Is Danmaku an Effective Way for Promoting Event based Social Network?

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Abstract
Recently, a new type of social network called event-based social network(EBSN) is emerging to promote real-time online to offline social interactions. On the other hand, Danmaku (Danmu) is becoming increasingly popular on video sharing sites in Asia. Danmu creates a one to many social experiences suitable for EBSNs. It enables real-time commentary and serves as a valuable source for further analyzing social networks. In this poster, we use Danmu to create real-time online to offline event based social network. A method for analyzing user's activity via Danmu is proposed. Finally, we conclude that Danmu is effective in promoting EBSN by presenting the results of analyzing Danmu contents gathered by a social network App called "USee" on three social events.

Author Keywords
Danmaku; Event Based Social Network; User Participation Degree

ACM Classification Keywords
H.5.3 [Group and Organization Interfaces]: Computer-Supported Cooperative Work

USee – An Danmu based Social Service

Overview: USee provides a EBSN for users to freely create location-aware topics and interact with nearby users via Danmu. The key entities of USee are topic and Danmu. A topic represents any real world event. Registered user can create or visit topics and post or view Danmus to interact with each other.

Interface: After login, user enters the topic list page that shows the topics within a certain radius. Users in a topic (Figure 2) watch the Danmu moving from right to left just like in the video sharing sites. Users could chick on Danmu to see the detail page where they can praise, dispraise or comment a Danmu. Users can choose to be anonymous using a random nickname or be authenticated using the real nickname.

Introduction

Recently, a new type of social network called event-based social network(EBSN) [1, 2, 3] has emerged. EBSN not only provides online social networking, but also promotes real-time offline social communication. EBSN satisfies people's strong desire for social interaction in public events like lecture, concert and sport games, it has far-reaching social and commercial value. For instance, *Meetup* is shown to have a positive impact on a US Presidential campaign[4].

On the other hand, Danmu offers an entertaining and interactive way for expressing ideas anonymously and openly. More importantly, Danmu creates a one to many social experiences suitable for EBSNs. More and more public events adopt Danmu to offer interactive social services. For instance, a movie called "Moon in the Qin Dynasty" put two large screens for users to send Danmu while watching the movie (Figure 1).

In this poster, we use Danmu to create real time online to offline EBSN. The event is any kind of public gathering like soiree, lecture or sport games where many people attend at the same time and location. Danmu enables real-time commentary, also known as live-tweeting[5]. User's Danmu is simultaneously broadcasted online and instantly viewed by many users on the large screen, it spurs offline discussions to produce related new Danmu, forming a close loop between online to offline worlds. When user comments other's Danmu, an underlying social network is created with edge presenting the sender – receiver relationships. Furthermore, Users' comments or logs serve as a valuable source for further analyzing social network [6]. We can build analytic model to reveal users' thinking and degree of participation over time.

We conclude that Danmu is an effective way for promoting EBSN by presenting the results of analyzing Danmu contents gathered by a Social Network App called "USee" on three public social events. This work has implications not only for the different social network platforms to offer more interactive services, but also for organizers of public events who try to maximize user satisfactions and gain more insights about the events.

Figure 1: Danmu walls on both sizes of the theater during the movie "Moon in the Qin Dynasty" in 2014

There exist limited studies on the Danmu [7,8], they mostly attempt to understand and explore the usage of Danmu in video sharing sites. To the best of our knowledge, there is no previous study on adopting Danmu to create an event based social environment.

Datasets and Methodology

Datasets

In order to study the effect of Danmu on EBSN. We collaborate with three campus soirees (S1,S2 and S3) where there is gathering of many students in one theater. Using USee, students can send Danmu that is

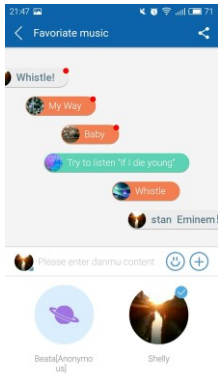


Figure 2: Topic room of USee

	Time	# of Danmu
S1	10/08	2633
S2	09/27	2163
S3	05/24	1334

Table 1: Datasets collected by students using Usee from three campus soirees.

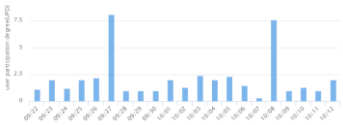


Figure 3: Daily Users Participation Degree chart from 09/22/2016 to 10/12/2016

directly displayed on the large LED screen during the events. In the end, we gather three datasets (Table 1).

Methodology

We use jieba[1] for words segmentation and obtain the key word set. Based on the well established TF-IDF method, we proposed the following model for calculating User Participation Degree(UPD) using Danmu contents:

Given a key word W_i, $C(W_i)$ is the count for its occurrences in the document:

$$TF(W_i) = \frac{C(W_i)}{\sum_{j=1..N} C(W_j)} \quad (1)$$

Then calculate IDF, $D(W_i)$ stands for the number of danmu containing the key word W_i

$$IDF(W_i) = \log\left(\frac{\sum_{j=1..N} D(W_j)}{D(W_i)}\right) \quad (2)$$

Let $L(W_i)$ represents the length of keyword W_i, the weight or importance of W_i is defined in Equation 3:

$$Weight(W_i) = TF(W_i) * IDF(W_i) * Log(L(W_i)) \quad (3)$$

Finally, for an event E, given all the Danmus in a period of time, user participation degree (UPD) of the event can be calculated by Equation 4 by choosing the TOP K words ranked by weights.

$$UPD(E) = \sum_{K=1..N} Weight(W_i) \quad (4)$$

1 Jieba, https://github.com/fxsjy/jieba

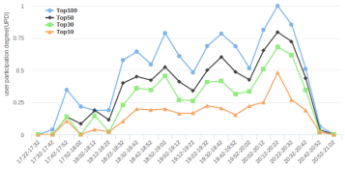
Analysis and Discussion

Figure 3 is the daily UPD of USee from 9/22/2016 to 10/12/2016. Two sudden peaks are observed on 9/27 and 10/8 when two welcome soirees are hold. In contrast, during normal days when there is no social event, UPD remains stably low. Therefore, we conclude that using Danmu in public event could stimulate the desire of expression among young people.

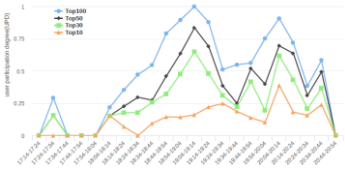
Figure 4: Word Cloud of top 100 keywords by analyzing the Danmus from S1

Figure 4 shows the word cloud of Top 100 keywords ranking by weight from S1, words like "I love you", "confession", "like", "gorgeous" and "handsome" stands out. This captures the essential emotion of the usrs and gives more insights about the event.

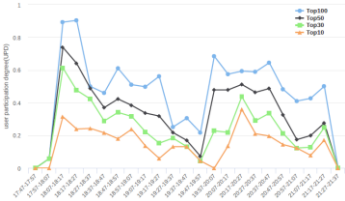
Figure 5.a shows the UPD trend in a large new student welcome soiree(S1) on 10/08/2016. From 17:30 to 18:30, the students are gradually attending, so the trend is steadily increasing. Form 18:30 to 21:00 the performance has four programs that are most entertaining, according interviews from 5 attendees, the atmosphere is the most vibrant during these programs, there is a burst of Danmus flying on the



a. UPD of a new student welcome soiree S1



b. UPD of a new student welcome soiree S2



c. UPD of a graduation soiree S3

Figure 5: UPD Charts of three events. Each Chart has four lines of UPD generated by Top K (10,30,50 and 100) keywords.

screens. Correspondingly, there are 4 peaks in the UPD trend. The best program of S1 begins at 20:20, it corresponds well with the highest UPD in Figure 5.a. After 21:00，the performance is over, UPD swiftly drops to 0. It is also worthy to mention that the there are 136 new users who install USee during the performance, it is almost half of all the audiences in the theater, that is 50% user conversion rate! In two hours, these new users send 2633 Danmus, averaging 20 Danmus per person. Users wrote 148 comments containing 30 senders and 65 receivers, we can use this information to infer the transient social networks that evolve and decline over time. Figure 5.b and c shows the UPD trend of two soirees (S2 and S3) hold earlier, similar trends are observed.

Conclusion and Future work

Through this interactive poster, we show the effectiveness of Danmu for promoting EBSN in front of the research community. we first propose a TF-IDF based method for quantitatively analyzing user's participation degree in a social event via Danmu. Then, we present the results of analyzing Danmu contents gathered by a Social App called "USee" on three public social events. The results show that Danmu can act as a collaborative medium and support the EBSN well. It helps to quickly create an event based online to offline social environment that stimulates user's desire to share and express. It can depict the development of the event in real time and offer meaningful insights. In the future, we plan to gather more data from different social events via Danmu and further infer the dynamics and internal structure of event based social network.

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