Live Collaborative Social-Media Video Timelines

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ABSTRACT
In this paper, we propose a collaborative system to let users share their own videos and interact among themselves to collaboratively do a video coverage of live events. Our intention is to motivate users to make positive contributions to the comprehensiveness of available videos about that event. To achieve this we propose a collaborative video framework, named LiveTime, allowing users to shared information timelines of real-world events. With this solution we offer collaboration features that go beyond existing systems like Youtube and Vimeo. The paper describes the rational and main concepts, the implementation and the results of a preliminary user study.

CCS CONCEPTS
• Information systems → Collaborative and social computing systems and tools; • Human-centered computing → Collaborative filtering;

KEYWORDS
Collaborative video, storytelling, timeline, live stories

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1 INTRODUCTION
Existing work in the area of social-media collaborative UHD (Ultra High Definition) video has considerable gaps in terms of collaborative video in social-media. This paper proposes a new collaborative video framework, named LiveTime, allowing users to create shared information timelines of real-world events. The proposed solution is implemented as an on-line platform deployed to store and stream collaborative stories to multiple devices. We want to ensure user collaboration in terms of basic features like video uploading and streaming, and more importantly, but features leading to the concept of an event timeline to be enriched by user contributions in terms of comments, tags, videos and other material. This is our main contribution: to have timelines from different events with videos that were uploaded by different persons to make a more complete timeline for a given event, Figure 1. Hence, in LiveTime, timelines tell a story about a given event in life and this story can be created by only one user using only their own videos or it can also be shared by several users who attended, for example, the same event.

LiveTime framework implements a series of functionalities that fosters and promotes user collaboration towards the video event timelines. We also explored ways to encourage users to participate with quality contributions. We sought to engage users with strategies based on leaderboards (social rewards/recognition) and challenges (competitiveness) to participate with more quality contributions.

In the following section we discuss previous work that served as inspiration to LiveTime. Section 3, details the implementation of the main contributions. Section 4 then presents a user study that clearly illustrates the importance and timeliness of the proposed work.

2 RELATED WORK
In 2014, Habibian et al. [7] proposed a new format for video representation, recognition and translation of events which was called VideoStory. This new event recognition algorithm used videos available on Youtube using their title, content and description to provide the semantic interpretation of a video and not only a collection of words used to summarise it. The collection was then made available online in a storage called VideoStory46k. Liu et al. [9] proposed a framework that extracts and illustrates social media events automatically for a given query. They use an NLP algorithm to parse the input query to extract related news from a social news web service. With the given query they try to extract some relevant information like event location, topic or time information to then search directly through a social news service provided by Digg1.

1http://digg.com/
After, they divide the query and use the Twitter API to retrieve some relevant tweets regarding the topic, cleverly filtering the search from the date that the news was posted on Digg to the current date to get more accurate and relevant tweets. They also use Google to retrieve related pictures to illustrate the content. Their big advantage using a service provided by others, in this case Google, is that they save a lot of resources in data storage or processing time. It is another example of how event detection is being used to facilitate the process of showing information. Another work regarding this problem was studied by Bian et al. [2] which applied event detection and summary techniques to answer the quick growth of microblogging services. This type of services are changing the way that information is exchanged and this work introduces a new framework to generate visual summaries for trending topics. Basically what they do is to analyse the context of the topic and to divide it into sub-topics. Then, the system uses a set of images to automatically select representative images to illustrate the given topic. Also interesting and dealing with the same issues is the work of Kennedy et al. [8]. In their work they build a timeline focusing on video concerts. The goal is to ease the search of concert videos since usually after a concert there will be plenty of videos regarding that same concert across the web. With their work they gather a collection of videos regarding that concert uploaded by different users and then they run an algorithm which compares them to find points in common. With that they can achieve things like reducing the redundancy since videos not showing the same parts and they can even go further choosing the best quality videos instead of the poorest ones. With our solution we also aim to reduce video redundancy since the creation of events will help to store in the same place all videos regarding that same event.

The idea of using multimedia information to build this kind of stories has been explored for some time. In 2000, Balaboniv et al. [1] started working on a system allowing pictures to be uploaded, automatically rearranged by date and that can be presented as slideshow to let users annotate the slideshow with their recorded voice. Delgado et al. [6] tackled the illustration of story timelines to keep the user alert and engaged. The idea is to illustrate a news article with images that match the news content according to the automatic annotations of the images [10] and present it as a slideshow where news sentences are associated to a picture. Our idea with the timelines is similar, but now using videos from many different sources to also build a story/lifetime event.

3 COLLABORATIVE LIVE VIDEO TIMELINES

LiveTime aims to deliver collaborative live video timelines supported by two major pillars. First, we wish to build better storylines, or video timelines as we call in LiveTime, through the aggregation of video contributions made by users that best represent a real life event or a real life story. With this in mind, the second pillar aims to achieve a way to make the user contributions to be of the best possible quality that makes sense to the context of the event.

This section will describe the timelines creation and visualization, the filling of story gaps and how we encourage users to make their LiveTime contributions, but first we will start by introducing the concept of a spontaneous contribution.

3.1 Video timelines

In our system, all users can contribute to any available timeline. To help the building of timelines, there is the possibility to host competitions asking users to contribute to it and reward this contribution, Figure fig:storygap. The goal is to have the timelines as complete as possible. Rewards will be discussed later in this section. However, this is just one way to reach the goal of building better timelines since we are confident that most contributions will come spontaneously (spontaneous contribution). A spontaneous contribution is a contribution (adding a video) to an existing timeline with no contest associated, only with the goal to help build it and grow.

3.1.1 Microblog contribution. To facilitate the process of contributing to timelines, LiveTime has a close association with Twitter. When users create LiveTime accounts, they can associate it to their Twitter Account. With this functionality a spontaneous contribution can be the result of a direct contribution (a video directly uploaded to LiveTime) or an indirect contribution (possible using Twitter).

In practice, each timeline has an hashtag on Twitter, created by a LiveTime Twitter Account. To make a Twitter contribution, users need to tweet a video to our LiveTime Twitter Account with the hashtag of the timeline to which they wish to contribute to. The tweet will be then added to the corresponding timeline and a new indirect contribution will be made.

3.1.2 Detecting storygaps. One of the main purposes of LiveTime is to have our events/timelines with the most videos possible to also be the most complete possible, since each video will fill gaps
that exist in it. In figure 2 we have an illustration of a story gap. Basically, we can divide a storygap filling process in two parts, the first part which is represented in the picture is where we can clearly see that something is missing from an event. This is a **basic storygap** that someone with the missing video can fill. Another and more complex storygap, is for instance when we have an event of a summer music festival with multiple days. We have some videos from each day but we would like to have more videos to a specific day in the past. These are some of the examples of storygaps we wish to fill with collaborative social-media information.

### 3.2 Collaborative contributions

#### 3.2.1 Community recognition.

We learnt from [5] that ratings in applications of this type are not that much used, in fact they say that only 0.22% of the total video views generate ratings. With our system we aim to change this with different rewards to user participation. LiveTime implement leaderboards that are updated every time a video is uploaded or a timeline created or rated - their goal is to **reward participation**. The first two leaderboards are the **Top Videos** and **Top Timelines**. In these leaderboards each timeline created or uploaded video will add one point to the LiveTime member responsible to its creation. In contrast to this **activity recognition**, we support social recognition through the **Videos By Rating** and **Timelines By Rating** leaderboards, where we count the ratings given to the videos and timelines by users. Everytime the rating of a video changes (as a consequence of a user feedback) leaderboard classification will also change accordingly. Imagine a video rated with one gives the user five points in the score, a video rated with five stars gives the user twenty points in the score. The same goes for timelines. We use this scoring mechanism to reward better contributions.

#### 3.2.2 Collaborative-competition.

Despite of the leaderboards importance, we seeked other ways getting users involved in the creation of video timelines. Twitter integration also contributes to user involvement in LiveTime for instance in the building of storylines. As mentioned, we created a LiveTime Twitter user account to link both applications. This account is used to facilitate the process of filtering users contributions to LiveTime, but it has other advantages. Everytime a new contest or timeline is created, LiveTime will automatically make a tweet and will post it to its Twitter account, announcing that a new contest or event was created. In this way, all users that follow LiveTime on Twitter, will be instantly notified about the creation of a new timeline and can start helping and participating in the timeline building process.

A contest is something that every user create and then LiveTime users will compete against each other to win it. The contest main goal is to gather videos to specific events or to a specific day of a festival as exemplified. We can create contests from scratch with no timeline associated or create contests to a specific timeline since for each timeline we have buttons between the contributions to allow users to open contests and timelines to that specific parts. To create a contest users will need to select a few options that the user will need to select like the competition type and leaderboard type.

In LiveTime we offer four types of competitions:

- **Winner Takes-It-All.** In this type of collaborative-competitive contributions, only the leader of the contest will win the prize.
• **Equal-share prizes.** Equal distribution competition where the prizes will be distributed in equal parts to all the contributors.
• **Top contributors.** In the top contribution system the prize will be offered only to a few contributors in the top of the table.
• **No reward.** There is also the possibility to create a contest with no reward at all.

We choose to support this type of contests, inspired by the work of Rokicki et al. [11]. In particular, they found the *Winner Takes-It-All* strategy to be the most effective.

## 4 USER STUDY

Our evaluation focused on the usability and utility of the features provided by LiveTime. The user study covers most of the features currently available in the LiveTime platform with a special focus on the timelines creation with both direct and indirect contributions. To assess system usability we followed the methodology proposed by Brooke [3, 4]. The collaborative video timeline functionalities provided by LiveTime were also assessed in the user study.

### 4.1 Population

Our user study was conducted with twenty one participants, with ages between eighteen and fifty six years old (an average of 26.38 years old). The percentage of male and female subjects were divided in 23.8% female and 76.2% male. In the total population, 57.0% of the participants come from the field of technologies and natural sciences, while the remaining 43.0% come from other areas.

### 4.2 Methodology

All the test subjects were presented with a series of tasks to perform with a few options and paths which they can take. In the test scenario we created a few timelines to see to which ones the users will contribute to. Our main goal is to see the evolution of the timeline called 2016 Music Concerts in Portugal. We started the timeline without any video and in the tasks guide, we recommend our users to contribute to it with their own videos.

### 4.3 Discussion

#### 4.3.1 Protocol

During our test section we launched a small timeline and asked users to help us build it. The timeline is called 216 Music Concerts in Portugal and the goal was for users to contribute with videos from concerts were they went during this year in this country. In figure 5 we present a screenshot of the video timeline created with user contributions during this test phase. Note that the temporal scale of the timeline is not accurate. The density of the timeline is related to the number of contributions.

The timeline also had a contest associated to rank the number of contributions made by each user and started completely empty and it lasted one day. Not all users contributed to the timeline, and we after discussing it with users, we realized that it was due to lack of videos for the subject in matter that could serve as examples. Still, we gathered contributions to it with two coming from the same user and the others coming from individual users and Twitter. Since all the twitter contributions were made using the Twitter account that we provided for our test scenario we do not know how many of them are individual. Five of the contributions were directly to the contest created and four of them were made using the Twitter Account provided. Apart from that there were twenty three direct videos uploads to Lifetime from eighteen individual users and there were also eight tweets uploads through Twitter, six of them using the Twitter Account that we provided. Finally there were created ten timelines and three contests from thirteen different users.

#### 4.3.2 Specific feedback

At the end of the evaluation, users had to complete a questionnaire, and they were also allowed to provide free-text feedback or to discuss about their experience. Figure 5 illustrates the results across the considered dimensions. The first groups of aspects, addressed the usefulness of timelines, contests, leaderboards. Results indicate that 90.9% of the users consider to timelines functionality to be *Good* or *Very Good*. Hence, it confirms the starting point of this paper. The relevance of contests and leaderboards, however there were slightly more users who enjoyed leaderboards than contests. We believe this is due to the competitiveness factor.

We then assessed the video uploads and timeline creation. These were the most positive functionalities, which is not a surprise, since this became a standard feature in many social-media services. Next, we looked at the functionalities concerning contributions to timelines and creation of contests, which were well scored by users: 76.2% considered these functionalities to be *Good* or *Very Good*. Finally, 81.0% of the users believe that contests led to better contributions to the video timelines. These results, largely confirm our main hypotheses.

#### 4.3.3 General feedback

After collecting the specific user feedback we also discussed with users to get more general feedback. In general, people enjoyed our system and the idea behind it. Of course it would be better for a system like ours to have a bigger amount of subjects to test it, making their contributions and to give their opinion, but we also believe that our results are already a good sample for a first phase. Also, to test our system and perform all the supposed tasks users need to spend a few amount of time since there is a lot to do and to try so that is probably one of the main reasons why not all of them performed all the tasks. There are still some improvements that need to be made in the responses we received there were even a few suggestions made by the testers. Ideas like changing the buttons colour to better suit reality and at the same time facilitate user interaction is an easy addiction to be made that we will think about in future work. A few dropdowns to order videos by genre are other of the suggestions that were made. An important suggestion that was made was the possibility to direct upload a video directly into a timeline or a contest instead of what is happening now were users need to first upload their video into Lifetime and only then add it to the timeline.

Finally, users pointed to a few performance issues. It was also important to have a sample of people from different formation areas. Despite the main area of responses being from technologies or natural sciences, almost half of them were from other different areas and didn’t seem to have big difficulties performing the tasks or understanding the system.
5 CONCLUSION

In this paper we presented the LiveTime system for collecting video from users about a specific topic/event to build a video timeline of such event. LiveTime gives users the opportunity to ask other users for videos. These video contributions can be made in the context of a contest created by the user. The user study confirmed that users got engaged in the contests, leading to better contributions. Apart from that we also added Twitter integration to facilitate user interaction, that way we allow users to directly contribute to LiveTime or to make indirect contributions through Twitter. In general, the user study shows that there is a clear need for systems that present video in a timeline of the event. All functionalities were well received and were highly scored.

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REFERENCES

[1] M. Balabanović, L. L. Chu, and G. J. Wolff. Storytelling with digital photographs. In ACM SIGCHI, CHI ’00, 2000.
[2] J. Bian, Y. Yang, and T.-S. Chua. Multimedia summarization for trending topics in microblogs. In Proc. of ACM CIKM, 2013.
[3] J. Brooke. Sus: a retrospective. Journal of usability studies, 8(2):29–40, 2013.
[4] J. Brooke et al. Sus—a quick and dirty usability scale. Usability evaluation in industry, 189(194):4–7, 1996.
[5] M. Cha, H. Kwak, P. Rodriguez, Y.-Y. Ahn, and S. Moon. I tube, you tube, everybody tubes: Analyzing the world’s largest user generated content video system. In Proceedings of the 7th ACM SIGCOMM Conference on Internet Measurement, IMC ’07, pages 1–14, 2007.
[6] D. Delgado, J. Magalhaes, and N. Correia. Automated illustration of news stories. In 2010 IEEE Fourth International Conference on Semantic Computing, pages 73–78, Sept 2010.
[7] A. Habibian, T. Mensink, and C. G. Snoek. Videostory: A new multimedia embedding for few-example recognition and translation of events. In ACM Multimedia, 2014.
[8] L. Kennedy and M. Naaman. Less talk, more rock: Automated organization of community-contributed collections of concert videos. In Int’l Conf. on World Wide Web, 2009.
[9] X. Liu and B. Huet. Event representation and visualization from social media. In PCM 2013, 14th Pacific-Asia Conference on Multimedia, 13–16 December 2013, Nanjing, China, 2013.
[10] J. Magalhães and S. Rüger. Logistic Regression of Generic Codebooks for Semantic Image Retrieval, pages 41–50. Springer Berlin Heidelberg, Berlin, Heidelberg, 2006.
[11] M. Rokicki, S. Chelaru, S. Zerr, and S. Siersdorfer. Competitive game designs for improving the cost effectiveness of crowdsourcing. In Proc. of ACM CIKM, 2014.