Web Based Collaborative Social Album Authoring System Using Facebook Photos

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Abstract—**This paper describes collaborative social authoring technique using SNS (Social Network Service) contents, especially SNS event photos uploaded to Facebook by the author and collaborating authors. The main motivation of our research is to support the collaboration among event participants for co-authoring of event contents systematically while gathering participant's social data and utilizing the expertise of each participant. The traditional UCC (User Created Content) relies on UCC author oneself and one's data only. The resources of UCC are collected from author's personal data and also from a search result from several web sites. In case of collaborative authoring of a YouTube video, authors exchange intermediate contents through e-mail or shared storage space like cloud storage. The main features of our research include (i) web-based collaboration service, (ii) recommendation of contents from SNS (social network services) sites based on user's interest degree, and (iii) DUI (distributed user interface) for social authoring, especially, supporting both desktop environment and also mobile participation using component-based web-app. As an application, experiment on social album creation from Facebook photos is introduced and shows the effectiveness of our system.**

Keywords—Web-based Collaboration, DUI (Distributed User Interface); CAM (Collaborative Authoring Metadata); Social Media Recommendation; Collaborative Work, UCC (User Created Contents) authoring

I. INTRODUCTION

In recent years, social media has emerged as a form of web services. Social media is open online tools and media platform to share thoughts, opinions, experiences perspectives, and participation. Compared to Web 2.0 for collective intelligence, social media pursues communication and collaboration beyond participation and sharing [1].

Widely used social media services include Facebook, Twitter and Flickr. The internet clubs are also widely used for members of similar hobbies or alumni association, such as marathon club, music club, alumni club and so on. The types of contents that are shared by social media are mostly text, photos, videos and audio.

As a state-of-the-art of social media services, most contents posted on SNSs are created and posted by one person. For example, after attending an outdoor event, each attendant uploads photos taken at the event into their own SNS account. These uploaded photos have no story line and just in the form of simple sequence of photos.

A video usually consists of several components, such as visual, audio and textual components. Let's take a look at a YouTube video for example. A YouTube video is usually composed of theme music and appropriate image sequencer experts are needed to collaborate together. In most cases, they are physically apart. However, it is not so easy to collaborate to share the authoring intention and create video efficiently through network. In this case, they rely on e-mail or cloud storage.

The motivation of this research is to support the idea sharing for social authoring and easy collaboration through network instead of traditional, individually authored contents which is usually supported by e-mail or cloud storage-based approach.

Fig.1 shows our research motivation. As shown in Fig. 1, compared to the traditional authoring alone, our research aims to provide framework for the idea sharing and co-creation for social authoring.

Fig. 2 shows ad-hoc solution for collaboration. Fig. 3 depict traditional approach of collaborative authoring scheme without using collaborative framework. As shown in Fig. 2, the users depend on e-mail for sending intermediate files or comments. Nowadays, they use cloud services like Dropbox to share the files. However, this is a stage of file sharing collaboration only.

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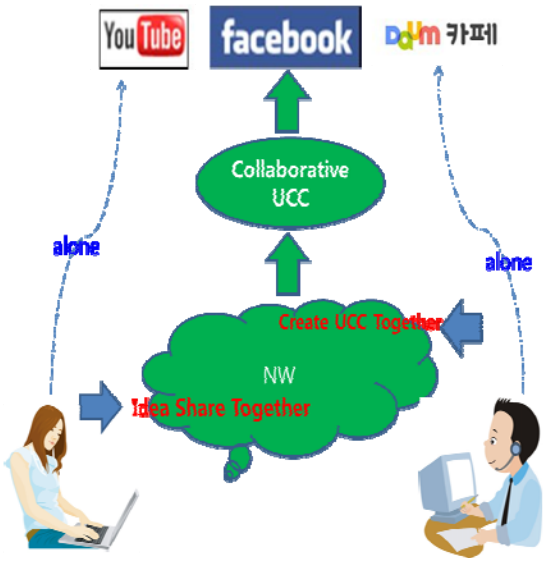
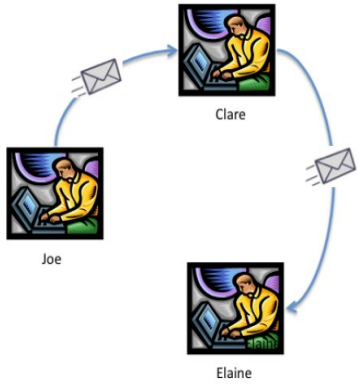
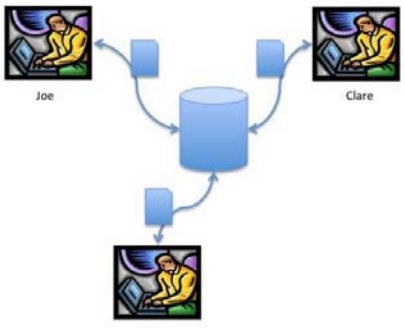


Figure 1. Motivation of collaborative authoring UCC



(a) E-mail based sharing



(b) repository based sharing

Figure 2. Ad-hoc solution for collaboration

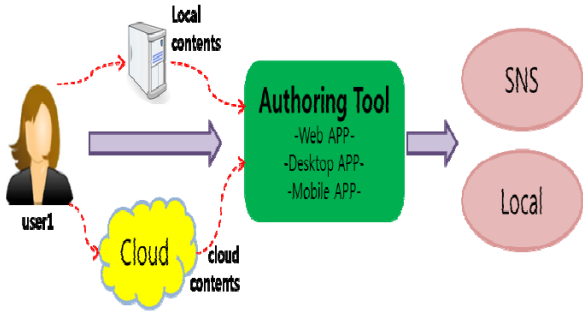


Figure 3. Traditional approach for collaborative authoring

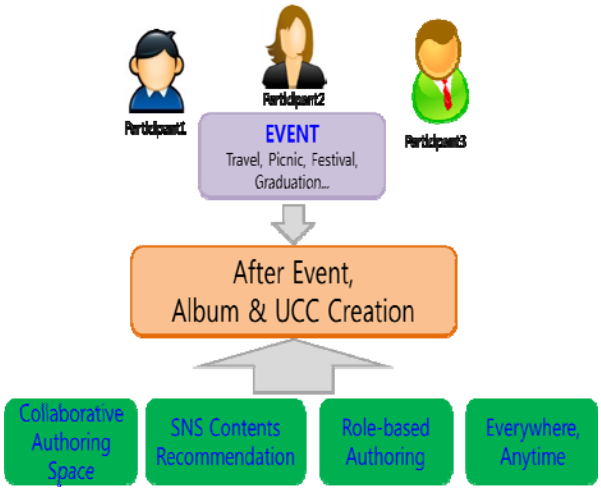


Figure 4. Research direction of collaborative social authoring

Fig. 4 shows our research direction of collaborative authoring. Our system especially aims to support expert role-based collaboration. For this, mechanism to invite is done while using KakaoTalk through smartphone and tablet.

This paper focused on developing collaborative social authoring on the web and suggesting communication method between collaborative authors for creating UCC (User Created Content). For providing resources for authoring, the contents recommendation method from social media services is also suggested. The component-based web-app for mobile collaboration is also addressed.

II. PRIOR WORK ON COLLABORATIVE AUTHORING

There are many researches on collaborative authoring [2-9] and collaborative softwares [10] that support various purposes. Among them, the typical web-based document collaboration tools are Google Docs and Wiki. The Google Docs provides simultaneous document editing; however there is lack of communication to share the editing intention. The Wiki has a lack of contents sharing during

authoring process and also lack of group management between authors.

In 2011, the Creaza VideoCloud Platform is introduced [11], which is a tool for collaborative video authoring on the web. Lately, this tool is called as WeVideo [12] as a commercial solution. The main feature of WeVideo includes web-based collaboration, video authoring, and utilization of cloud. However, the WeVideo is lack of communication to share the editing intention and comments among collaborative authors.

Stupeflix [13] is a web application to make videos in a few clicks. This solution imports directly from Facebook, Flickr, Picasa or Dropbox. User can add text, maps, voice-over, images and videos. This one also provides customized preview and free videos that can be downloaded in HD. They provide open APIs for developers. This solution does not support collaborative authoring, however, support the coordination with SNS (social network services) contents for video authoring. To enhance the limitation of previous collaboration systems, we tried to leverage collaboration intention sharing and also supports resource gathering from SNS using a recommendation system.

III. COLLABORATIVE AUTHORING SYSTEM

As shown in Fig. 5, our collaborative authoring system consists of web browser, web server and social DB. The web browser provides a personal web space to create a project, share status and manage account. Authors store their resources (images, photos, and videos) and CAMs (Collaborative Authoring Metadata) in the social DB. Lastly, the web server takes role of linking web browser and social DB and includes modules of collaborative authoring system.

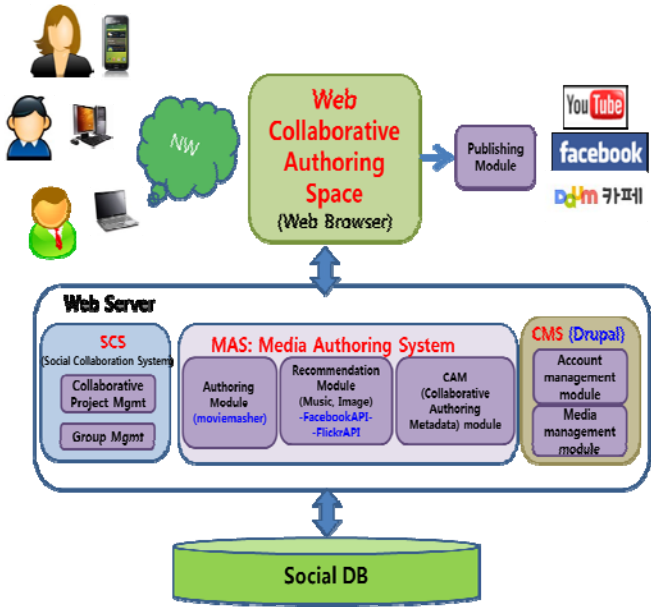


Figure 5. Web based collaborative authoring system architecture

The web server consists of SCS (Social Collaborative System), MAS (Media Authoring System) and CMS (Contents Management System). The SCS includes collaborative project management module and group management module. The MAS includes authoring module, recommendation module and CAM module. The CMS includes an account management module and a media management module. We use an open source video editing tool for implementing authoring module and Drupal for implementing CMS.

A. Social Collaboration System (SCS)

The SCS include collaborative project management module and group management module. These modules take role of implementing collaborative function on the web. When user searches co-authors, group management module requests author's information at the social DB and then group management module provides appropriate author information to the requesting user. The collaborative project management module takes role of managing group of the project.

B. Media Authoring System (MAS)

When authors make their project, Media Authoring System provides media authoring capabilities. MAS consists of several modules.

The authoring module provides editing capability and preview.

The CAM module enables the creation of collaborative authoring metadata. The CAM module also analyzes the created CAMs and displays this information systematically for the collaborative authoring. Using these CAMs, authors can exchange their authoring intention and information of each media. As shown in Fig. 6, you can see the analyzed CAM information. This information is provided to every user for exchanging all of the media information.

Back

Uploaded CAM Information

Image	Date Created	Weather	Location	With	Event	Organization	Date Uploaded
	2012-10-20	sunny	KIST	KIST Friends	Chuseok	KIST	2012-10-24
	2012-10-20	sunny	KIST	Alone	Chuseok	KIST	2012-10-24
	2012-11-04	warm	kist	friends	chuseok	kist	2012-11-03
	2012-11-04	sunny	kist	friends	chuseok	kist	2012-11-05

Figure 6. Table of uploaded CAM information

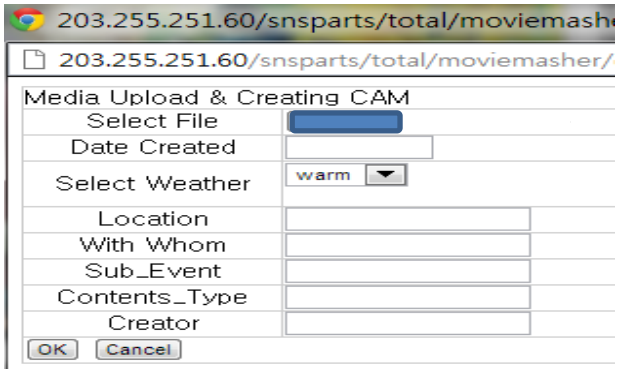


Figure 7. Media upload & Creating CAM window

The CAM information is uploaded by authors using media upload and creating CAM UI shown in Fig. 7.

In Facebook album, each photo can have several metadata information, such as time, location, likes, tagged person, comments and so on. So, these metadata of Facebook photo can be used as CAM for our collaborative authoring. Using these Facebook photo metadata, our system can search and collect the related photos of our friends from Facebook album and create social UCC using these searched photos.

Fig. 8 shows an example of CAM created by users. According to the user's situation and state of mind, the CAM can be created differently. For example, user1 creates CAM (a) and user2 creates CAM (b) in Fig. 8. As shown in the Fig. 8, user 1 and user 2 attended same event that was held at the same place. However, they had different feeling and spent event with different friends. Our system can use these different CAMs in collaborative work among distributed users. These CAM can be used appropriately for the collaborative contents authoring.

```
<image>
    <filename>DSC_048.jpg</filename>
    <date_created>2012-04-21</date_created>
    <mood>enjoy</mood>
    <weather>warm</weather>
    <location>Seoul</location>
    <with_whom>Fidel Aja, Iwa Nurqadar</with_whom>
    <event>ICE</event>
    <organization>KIST</organization>
    <date>2012-04-24</date>
    <time> 02:44:08</time>
</image>
```

(a) CAM created by user1

```
<image>
    <filename>DSC_033.jpg</filename>
    <date_created>2012-04-21</date_created>
    <mood>sad</mood>
    <weather>sunny</weather>
    <location>Seoul</location>
    <with_whom>Hoang Phong, Hoang Hoa</with_whom>
    <event>ICE</event>
    <organization>KIST</organization>
    <date>2012-05-10</date>
    <time> 12:09:04</time>
</image>
```

(b) CAM created by user 2

Figure 8. Examples of CAM created by two users

The recommendation module is a novel method for media authoring. The recommendation module searches related image and audio from social media (Facebook, Flickr..) based on the keyword of the analyzed CAMs. During the authoring process, each author could be recommended with related image and sound from social media (Facebook, Flickr...) based on this CAM.

For example, the author can be recommended with same Flickr photos that were taken by someone from the different angle of the same object, which were not taken by the author himself. This recommended photo could be helpful to make the contents more meaningful.

In case of music composer, one creates music for Jeju Island of Korea for introducing the beautifulness of the Jeju Island. Then, one wants to make a music video related to Jeju island and publish it to YouTube. In this case, one needs the related images or videos about Jeju Island. Our recommendation system can help this music composer while providing the appropriate image or video according to the music theme. There are many music part which have different theme, and the musician can get a recommendation according to the change of metadata of music part. So, the music composer who does not have much knowledge on image or video can also create a music video while using our authoring system.

C. Content Management System (CMS)

The CMS manages user account and uploaded media. The account management module enables to change authors profile information. The media management module provides that the author can upload, modify and delete their media (video, image, audio). Fig. 9 shows web browser UI for our system

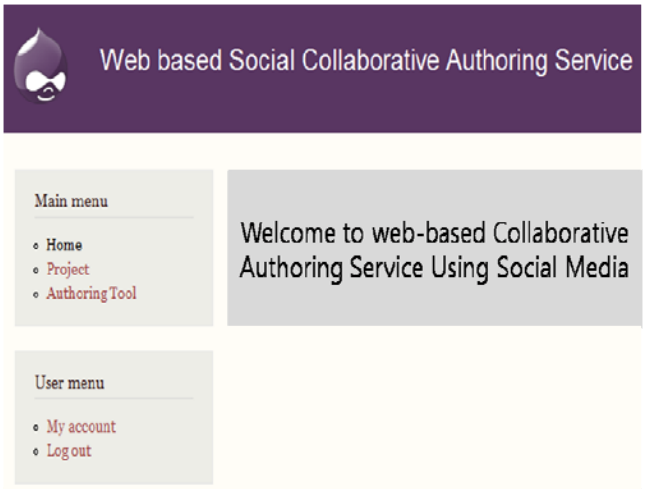


Figure 9. User interface of collaborative authoring system

IV. RECOMMENDATION OF SNS CONTENTS

A. Prior Recommendation Techniques Review

For the contents authoring, the recommendation of appropriate related resources are needed. Recommender System is a software tool and technique that suggests items to be used by a user [14-16]. The term "item" refers to what the system recommends to users. In most cases, a recommendation system only focuses on a specific type of item (e.g., movies, news or music). In the past few years, recommendation system has become a valuable means to cope with the problem of information overload [17].

The interest towards recommender systems has been dramatically increased lately, as indicated by some facts. First, recommender systems play an important role in such highly rated Internet sites (e.g. IMDb, Amazon.com). Second, there are dedicated conferences and workshops related to the recommendation system field (e.g. ACM Recommender Systems - RecSys). Third, college courses that dedicated entirely to recommendation system are offered at higher education institutions around the world. Lastly, there have been several special issues in academic journals that cover research and developments recommendation [17].

Recommendation systems have several differences with search engines. The goal of search engine is to answer user's ad hoc queries, while recommender systems are created to recommend services or items to user. The input of a search engine is defined as a query, while recommendation systems also rely on user preferences that defined as a profile. Output of a search engine is ranked items relevant to user's need, meanwhile, in recommendation systems, the items are ranked based on user's preferences. Search engines rely mainly in information retrieval-based methods, while recommendation systems rely on several methods, such as information retrieval, machine learning, and user modeling [18].

There are two major approaches for recommendation systems. First, collaborative filtering based recommendation systems as described by Goldberg et al. [19], and Second, content-based filtering based recommendation systems as explained by Pazzani and Billsus [20]. Collaborative filtering uses data from another user with similar preferences (e.g. Amazon.com's item recommendation). Collaborative filtering-based recommendation systems identify users whose preferences are similar to the current user and recommend items that have been liked by identified users [21]. Meanwhile, content-based filtering is based on the description of the item and a profile of user's interest (e.g. Internet Movie Database movie recommendation). Content-based filtering-based recommendation system tries to recommend similar item to those a given user has liked in the past [21]. Some works use tags as content descriptors for collaborative filtering, such as work by Firan et al. [22] shows that tag-based profile is capable of producing better personal recommendations on Last.fm compared to conventional recommendations. Meanwhile, Guy et al. [23] uses the related people and related tags to recommend social media items (blogs, communities, wikis, bookmarks, files) using hybrid approach (both collaborative filtering & content-based filtering). After evaluating the result, they found that tag-based recommendation provides better item recommendation, and recommendation based on combination of people and tags provides slightly more interesting recommendation with less already-known items.

Lerman et al. [24] worked on recommendation sys-tem that tried to solve ambiguity caused by homonyms and polysemy in Flickr tags. Their work uses hybrid approach (combining collaborative filtering and content-based filtering) based in contacts and tags. Recommendation based on users' contacts has proven to significantly improve the relevancy. In tag based part, a probabilistic topic model that predicts the users' desired contexts is developed. The probabilistic topic model is based on previous tags used by the user and to which group the user assigns his/her photos into. The result for this is a model that interprets the keyword as intended by the user (not biased by either homonym or polysemy). Thus, the precision of recommended item increased. In this work, comment & favorites were not utilized and there was no way to handle uninformative tags (e.g "Let's Play"). Gursel and Sen [25] proposed another recommendation system which is also based on Flickr. They developed an agent that observes the user's past activities and observes rating and comments provided by the user. As a result, photos are recommended in order, based on user preferences. Unfortunately, user with lack of past activities may have irrelevant agent. And also, the content source is derived from Flickr, therefore may not have a deep social meaning compared to SNS websites like Facebook.

B. Our Approach

The CAM data and user input keyword are used for recommendation. Fig. 10 shows how data for recommendation is created. Here, option 1 and option 2 data is entered by user.

After creating data for recommendation, recommendation scheme is applied to target SNS contents. As shown in Fig. 11, there are four recommendation schemes. According to the system policy, one of the scheme is used. Here, the red numbers 1, 2, and 3 correspond to the red numbers in Fig. 10.

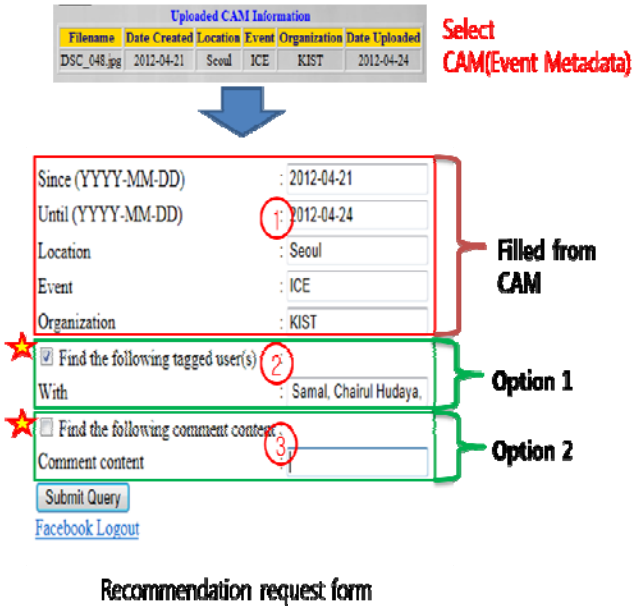


Figure 10. Creation of data for recommendation

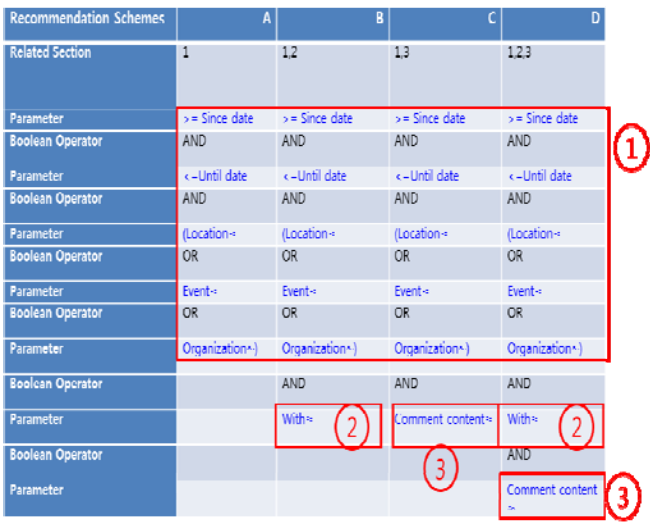


Figure 11. Recommendation schemes

Recommendation results are ranked using collaborative filtering, utilizing social information/user feedback, such as comments, likes and shares and the relationship between the user who obtain reocommendation and the content uploader. This ranking is intended to help the authors selecting which contents are most favorable by users on SNS. To rank the recommendation results, recommendation score *RS (u,i)* for user *u* and SNS content item *i* is calculated by using this formula:

$$RS(u,i) = \alpha * s_f(i) + \beta * p(u,v) + \gamma * t(i,k)$$

Where:

$$s_f(i) = a*\#ofShares(i) + b*\#ofComments(i) + c*\#ofLikes(i)$$

a, b, c are the recommendation weight for number of shares, number of comments and number of likes respectively.

$$p(u,v) = familyReationship(u,v) + employerSimilarity(u,v) + educationalSimilarity(u,v)$$

for user *u* and friend *v*.

$$t(i,k) = similarity(k\_location, t\_location) + similarity(k\_comment, t\_comment) + similarity(k\_tagged, t\_taggeedPerson) + similarity(k\_eventName, t\_AlbumTitle) + similarity(k\_eventOrganizer, t\_albumTitle)$$

for keyword *k_[any_keyword]* and tag *t_[any_metadata]*.

Here, $s_f(i)$, *p(u,v), and t(i,k)* denote social factor of SNS content item *i*, relationship between user *u* and *v*, similarity user keyword in data for recommendation (as shown in option 1 and option 2 on Fig. 2) and tag data of SNS content *i*. α, β *and* γ are the recommendation weight for each calculated recommendation factor.

Fig. 12 shows a basic concept of recommendation system flow based on CAM. Our system includes Facebook contents recommendation engine using CAM. The detail of our recommendation engine will be described in another paper.

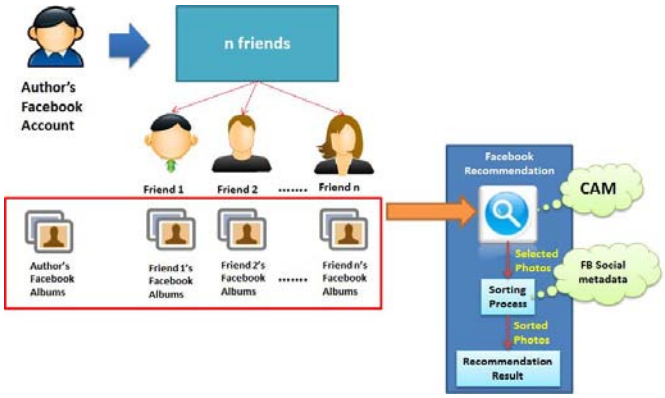


Figure 12. Facebook recommendation scheme with CAM

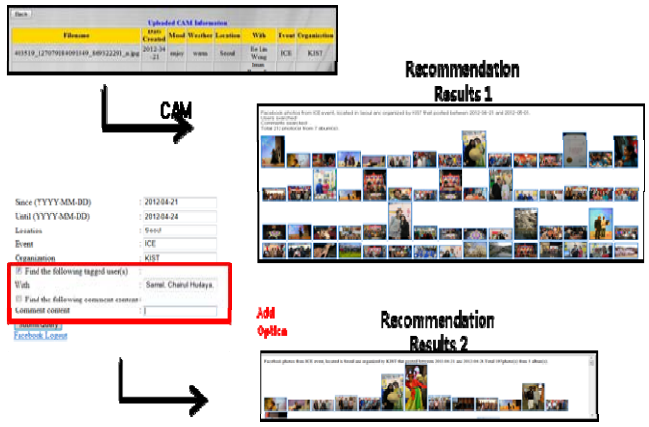


Figure 13. Facebook recommendation example

Fig. 13 shows one example of Facebook photo recommendation while using CAM and social factor query such as "photo in which someone is tagged."

V. DUI (DISTRIBUTED USER INTERFACE)

A. DUI for Collaborative Authoring

Our proposed system is considering a distributed user interfaces (DUIs) [26] for collaborative authoring, which is based on the concept of UI component adapted for the physical device characteristics.

Our general direction can be seen in Fig. 14. The users have multiple devices (e.g. tablets, smartphones, PCs and notebooks) with different display size, computational resource, and features. Every device connected to the internet, and the internet connects the users to several services, such as mobile messaging service, collaborative content authoring service, and social networking service. The users can create a content using web based collaborative authoring service anywhere, using any devices that connected through the internet. Since the user might not feel convenient using the UI developed for desktop in their mobile devices, component based specific UI for mobile devices are developed.

In view of DUIs, for heterogeneous device/platform, a concept of UI component is used and its component can be downloaded to devices according to the authoring purpose and device's physical characteristics. In other words, functionalities of collaborative authoring can be divided into component. For example, the authoring of multimedia contents handles several media, such as image, video, audio and text. In the desktop environment, the authoring tool provides all the functionalities for multimedia in one application UI. However, in case of mobile devices, it is not possible to provide all multimedia-authoring functionalities in mobile device with small screen and low computational capability.

Another consideration is the authoring system did not have the capability of adapting the UI according to specific editing part for the user. Some authors might be expert to provide audio enhancements on the project (audio authoring), while the other authors are excellent in narrative visual storytelling (video authoring), and the other users might know many things that could be used to provide textual information on the project (textual authoring). In this case, it is needed to provide adaptability of the interface based on the users' intention (or expertise). For supporting the expertise in collaboration, our system supports three interfaces, Audio Authoring User Interface, Video Authoring User Interface, and Textual Authoring User Interface.

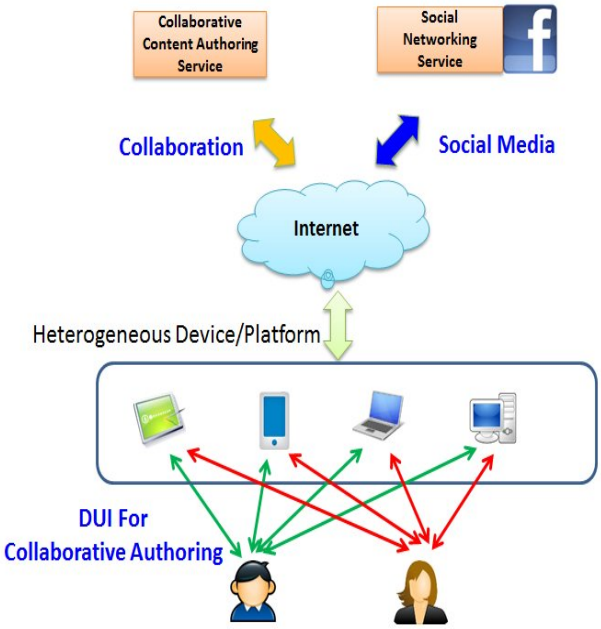


Figure 14. DUI for collaborative authoring

B. Component based Mobile Authoring Web-App

Our system supports collaborative authoring using smart phone like iPhone and Android phone using web browser. Especially, due to the small screen size of smart phone, user can select authoring component based on the authoring media, like image or audio. Fig. 15 shows UI in the smart phone.

Fig. 16 shows expert friend invitation UI. Here, KakaTalk is used for sending invitation message and corresponding URL

(a) Web app for collaborative video authoring

(b) Image Authoring App (c) Audio Authoring App

Figure 15. Authoring User Interface for smartphone

.

Figure 16. Expert friend invitation UI

VI. DEMONSTRATION

Our system is implemented on web server and demonstrated to create social album while using Facebook photos. Fig. 17 shows screen shot of web browser in PC. Fig. 18 shows a recommendation process and its ranked result photos in smart phone.

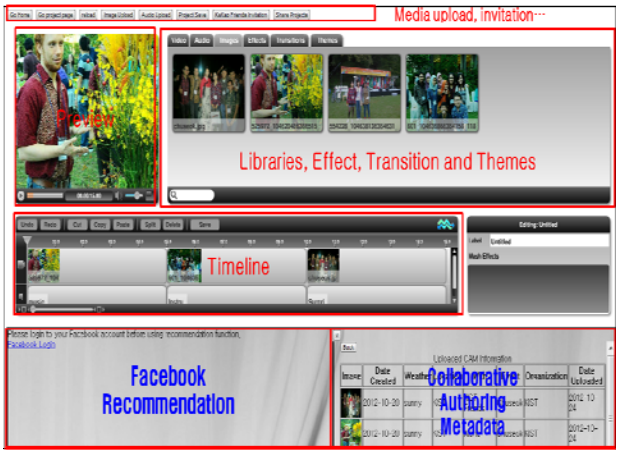


Figure 17. UI of collaborative video authoring in PC

Figure 18. Recommendation Process and its result in smart phone

VII. QUALITATIVE EVALUATION

In view of collaboration and creation of contents, the requirement for the collaborative authoring tool can be classified into six categories, such as Editing/Authoring, Contents sharing, Collaboration Grouping, Collaborative Time, Communication, and Publishing. Our system is evaluated in these points qualitatively.

Editing/Authoring

Our system provides editing and authoring capabilities on the authoring page. User can mix pictures and videos. Then, it is also possible to split and combine them. For high quality authoring, our system provides the recommendation of related appropriate resources from social media (Facebook, Flickr).

Contents sharing

The authors can manage their own media (images, videos, audios). The authors can also upload their media to the project space. If the author wants to share one's media with co-authors, one can share media or authoring contents by inviting the co-author. The invitation into the authored contents means to give authority to the invited users for accessing and editing to the authored content.

Collaboration Grouping

Using the project features, our system can implement grouping capability by searching friends with username and email address from social DB. After searching friends, the authors can add their friends on their own project by clicking add button. The added authors can share authoring content of shared project, comments, and CAM information.

Additionally, our system also provides the inviting expert friend using KakaoTalk in the smartphone or smart Pad while attaching web URL for authoring. The invited friend can join easily collaborative authoring easily simply by clicking URL in the KakaoTalk message.

Collaborative Time

Our current collaborative authoring system is not simultaneous. Authors can add or invite co-author to their own project. Then, the invited co-author can access, change or edit the authoring contents of the on-going shared project at different time. Our future work considers implementation of simultaneous collaborative authoring system.

Communication

In this paper, in order to implement communication feature, we implement capability of comments, poll and displaying all of the CAM information among co-authors. The co-authors can suggest the direction of authoring and then the authors determine the direction of authoring with poll. In addition, the authors can comment on the web.

Publishing

The publishing of the content authoring is also important element of web-based collaborative authoring using social media. Our system needs to implement for publishing the results to Blog, Internet club (Daum internet Café) and social media services (YouTube, Facebook…).

Table I shows evaluation of our system compared to several collaboration platform, such as Google Docs, Wiki and WeVideo.

In view of video authoring, our system is compared to WeVideo and Stupeflix. As shown in Table II, our system supports collaborative authoring while coordinating with SNS contents including friend's social contents. Our system also supports mobile authoring using smartphone or tablets.

TABLE I. EVALUATION OF COLLABORATIVE SOFTWARE

	Google Docs	**Wiki**	**WeVideo**	**Our System**
Editing/ Authoring	Document Editing	Document Editing	Text, image, video, audio Editing	Text, image, video, audio Editing
Contents Sharing	Document Sharing	NO	Project Sharing	Project Sharing
Grouping	Invitation	NO	invitation	invitation
Collabo-ration Time	Simultaneous document editing	open to revision	Group collaboration (no simul-taneous)	Group collaboration (no simul-taneous)
Commu-nication	Comment	comment	NO	Yes Metadata
Publishing	Pdf, Word, HTML	Wiki	YouTube, Facebook	Under Development

TABLE II. COMPARISON OF VIDEO AUTHORING SOLUTIONS

	Our System	WeVideo	Stupeflix
Collaboration	O	O	X
Importing SNS Contents (Mysel')	O	X	O
Importing SNS Contents (Friend)	O	X	X
Share of Intention	O	X	X
Mobile Device Support	O	X	O
Web-based	O	O	O

VIII. SUMMARY

This paper describes web-based collaborative authoring technology using social media. The design and implementation of our system are introduced. Demonstration of collaborative social video creation is presented. Using multi devices (PC, smartphone etc.), the demonstration shows effectiveness of the implemented system.

Nowadays, social curation for story telling using distributed big social data is focused for various application areas. Currently, our system is being extended to support social curation while supporting several SNS services and recommendation engine.

ACKNOWLEDGEMENT

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REFERENCES

[1] http://en.wikipedia.org/wiki/Social_media
[2] Joe Thurbon, “Collaborative Authoring,” Intersect Australia Ltd., 2010.
[3] Adler, A., Nash, J.C. And Noël, S., “Challenges in Collaborative Authoring Software, submitted to a special Issue of the IEEE Transactions on Professional Communication “Expanding the boundaries of E-collaboration,” 2004.
[4] William Emigh, Susan C. Herring, “Collaborative Authoring on the Web: A Genre Analysis of Online Encyclopedias,” Proceedings of the 38th Hawaii International Conference on System Sciences, 2005
[5] Mike Alcok, “Collaborative Authoring – The Future of e-Learning,” Atlantic Link, Limited, 2008.
[6] Jennifer Thom-Santelli, Dan Cosley and Geri Gay,” What’s Mine is Mine: Territoriality in Collaborative Authoring,” CHI 2009, Boston, MA, USA, April 4–9, 2009.
[7] Ilaria Liccardi, “Improving Users’ Awareness Interactions in the Collaborative Document Authoring Process: The CAWS Approach,” Ph.D Thesis, University of Southampton, Feb. 2010.
[8] Changyan Chi, Michelle X. Zhou, Min Yang, Wenpeng Xiao, Yiqin Yu, Xiaohua Sun, “Dandelion: Supporting Coordinated, Collaborative Authoring in Wikis,” CHI 2010, April 10–15, 2010, Atlanta, Georgia, USA.
[9] Yuanling Li, Paul Logasa Bogen II, Daniel Pogue, Richard Furuta, Frank Shipman, “Collaborative Authoring of Walden’s Paths,” TPDL 2012, LNCS 7489, 2012.
[10] http://en.wikipedia.org/wiki/Collaborative_software
[11] N. Takhirov, F. Duchateau, “A cloud-based and social authoring tool for video,” DocEng ’11, Mountain View, California, USA, 2011.
[12] WeVideo, http://www.wevideo.com/
[13] Stupeflix, http://studio.stupeflix.com/en/
[14] Mahmood, T., Ricci, F., “Improving recommender systems with adaptive conversational strategies,” C. Cattuto, G. Ruffo, F. Menczer (eds.) Hypertext, ACM . pp. 73–82, 2009.
[15] Resnick, P., Varian, H.R., “Recommender systems,” Communications of the ACM 40(3), pp. 56–58, 1997.
[16] Burke, R., “Hybrid web recommender systems,” The AdaptiveWeb. Springer Berlin / Heidelberg, pp. 377–408, 2007.
[17] Ricci, F., Rokach, L., Saphira, B., “Introduction to Recommender Systems Handbook,” Ricci, F., Rokach, L., Saphira, B., Kantor, P. B. (eds.) Recommender Systems Handbook. Springer, New York. pp. 1-29, 2010.
[18] Shaphira, B., Rokach, L., “Recommender Systems and Search Engines – Two Sides of The Same Coin ?,” Slide Lecture < http://medlib.tau.ac.il/teldan-2010/bracha.ppt>, 2012.
[19] Goldberg, D., Nichols, D., Oki, B. M., Terry, D., "Using Collaborative Filtering to Weave an Information Tapestry," Commun. ACM, vol. 35, no. 12, pp. 61-70, 1992.
[20] Pazzani, M.J., Billsus, D., “Content-based recommendation systems,” Brusilovsky, P., Kobsa, A., Neidl, W. (eds.) The Adaptive Web: Methods and Strategies of Web Personalization. LNCS, vol. 4321. Springer, Heidelberg, pp. 325–341, 2007.
[21] Balabanovic, M., Shoham, Y., “Fab: Content-based, Collaborative Recommendation,” Communications of the ACM 40(3), pp. 66–72, 1997.
[22] Firan, C. S., Nejdl W., Paiu R., "The Benefit of Using Tag-Based Profiles," in LA-WEB '07 Proceedings of the 2007, Latin American Web Conference , Washington DC,, pp. 32-41, 2007.
[23] Guy I., Zwerdling, N., Ronen, I., Carmel, D., Uziel, E., "Social media recommendation based on people and tags," in SIGIR, New York, pp. 194-201, 2010.
[24] Lerman, K., Plangprasopchok, A., Wong, C., "Personalizing Image Search Results on Flickr," in AAAI workshop on Intelligent Techniques for Web Personalization, 2007.
[25] Gursel A., Sen, S., "Improving Search In Social Networks by Agent Based Mining," in IJCAI'09 Proceedings of the 21st international jont conference on Artifical intelligence, San Francisco, pp. 2034-2039, 2009.
[26] Niklas Elmqvist, “Distributed User Interfaces: State of The Art,” CHI 2011 Workshop, 2011.