

## **Web-based Social Collaborative Authoring Technology**

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**Abstract:** This paper describes collaborative social authoring technology using web-based distributed user interface (DUI). In view of collaboration, web is one of the most common user environments on various systems of desktop and mobile devices. This paper addresses the DUI issues for the support of multiple kind of devices, such as PC, smartphone, tablet and so on. In our system, we define CAM (Collaborative Authoring Metadata). CAM is used for the exchange of authoring intention of each user during the collaborative authoring. We define elements of CAM that is useful for exchanging information among distributed users. Our system also provides the recommendation function for referring and adding the related media from the participants' social media service account during the authoring process.

**Keywords:** DUI (Distributed User Interface); CAM (Collaborative Authoring Metadata); Social Media Recommendation; Collaborative Work; UCC authoring.

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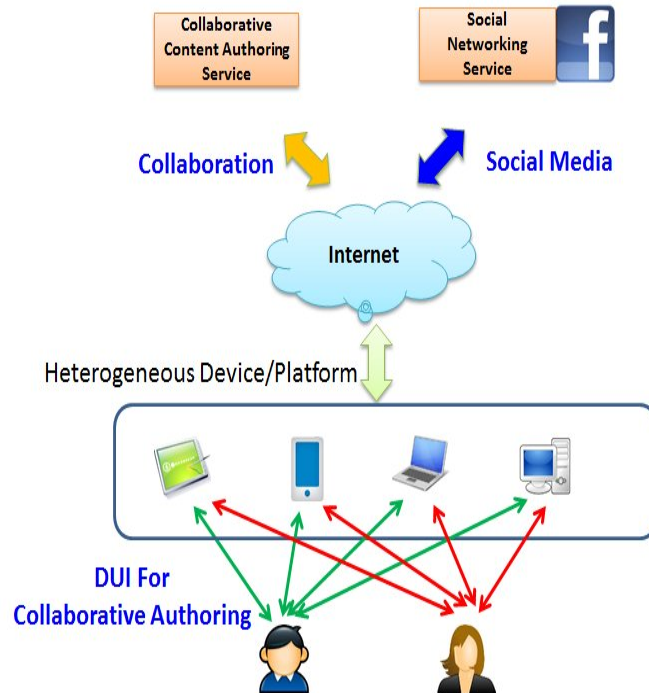
### **1. Introduction**

This paper describes the issues on developing web-based collaborative content authoring intended for multi-device environment and utilizing metadata provided in uploaded media, as well as proposal for using metadata provided in the users' Facebook account to provide recommendation based on some rules. Our proposed system is considering a distributed user interfaces (DUIs) [1] for collaborative authoring, which is based on the concept of UI component adequate for the physical device characteristics and social media recommendation scheme from SNS such as Facebook.

This paper describes our approach for web-based social collaborative authoring technology and shows some current research results.

## 2. Approach

Our general direction can be seen in Figure 1. The users have multiple devices (e.g. tablets, smartphones, PCs and notebooks) with different display size, computational resource, and features. Every devices 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 collaborative content 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, we develop specific UI for mobile devices.



**Figure 1.** General direction of the proposed system.

In view of DUIs for heterogeneous device/platform, we use a concept of UI component which is used or 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. However, in case of mobile devices, it is not possible to provide all multimedia contents authoring functionalities in small screen and low computational capability mobile device.

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, we need to provide adaptability of the interface based on the users' intention (or expertise). For supporting the expertise based collaboration, we develop three interfaces, Audio Authoring User Interface, Video Authoring User Interface, and Textual Authoring User Interface.

Collaborative work needs sharing knowledge, experience and abilities to achieve common goals among users. It is important to share this information for collaborative authoring on distributed environment among users. We designed CAM (Collaborative Authoring Metadata) that includes authoring intention, name of author, created date, time, location, mood, with whom and so on. Each of users can upload and create their own contents (Video, Image, Audio and Text) to collaborative authoring space. When user uploads and creates their own contents, CAM is created as different knowledge and experience.

Another consideration is although today we have personally meaningful multimedia data in our social networking sites, these authoring tools are incapable of recommending multimedia files from our social networking sites, such as Facebook. This paper addresses the issue of the related contents recommendation from social media services during the collaborative authoring. The above mentioned CAM is used for the recommendation of social media contents.

### **3. Recommendation Scheme Review**

This section reviews the previous recommendation scheme that is one of the important issues addressed in this paper. There are two approaches for recommendation systems, i.e., collaborative filtering (CF) [2] and content-based filtering (CB) [3]. In CF, data from another user who has similar preferences is used. Meanwhile, CB is based on a profile of user's interest and the description of the item.

In some works, CF is implemented by using tags as content descriptors. Firan et al. [4] shows that tag-based profile is capable of producing better personal recommendations on Last.fm (a popular music SNS) compared to conventional recommendations that based on track (song) usage. Guy et al. [5] uses related people and related tags to recommend social media items (blogs, communities, wikis, bookmarks, and files) using hybrid approach (both CF & CB). Their research suggests that "people and tags" and "people or tags" based recommendation provide better recommendation in high number of interesting item and low number of "not interesting" and "already known" item. Lerman et al. [6] tried to solve ambiguity caused by homonyms and polysemy in Flickr tags using hybrid approach by contact based and tag based approach. Recommendation based on user's contacts improves the relevancy significantly. For recommendation based on tags, a probabilistic topic model that predicts the user's desired contexts is developed. The probabilistic topic model is based on previous tags used by the users

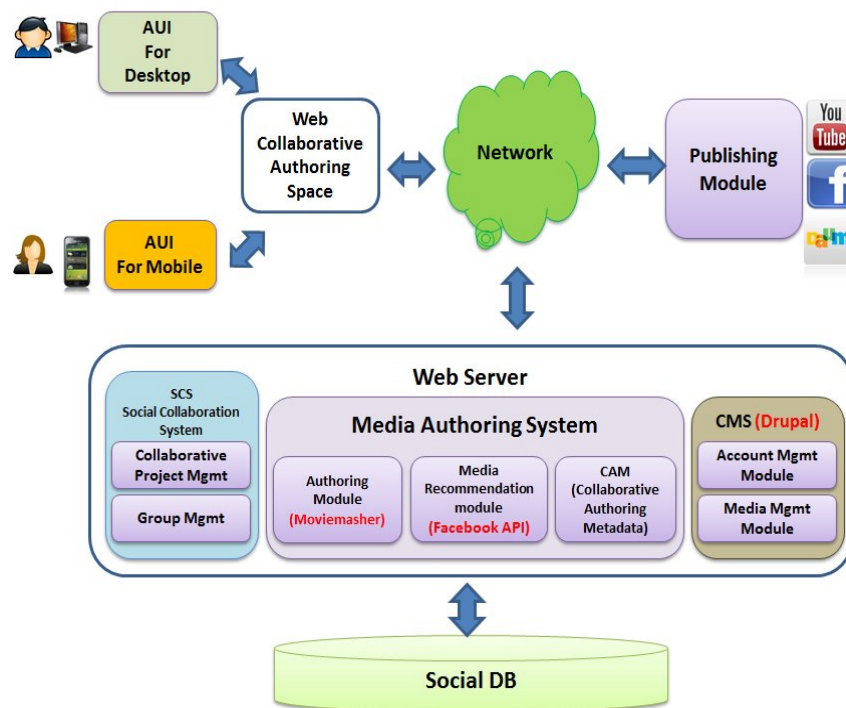
and to which group the user assigns his(her) photos into. The result for this method increased search precision. In Lerman’s work, metadata such as comment & favorites were not utilized and there was no way to handle uninformative tags.

Another Flickr-based recommendation system was proposed by Gursel & Sen [7] by developing agent that observes the user’s past activities and observes rating and comments provided by the user. The recommendation is provided as ranked photos based on user preferences. The limitation is that any use with lack of past activities may have irrelevant recommendations from the agent.

## 4. Results

### 4.1. Our Social Collaborative Authoring System

This paper describes an architecture which can support the concept of DUI and links with SNS like Facebook. This architecture is provided in Figure 2. The proposed system consists of web-based DUIs, web server and social database. Web-based DUI provides a space to create project, publish the content, and manage authors’ accounts. In more detail, AUI (Authoring User Interface) is developed for desktop PC and mobile devices. Authors can store their resources (audio, photos, and videos) and CAMs in the social DB. The web server links web based DUI and social DB, and includes the modules for collaborative authoring system.



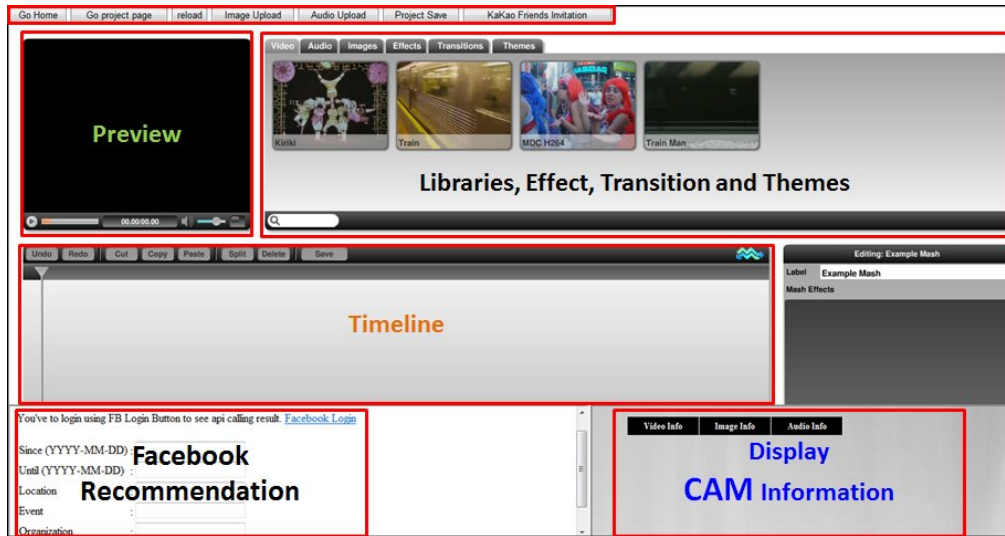
**Figure 2.** Architecture of the social collaborative authoring system.

Web-based DUI can be composed according to the user's device. In case of desktop PC, we can use web browser in which all the authoring functionalities are provided. However, in case of mobile devices, user can select the DUI component according to the user intention. For example, the audio authoring user can only download the audio AUI and perform the collaborative authoring. Here, the pre-authored video and text content is provided as a reference in the timeline.

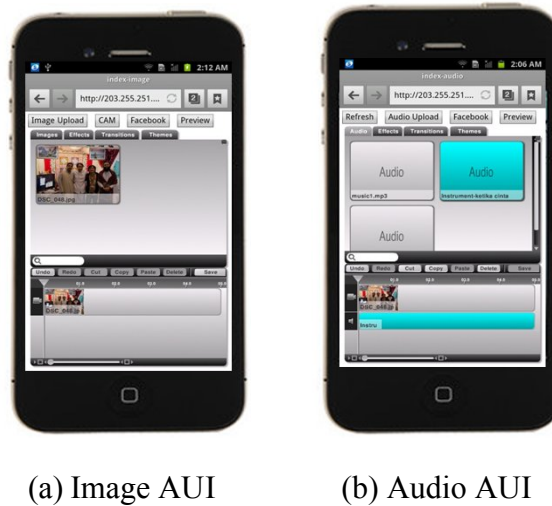
The web server consists of SCS (Social Collaborative System), MAS (Media Authoring System) and CMS (Contents Management System). The SCS includes collaborative project management module and group management module. These modules implement collaborative function on the web. When a user searches for co-authors, group management module requests author's information at the social DB and provides appropriate author information to the requesting user. The collaborative project management manages group of the project.

The MAS includes authoring module, recommendation module and CAM module. The authoring module provides editing capability and preview of edited content. The CAM module creates CAMs, analyzes created CAMs and displays this information systematically for collaborative authoring. Using these CAMs, authors can exchange their authoring intention and information of each media. CAM is provided by authors during media (image, video or audio) upload. We define and store CAM using XML.

In case of creating narrative story using images, the authors need related images or videos about certain topic. Our recommendation system can help the authors by providing the appropriate image or video from Facebook. The recommendation module is a novel method for media authoring. The recommendation module searches related images from Facebook based on the keyword of the analyzed CAM. During the authoring process, each author can have a recommendation with related images and sound from Facebook based on this CAM. For example, the author can be recommended with some Facebook photos that were taken by other participants which include similar metadata. CMS includes an account management module and a media management module. We use open source video editing tool (Moviemasher [8]) for implementing authoring module and Drupal [9] for implementing CMS. In view of DUI, Figure 3 and Figure 4 show desktop PC UI and smartphone UI, respectively.



**Figure 3.** Collaborative authoring tool for desktop PC.



(a) Image AUI

(b) Audio AUI

**Figure 4.** Image and Audio Authoring User Interface for smartphone

#### 4.2. CAM & Facebook Photo Metadata

This paper also addresses the coordination of our collaborative authoring system and current Social Network Services such as Facebook, Flickr etc.

In Facebook, each user has many friends and shares several kinds of contents with one's friends. So, when we want to create collaborative UCC, it would be also useful to use our friend's Facebook album as a social database. For this, we want to coordinate our collaborative authoring system and Facebook photo album.

Here, Participants' Facebook photos are accessed using Facebook API. Our system supports the collaborative authoring based on the CAM. In Facebook album, each photo can have several

metadata information such as time, location and so on. So, this metadata of Facebook photo can be used as CAM for our collaborative authoring. Using this Facebook photo metadata, we can search and collect the related photos of our friends from Facebook album and create social UCC using these searched photos.

Currently, we are developing collaborative UCC authoring system while coordinating Facebook album as a social DB. Figure 5 shows an example of CAM created by users. According to the user's situation and status of mind, the CAM can be created differently. For example, user1 create upper CAM (a) and user2 create lower CAM (b) in Figure1. As you can see in the Figure5, user1 and user2 enjoy same event in the same place. However, they have different feeling and enjoy event with different friends. We can use these different CAMs in collaborative work among distributed users. These CAM can be used appropriately for the collaborative contents authoring. Figure 6 shows a recommendation system based on CAM.

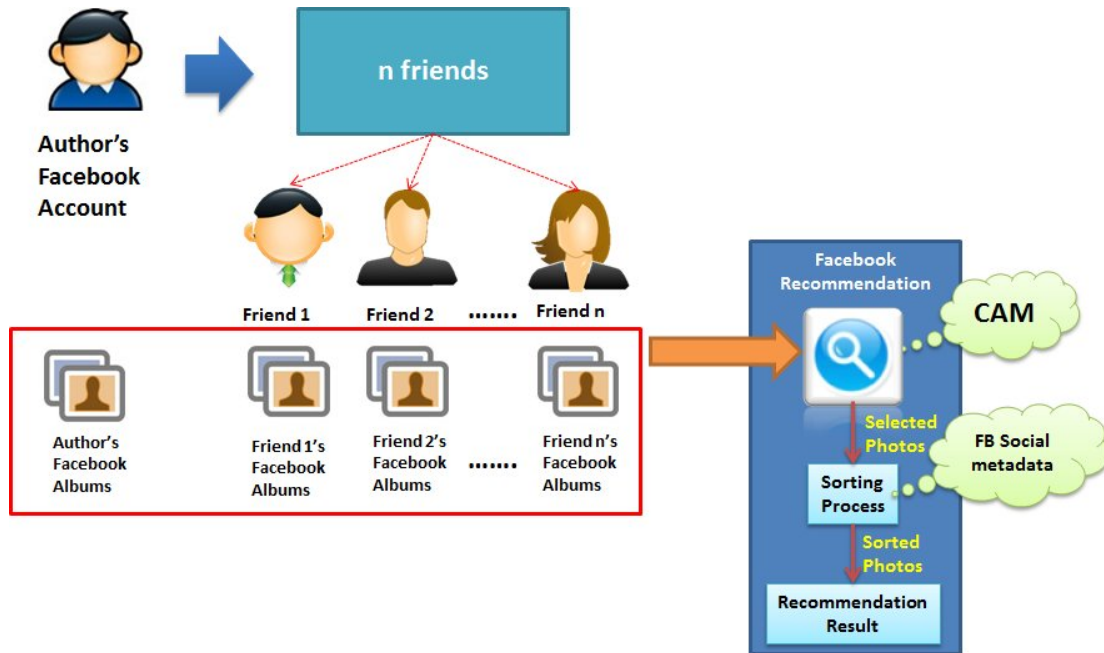
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(b)

**Figure 5.** Examples of CAM created by two users.



**Figure 6.** Facebook recommendation scheme with CAM.

## 5. Conclusions

In this paper, we consider DUI for developing web-based user interface into collaborative social authoring. We develop web-based collaborative media editing environment and adapt CAM to communicate authoring intention and comments among collaborative authors, and coordinate with Facebook photo album. We add new consideration that arises from current system and propose DUI for collaborative authoring, which has adaptability of the system to be used in multiple platforms and space, and content recommendation scheme from Facebook.

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## References

1. Elmqvist, Niklas. Distributed User Interfaces: State of The Art. CHI 2011 Workshop, 2011.
2. D Goldberg, D Nichols, B.M. Oki, and D Terry, Using Collaborative Filtering to Weave an Information Tapestry, Commun. ACM, 1992, vol. 35, no. 12, pp. 61-70.
3. M. J. Pazzani and Billsus D., Content-based recommendation systems, The Adaptive Web, 2007, pp. 325-341.



4. C. S. Firan, W Nejdl, and R. Paiu, The Benefit of Using Tag-Based Profiles, LA-WEB '07 , Washington, DC, 2007, pp. 32-41.
5. I Guy, N Zwerdling, I Ronen, D Carmel, and E. Uziel, Social media recommendation based on people and tags, SIGIR, New York, 2010, pp. 194-201.
6. Kristina Lerman, Anon Plangprasopchok, and Chio Wong, Personalizing Image Search Results on Flickr, Intelligent Information Personalization, 2007.
7. Anil Gursel and Sandip Sen, Improving Search In Social Networks by Agent Based Mining, IJCAI'09 Proceedings of the 21st international joint conference on Artificial intelligence, San Francisco, 2009, pp. 2034-2039.
8. MovieMasher, <http://www.moviemasher.com/>
9. Drupal, <http://drupal.org/>

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