

Folksonomy-Based Collaborative Tagging System for Classifying Visualized Information in Design Practice

Hyun-oh Jung, Min-shik Son, and Kun-pyo Lee

Human Centered Interaction Design Laboratory, Department of Industrial Design,
Korea Advanced Institute of Science and Technology, Daejeon, Republic of Korea
{brianjung, uniquex, kplee}@kaist.ac.kr

Abstract. The aim of this research is to suggest folksonomy-based collaborative tagging system for supporting designers in group who interpret visualized information such as images through grouping, labeling and classifying for design inspiration. We performed field observation and preliminary studies to examine how designers interpret visualized information in group work. We found that traditional classification methods have some problems like lack of surface and time consuming. Based on this research, we developed PC based group work application, named I-VIDI. By implementing I-VIDI based on functional requirements, we have showed how I-VIDI reduces problems found from current image classification methods such as KJ clustering and MDS. In future case study, we plan to conduct extensive user research to evaluate the system further as well as adding more functions which can be usefully applied to collaborative design work.

Keywords: Collaborative Tagging, Image Classification, Information Visualization, Information Organizer, Folksonomy.

1 Introduction

1.1 Research Background

Because designers should collect a lot of data and analyze them to develop a new concept, collaborative work became important issue.¹

Current typical methods for information structuralizing in design field are KJ clustering and image map generation via multidimensional scaling. For visualizing information, designers often use diagrams. To analyze visual information and get insights, designers assign keywords on images and classify them.²

However, these methods have some problem like limitation of surface and time efficiency as amount of information increased. To solve these problems and support collaborative design problem solving, this research focused on developing tool that support collaborative visual information analyzing. As a start point of this research, collaborative tagging has similar concept to this project that tagging on visual information and share³, and we expect this aspect can be applied effectively.

¹ Marvin E. Shaw: Group structure and behavior of individuals in small group, *Journal of Psychology* (1954) 139-149.

² Gert, Passman: *Design with Precedents* (2005).

³ <http://www.wikipedia.org/wiki/folksonomy>

1.2 Research Objectives and Methodology

Aim of this research is finding limitations of current methods which used by designers to analyzing visual information, and develop tool that solve the problems and support visual information based collaborative design work. By these objectives, the research carried out by following process described in Fig. 1.

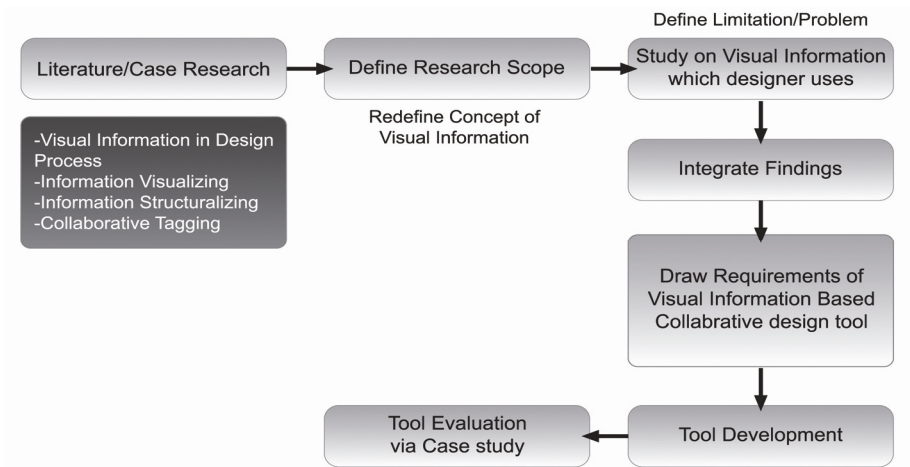


Fig. 1. Research Process

2 Study on Theoretical Background

2.1 Visual Information Based Design and Collaborative Tagging

Understanding Visual Information in Design Process. In this research, we studied on type and concept of visual information used in design process, and tried to redefine the scope of visual information in design field.

Definition of Visual Information in Design. In design field, “Visual Information” means visual artifacts that can be processed by design purpose, which consisted with line, shape, texture, color, or volume, the basic elements of visual objects.⁴

Images as Visual sources in Form reference phase. Various image collection or notes become collage or one big image and can be used as source of design idea to visualizing context and evaluate them.⁵

Image collage as Source of Design Inspiration. Collage is regarded as a work of visual arts made from an assemblage of different forms, thus creating a new whole⁶

⁴ Kolli, R. Pasman: Some consideration for designing a user environment for creative ideation (1993) 72-77.

⁵ Gert, Passman, Design with Precedents (2005) 78-81.

⁶ <http://en.wikipedia.org/wiki/Collage>



Fig. 2(left). Example of visual information: Sketch, Computer generated image

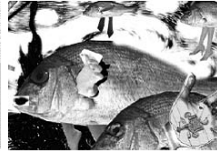


Fig. 3(right). Collage: Source of design inspiration

that combining different materials or illustrations to make chain reaction of images. This technique used by designers to make a suggestion.

Understanding Information Structuralizing and Visualizing Method of Designer.

Information Structuralizing Method of designers. To solve design problems with visual information, typical methods that designers use are KJ(Kawakita Jiro) clustering, Card sorting, and image map generation by multidimensional scaling. KJ method, the representative converging method, is assigning data to each card and makes a group with similar ones by intuition, as in Fig. 4.⁷

Multidimensional scaling or MDS is investigating distribution of data to deciding design concept⁸. Before deciding concept, designers can get the significant relationship between images by position the images on specified guideline (Fig. 5).



Fig. 4(left). Information clustering by KJ method



Fig. 5(right). Image positioning by MDS

Information Visualizing Method of designers. Popular method to visualizing information in design field is graphic organizer such as diagram. Diagram is way to express the abstract relationship between information using standardized shape⁹.

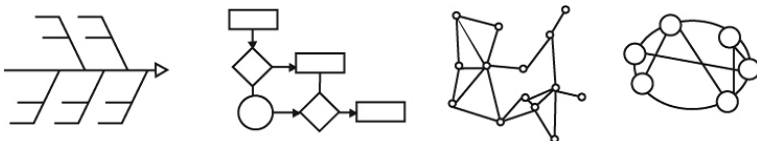


Fig. 6. Diagrams for visualizing information

⁷ <http://www.mycoted.com/KJ-Method>

⁸ William Write: From Function to Centex to Form: Precedents and Focus Shifts in the Form Creation Process, In Proceedings of C&C, April 1215 (2005) 195-204.

⁹ Collin Ware, Information Visualization, Perception for Design (2005).

Collaborative Tagging as Information Assigning and Analyzing. Tag is keyword that represents the web contents in subject or category. It can be expressed freely as a word, two-character word¹⁰. Tagging method is popular in web site like Flickr.com¹¹.

2.2 Redefinition of Concept of Visual Information for Research

Based on result of literature research and case research, we redefine the visual information in design field as following:

- Design precedence image as form factor reference data in design process
- Collage as source of design inspiration in concept decision
- Array and distribution as a result of KJ clustering and MDS
- Tag information of images
- Visualized information as a result of diagrams

3 Requirement Deductions for Tool Development

3.1 Understanding Requirement Through Field Research

To find the way how people use visual information, we visited educational space that teaching product styling. Participants of field interview are 20 people of men and women in undergraduate course 3rd and 4th year of Kookmin University¹². To investigate their workspace, we took a photo of their individual/public studio. Also we visited laboratories where using visual information. Field research and interview performed on 21st~22nd July, 2006.

Practical Usage of Visual Data in Collaborative Work Environment. Product precedence images, images for trend map, visual data for concept development are main visual information for cooperative environment.

Practical Method to grant information to image data. Most popular way to assigning information to images is direct annotation on images with text memo.

Sharing Visual data. They bring the source itself like magazines to others.

Practical Usage of visual data to solve design problem. They used image as reference of product shape, color and concept deduction.

Problems of current image data structuralizing method. The biggest problem is it takes too much time to structuralizing images using KJ clustering, road mapping, and so on.

3.2 Study on Information Structuralizing Method in Design Field

The usage and limitation of current information structuralizing methods in design field are like following Table 1.

¹⁰ <http://www.wikipedia.org/wiki/Tag>

¹¹ <http://www.flickr.com/photos/tags/>

¹² <http://english.kookmin.ac.kr>

Table 1. Usage and limitation of information structuralizing methods

Method name	Usage in design field	Limitations
KJ Method	Clustering relative image	Insufficient surface for a lot of images
	Assign image as keyword on image cluster	Hard to reveal the relationship between groups
MDS	Find trend between images	Difficult to positioning images on various conditions due to the fixed axes.
	Visualize image distribution on specified conditions	Difficult to measure scale value between images
Card Sorting	Hierarchical Information grouping	Difficult to reveal the relationship between groups
	Simulating web site structure	Unable to change standard

3.3 Study on Information Visualizing Method in Design Field

Based on literature research, flow chart, concept mapping, matrix and webbing are typical diagram method to visualizing information. There characteristics are describing, comparing/contracting, classifying, sequencing, casual arranging, and decision making. By purpose of information visualizing, usage of diagram method is distinguished.

3.4 Study on Collaborative Tagging

Folksonomy, a part of collaborative tagging, is compound word of Folk(people)+order+nomos(law) and it means “Categorizing by people”¹³. Folksonomy is commonly used in website like Flickr, Del.icio.us, and blog services. Table 3 shows comparing between taxonomy and folksonomy, the collaborative tagging.

Table 2. Comparing between taxonomy and folksonomy

Aspect	Taxonomy	Folksonomy
Information structure	Hierarchical tree	Radial shape network
System Characteristic	Systematic, Static, One-way	Non-systematic, Dynamic, Interactive
Information generation	Make category before enter information	Enter information first, and classify
Expansion	unable	Possible
Categorizing cost	High	Low

¹³ <http://www.wikipedia.org/wiki/Taxonomy>

3.5 Deduction of Requirements

Based on result of field research, we draw requirements of tool through process described in Fig. 7. Tool requirements are as following:

- Clustering a lot of images quickly, and overcome limit of surface.
- Tag on specified are of image
- Variable axes composition ability in MDS.
- Fluent image sharing between participants.
- Enable remote conference, not only local.
- Separate individual work space from public one.

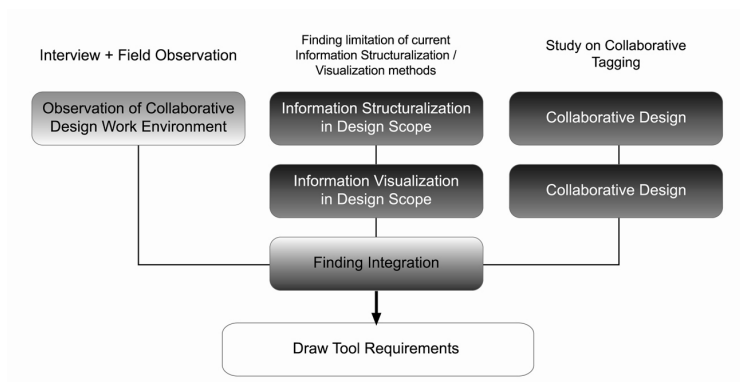


Fig. 7. Process of Requirements deduction

4 Development of I-VIDI Tool (Interpretation of Visualized Information for Design Inspiration)

4.1 Schema and Organization of I-VIDI

System schema of I-VIDI is described in Fig. 9.

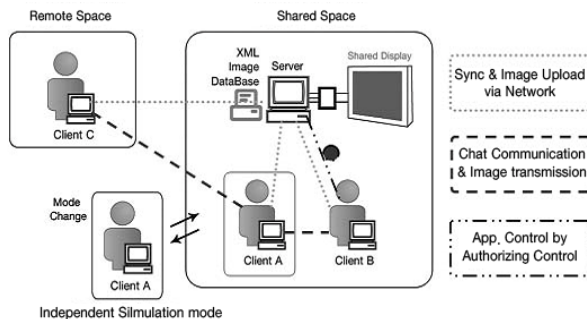


Fig. 8. I-VIDI system schema

I-VIDI is PC based application developed with Flash action script 2.0 and Visual C++. FSCCommand is used to connect flash and Visual C++ application, and communication is established via socket. I-VIDI designed to support local and remote conference in shard display. Every client screen synchronized via network connection. Also, members are allowed simulate work independently within connected session. Image data which participants upload to server is saved as XML data. I-VIDI is designed to support collaborative work in design concept generation phase of product design.

4.3 Functions of I-VIDI.¹⁴

I-VIDI application consists with server and client. Whole layout of each application is described in Fig. 9.

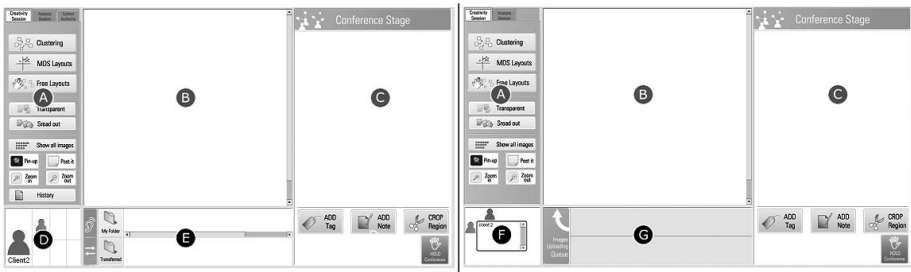


Fig. 9. I-VIDI client(left) and server(right) layout

- A(UI panel): Controls to using I-VIDI system
- B(Image Stage): Display area for KJ clustering or MDS results.
- C(Conference Stage): Shared area for keyword assign, direct annotating
- D(Client communication panel): Show client connection information. Image sharing channel. Client only.
- E(File management panel): Show image data
- F(Client Log-in status panel): Show client status and control authorize. Server only.
- G(Image uploading queue): Show image upload status

Key features of I-VIDI system are:

- Automated KJ clustering/MDS
- Image share via network
- Make a tag on specified area of image
- Two types of Keyword visualization
- Task history browsing

¹⁴ I-VIDI demo video is available at <http://storm541.dotheme.co.kr/ividi.wmv>

5 I-VIDI Evaluation Through Case Study

5.1 Plan and Progression of Case Study

Purpose of case study is to observe how the participants use I-VIDI system and measure usability and satisfaction of application. Participants for case study are a team consists with 4 men and women students who have experience of styling based design, and age range is 20s. Given task is generate concept of mobile music player for 20s women. This case study performed 2 times. After each session, we conducted quantitative evaluation on usability and satisfaction with 7-point Likert scale debriefing questions.

5.2 Result Analysis and Conclusion

According to the case study participants' answer, I-VIDI contributes to increase satisfaction of conference session. Especially in image arrangement, collaborative tagging and KJ clustering aspects, participants gave high score. However, image browsing and annotating on specified area function got relatively low score.

As a conclusion of case study, the benefits of using I-VIDI in conference are as following:

- Help collective intelligence via collaborative tagging
- Increase efficiency of conference in terms of time and cost
- Support drawing concrete concept

6 Conclusion and Further Studies

In contrast with taxonomy based classification, folksonomy way can assign multiple categories on data by tag. Namely, classification system can be selected by user dynamically. We suggested I-VIDI, collaborative visual information tagging system too through this research, and we proved I-VIDI is improved conference environment in efficiency, usability and satisfaction aspect by case study and debriefing.

Finally, through the case study, we set the research direction and improvement for further work:

6.1 Technical Limitations and Problems

Because more than one people involved in I-VIDI conference environment, authority control is important. And when more than 8 people involved, network slowed down due to the communication overload.

6.2 Expansion to Integrated Tool for Whole Design Process

By adding sketching or idea visualization functions, I-VIDI can become integrated design solution aiding tool.

References

1. Colin, W.: *Information Visualization, Perception for Design* (2005)
2. Gert, P.: *Design with Precedents* (2005)
3. Keller, A.: For Inspiration only, Designer interaction with informal collections of visual material (2005)
4. Buzan, T., Buzan, B.: *The mind map book*. Millennium Edition, pp. 144–155. BBC Worldwide Ltd, London (2000)
5. Crowley, T., Baker, E., et al.: Mmconf: an infrastructure for building shared applications. In: *Proceedings of the Conference on Computer Supported Cooperative Work*, ACM Press, New York (1990)
6. Eppler, M., Burkhard, R.: *Knowledge Visualization, Encyclopedia of Knowledge Management*, Idea Group (2005) (to appear)
7. Eckrt, C.M., Stacery, M.M: Sources of inspiration: A language of design. *design studies* 21(5), 523–538 (2000)
8. Greenberg, J.: *Computer-supported Cooperative Work and Groupware*. Academic Press, San Diego (1991)
9. Koyama, K.: The KJ editor: a supporting tool for idea generation (in Japanese), Thesis for Master of Engineering, Toyohashi University of Technology (1988)
10. Kolli, R.: Pasman Some consideration for designing a user environment for creative ideation. In: *Proceedings of the interface '93*, pp. 72–77 (1993)
11. Noguchi, H.: How do constraints Facilitate designer's Thinking? In: *Proceedings of 4th International Round Table Conference on Computational Models of Creative Design*, pp. 265–275 (1998)
12. Nagia, Y.: How does designer think with drawing in design process? In: *Proceedings of 5th Asia Design Conference, International Symposium on Design Science*, pp. 77–97 (2001)
13. Osborn, A.F.: *Applied Imagination*, Scriber's., New York, 58 (1953)
14. Greenberg, S.: Sharing views and interactions with single-user applications. In: *Proceedings of the Conference on Office Information Systems*, pp. 227–237 (1990)
15. Greenberg, S., Marwood, D.: Real Time Groupware as a Distributed System: Concurrency Control and its Effect on the Interface. In: *Proceedings of the ACM Conference on Computer Supported Cooperative Work*, pp. 207–217 (1994)
16. Tatar, D, Foster, G., Bobrow, D.: Design for conversation: Lessons from Cognoter. In: *Computer Supported Collaborative Work*, pp. 55–79. Academic Press, San Diego (1991)
17. Viégas, F.B.: *Visualizing Email Content: Portraying Relationships from Conversational Histories*, CHI (2006)
18. Wang, W., Wang, H., Dai, G., Wang, H.: *Visualization of Large Hierarchical Data by Circle Packing*, CHI (2006)
19. Wright, W.: From Function to Centex to Form: Precedents and Focus Shifts in the Form Creation Process. In: *Proceedings of C&C, London, United Kingdom, April 12-15, 2005*, pp. 195–204 (2005)
20. Wattenberg, M.: *Visual Exploration of Multivariate Graphs*, CHI (2006)
21. Wright, W.D., Schroh, P., Proulx, A., Skaburskis, B.: Cort: Oculus Info Inc. *The Sandbox for Analysis - Concepts and Methods*, CHI (2006)
22. Chen, Y.: Image Categorization by Learning and Reasoning with Regions. *Journal of Machine Learning Research* 5, 913–939 (2005)
23. Yukari, N.: How Designer Transform Keywords into Visual Images, *C&C'02*, pp. 118–112 (2002)