieval results, and (c) assessment summary of the selected image.

contents by clicking the images that are obtained with the search results (see Fig. 9b and c).

Retrieval by distance

The family art therapist tries to assess 'the image in which a mother is close to me and a father is away from a mother and me'. The family art therapist can search for images including a father, a mother and me through an image query (see Fig. 10a). Moreover, the family art therapist can perform the assessment of a client with reference to the detailed assessment results of the images, which are obtained as search results (see Fig. 10b and c).

Discussion and conclusion

It should be noted that this project started from the request of therapists in family art therapy session operated in one of the 'Health Family Support Centers' in Seoul, Korea. Many art therapists who are working actively in clinical field are expressing their difficulties for managing a massive amount of KFD data stored under the paper type. Therefore, in this paper, the prototype of the KFD Web database is developed in order to manage large amount of KFD assessment data and to support an efficient KFD assessment process by analyzing the requirements of family art therapists. We also devise and implement a novel object-based image retrieval algorithm with the KFD Web database system to enable the family art therapist to more consistently and objectively assess family problems by referring to the existing assessment contents that were obtained by object-based image retrieval and a systematic knowledge management system in the KFD Web database system.

There are many studies which are raising the questions to KFD's reliability and validity (McGregor, 1978; Brooke, 1997; McPhee & Wegner, 1976; Sobel & Sobel, 1976; Monahan, 1986). On the other hands, there are also many trials making an effort on KFD's reliability and validity (Mostkoff & Lazarus, 1983; Elin & Nucho, 1979; Schornstein & Derr, 1978; Goodwin, 1982; Hackbarth, Murphy, & McQuary, 1991; Cohen, 1986; Holt & Kaiser, 2001; Reddy et al., 2002; Veltman & Browne, 2003; Sanchez-Rosado, 2002). Especially, in computer-aided art therapy community, Kim (2008) stated that the expert system approach can serve as a critical means for finding solutions in the above problems. The purpose of this paper doesn't put the weight on KFD's verification of reliability and validity itself. But, by using of various functions (standard assessment form, knowledge management system, object-based image retrieval, replay of drawing, automatic measurement) provided by this system, we expect that the consistency and objectivity of family art therapists can be more or less elaborative in the process of KFD assessment.

The KFD Web database system is a unique application-driven. But it is difficult to declare its effect because this system has not been clinically verified. The proposed system is equipped with a function that enables the family art therapist to replay the sketch process when needed by storing it, but information for attitude, facial expression and voice information during the sketching process are still unobtainable. Consequently, further study of a video recording and replay function by using a Web-camera is needed. It is imperative to verify the efficiency of the proposed system through actual clinical trial, and the functions of this system should be enhanced. Even though the KFD Web database system has been focused on-line, its scheme can be implemented as a client-and-server or stand-alone application within a professional relationship. Finally, we believe that our proposed system can be a useful supplementary tool and an aid for humans in KFD sessions. But all final decision makings are up to art therapists. After all, we stress again that this system is developed as a useful tool for art

therapists, not for replacing the art therapists' roles with computer system.

KFD is the most widely used assessment tool for assessing family relations around family problems in family art therapy. Therefore, it is the most ideal scheme for our proposed computer aided KFD system to be used as a module of a computerized system for family therapy sessions. A joint research that will focus on computer science, family relations & therapy and art psychotherapy is required in the future.

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References

- Adobe Creative Team. (2004). *Adobe Photoshop 7.0 classroom in a book*. San Diego, CA: Adobe Press.
- Baxter, G., & Anderson, D. (1996). Image indexing and retrieval: Some problems and proposed solutions. *New Library World*, 96, 4–13.
- Betts, D. J. (2006). Art therapy assessments and rating instruments: Do they measure up? *The Arts in Psychotherapy*, 33, 422–434.
- Bilodeau, G. A., & Bergevin, R. (2003). Constructing and matching fuzzy graphs of volumetric primitives hypotheses. *Vision Interface 2003*.
- Bowen, M. (1978). *Family therapy in clinical practice*. New York: Aronson.
- Brooke, S. L. (1997). *Art therapy with sexual abuse survivors*. Springfield, IL: Charles C Thomas Publishers.
- Burns, R. C. (1982). *Self-growth in families: Kinetic family drawings (K-F-D) research and application*. New York, NY: Brunner/Mazel.
- Burns, R. C., & Kaufman, S. H. (1970). *Kinetic family drawings (K-F-D): An introduction to understanding children through kinetic drawings*. New York, NY: Brunner/Mazel.
- Burns, R. C., & Kaufman, S. H. (1972). *Actions, styles and symbols in kinetic family drawings (KFD): An interpretive manual*. New York, NY: Brunner/Mazel.
- Cohen, B.M. (ed.). (1986). *The diagnostic drawing series rating guide*. Unpublished guidebook.
- Do, M. N., & Vetterli, M. (2002). Wavelet-based texture retrieval using generalized Gaussian density and Kullback-Leibler distance. *Institute of Electrical and Electronics Engineers Transaction Image Process*, 11, 146–158.
- Elin, N., & Nucho, A. O. (1979). The use of kinetic family drawing as a diagnostic tool in assessing the child's self-concept. *Arts in Psychotherapy*, 6(4), 241–247.
- Goodwin, J. (1982). Use of drawings in evaluating children who may be incest victims. *Children and Youth Services Review*, 4(3), 269–278.
- Hackbarth, S. G., Murphy, H. D., & McQuary, J. P. (1991). Identifying sexually abused children by using kinetic family drawings. *Elementary School Guidance & Counseling*, 25(4), 225–260.
- Handler, L., & Habenicht, D. (1994). The kinetic family drawing technique: A review of the literature. *Journal of Personality Assessment*, 62(3), 440–464.
- Hartwich, P., & Brandecker, R. (1997). Computer-based art therapy with inpatients: Acute and chronic schizophrenics and borderline cases. *The Arts in Psychotherapy*, 24, 367–375.
- Holt, E. S., & Kaiser, D. H. (2001). Indicators of familial alcoholism in children's kinetic family drawings. *Art Therapy: Journal of the American Art Therapy Association*, 18(2), 89–95.
- Huang, P. W., & Jean, Y. R. (1994). Using 2D PC+-strings as spatial knowledge representation for image database systems. *Pattern Recognition*, 27(9), 1249–1257.
- Huang, J., Kumar, S., Mitra, M., & Zabih, R. (1997). Image indexing using color correlations. *Proceedings of Institute of Electrical and Electronics Engineers Conference on Computer Vision and Pattern Recognition*, 762–768.
- Joo, C. H., Chung, C. W., Park, H. H., Lee, S. L., & Kim, S. H. (2007). Content based image retrieval using 8AB representation of spatial relations between objects. *Journal of KIISE: Databases*, 34(4), 304–314 (in Korean).
- Kim, S. I. (2008). Computer judgment of main color in a drawing for art psychotherapy assessment. *The Arts in Psychotherapy*, 35(2), 140–150.
- Kim, S. I., Bae, J., & Lee, Y. (2007). A computer system to rate the color-related formal elements in art therapy assessments. *The Arts in Psychotherapy*, 34, 223–237.
- Kim, S. I., Kim, K. E., Lee, Y., Lee, S. K., & Yoo, S. (2006). How to make a machine think in art psychotherapy: An expert system's reasoning process. *The Arts in Psychotherapy*, 33, 383–394.
- Kim, S. I., Ryu, H. J., Hwang, J. O., & Kim, M. S. H. (2006). An expert system approach to art psychotherapy. *The Arts in Psychotherapy*, 33(1), 59–75.
- Kim, S. I., Yoo, S., & Kim, K. E. (2007). A framework for expert system knowledge base in art psychotherapy. In A. R. Tyler (Ed.), *Expert systems research trends*. Hauppauge, NY: Nova Science Publishers.
- Landgarten, H. B. (1987). *Family art psychotherapy: A clinical guide and casebook*. New York: Brunner.

- McGregor, J. (1978). Kinetic family drawing test: A validity study. Unpublished doctoral dissertation. Auburn University. Cited in Handler & Habenicht, 1994.
- McPhee, J. P., & Wegner, K. W. (1976). Kinetic family drawing styles and emotionally disturbed childhood behavior. *Journal of Personality Assessment*, 40(5), 487–491.
- Monahan, M. (1986). Situation influences on children's kinetic family drawings. *Dissertation Abstracts International*, 46, 4444.
- Mostkoff, D. L., & Lazarus, P. J. (1983). The kinetic family drawing: The reliability of an objective scoring system. *Psychology in the Schools*, 20, 16–20.
- No, D. Y. (2008). Analysis of Children's Types through Kinetic Family Drawing, Master's thesis, Department of Life Art Design Graduate School of Design, Daegu University (in Korean).
- Reddy, K. S., Bhadramani, G., & Samiullah, S. (2002). Placement of family members by normal and neglected boys: A study of family drawings. *Social Science International*, 18(1), 72–82.
- Riley, S., & Malchiodi, C. A. (2003). Family art therapy. In C. A. Malchiodi (Ed.), *Handbook of art therapy* (pp. 362–374). New York: Guilford.
- Sanchez-Rosado, K. A. (2002). Levels of acculturation of children of Mexican decent as perceived in their kinetic family drawing. *Dissertation Abstracts International Section A: Humanities & Social Science*, 62(7-A), 2596.
- Saykol, E., Gudukbay, U., & Ulusoy, O. (2005). A histogram-based approach for object-based query-by-shape-and-color in image and video databases. *Image and Vision Computing*, 23, 1170–1180.
- Schornstein, H. M., & Derr, J. (1978). The many applications of kinetic family drawings in child abuse. *British Journal of Projective Psychology and Personality Study*, 23(1), 33–35.
- Seo, N. K. (2004). A study on the kinetic family drawing (KFD) appear in emotional state family children, Master's thesis, Major in Art Education, Graduate School of Education, Kyung Hee University (in Korean).
- Silberschatz, A., Korth, H. F., & Sudarshan, S. (2006). *Database system concepts* (5th ed.). The McGraw-Hill.
- Sobel, H., & Sobel, W. (1976). Discriminating adolescent male delinquents through the use of kinetic family drawings. *Journal of Personality Assessment*, 40(1), 91–94.
- Veltman, M. W. M., & Browne, K. D. (2003). Trained raters' evaluation of kinetic family drawings of physically abused children. *The Arts in Psychotherapy*, 30(1), 3–12.
- Zhang, D., & Lu, G. (2002). Shape based image retrieval using generic Fourier descriptors: Signal processing. *Image Communication*, 17, 825–848.