Chapter 19
Construct a Bipartite Signed Network in YouTube

Tianyuan Yu
National University of Defense Technology, China

Jinlin Guo
National University of Defense Technology, China

Liang Bai
National University of Defense Technology, China

Zheng Yang
National University of Defense Technology, China

ABSTRACT

Nowadays, the video-sharing websites are becoming more and more popular, which leads to latent social networks among videos and users. In this work, results are integrated with the data collected from YouTube, one of the largest user-driven online video repositories, and are supported by Chinese sentiment analysis which excels the state of art. Along with it, the authors construct two types of bipartite signed networks, video network (VN) and topic participant network (TPN), where nodes denote videos or users while weights of edges represent the correlation between the nodes. Several indices are defined to quantitatively evaluate the importance of the nodes in the networks. Experiments are conducted by using YouTube videos and corresponding metadata related to two specific events. Experimental results show that both the analysis of social networks and indices correspond very closely with the events' evolution and the roles that topic participants play in spreading Internet videos. Finally, the authors extend the networks to summarization of a video set related to an event.

INTRODUCTION

The amount of information shared on online social media has been growing at an extraordinary speed during the recent years. Especially the rise of some easy-to-use video-sharing websites such as YouTube, make it easy for users to upload, manage and share videos. Recent statistics show that, 100 hours of videos are uploaded to YouTube every minute, more than 1 billion unique users visit YouTube each month and over 6 billion hours of videos are watched each month[1]. Among the videos, some are captured by

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uploaders, others are remixed and reposted. Users rate and comment the videos according to their tastes. Inevitably, it has led latent rich and complicated social networks in YouTube, which is an invaluable resource for understanding on-line social phenomenon.

In this work, with visual information we propose a weighted network, video network (VN). Companied with the corresponding metadata, a bipartite signed network, topic participant network (TPN) is constructed. Figure 1 illustrates the approach of constructing and analyzing the social networks. Firstly, we use event-related text queries to crawl large quantities of videos and the corresponding metadata from YouTube. Then, VN is constructed with the near-duplicate key frames (NDK) and video metadata. In addition, we construct signed network, TPN, with user metadata. In TPN, negative-weighted edges are constructed to represent users' opposite opinions according to the sentiment analysis method. Then, we analyze the statistics features of the networks on the global level and propose several measures to evaluate the users in the social network on the level of individual nodes. In the end, we select several representative video clips to summarize video sets according to the important videos and participants, which would be useful for video search engine.

The main contributions of the work are:

- We propose to construct a bipartite signed social network basing on Internet videos and the corresponding metadata related to specific events.
- We conduct Chinese sentiment analysis of YouTube comments for mining users' opinions about a specific event, and the method excels the state-of-art.
- We investigate to utilize the important videos and topic participants to summarize specific events with few videos.

Figure 1. Overview of constructing, analyzing, and application of social network